

**THE DEMOCRATIC SOCIALIST
REPUBLIC OF SRI LANKA
DETAILED DESIGN REPORT
ON
THE TELEVISION BROADCASTING
NETWORK CONSTRUCTION PROJECT**

VOLUME III

AUGUST 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

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VOLUME III

BUILDINGS AND TOWERS (1/2)

SECTION 7

TECHNICAL SPECIFICATIONS OF BUILDINGS AND TOWERS

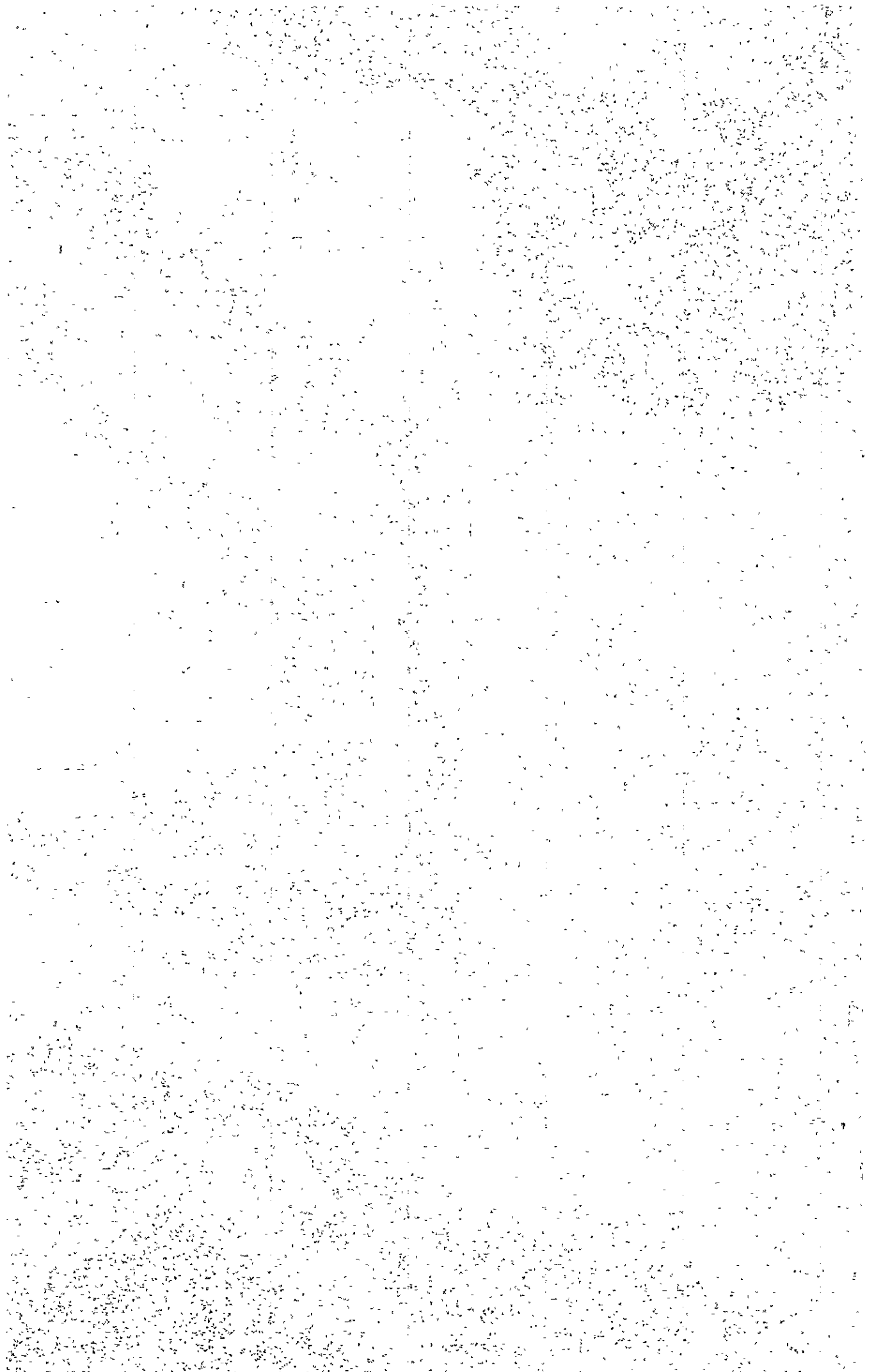


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REMARKS

(1) Relevant standards, specifications, and rules

Standards, specifications, laws and regulations, etc., set out by the Japanese Standards Association, the American Society for Testing Materials, the British Standards Institution, and the ministries, bureaus, and other organizations of the Government of the Democratic Socialist Republic of Sri Lanka are referred to in many paragraphs of this specification. These standards, specifications, laws and regulations, etc., shall mean the latest editions of these documents at the time of tendering.

(2) Abbreviations of standards, specifications, etc.

This specification uses abbreviations for standards, specifications, laws and regulations, etc., including those given in Table A.

Table A

Abbreviation	Description
JIS	Japanese Industrial Standards set out by the Japanese Standards Association.
JASS	Japanese Architectural Standard Specifications set out by the Architectural Institute of Japan.
ASTM	ASTM Standards set out by the American Society for Testing Materials.
BS	British Standards by the British Standards Institution.

(3) Nominal equivalents

Nominal equivalents given in Table B are used throughout this specification.

Table B

Inch size	Metric size (mm)	Inch size	Metric size (mm)
1/16	1.5	1	25.0
1/8	3.0	1 1/8	29.0
3/16	5.0	1 1/4	32.0
1/4	6.0	1 3/8	35.0
5/16	8.0	1 1/2	38.0
3/8	9.0	1 5/8	41.0
7/16	11.0	1 3/4	45.0
1/2	13.0	1 7/8	48.0
9/16	14.0	2	50.0
5/8	16.0	2 1/4	57.0
11/16	17.0	2 1/2	64.0
3/4	19.0	2 3/4	70.0
13/16	21.0	3	75.0
7/8	22.0	3 1/2	89.0
15/16	24.0	4	100.0

Note: In case any indicated or specified number is not available, the nearest higher number will instead be used with the Engineer's approval.

(4) Gauges

Metal plate thicknesses and wire diameters are given by the United States Standards Gauge (USSG), unless otherwise specified.

(5) Units of weights and measures

All documents and drawings to be submitted by the contractor shall use meters and kilograms for the units of length and weight, unless particularly specified by the Engineer.

SECTION 7

TECHNICAL SPECIFICATIONS OF BUILDINGS AND TOWERS

7-1 TEMPORARY WORK

7-1-1 Land Survey

Prior to the commencement of the construction work, land survey shall be accomplished and survey drawings which illustrate the shape, difference in elevation,

7-1-2 Materials for Temporary Work

Unless otherwise stated, used materials workable in practical use may be adopted for materials for temporary work.

7-1-3 Temporary Enclosures

The contractor shall provide through consultation with the Engineer proper, decent-looking temporary enclosures around the construction site so as to prevent unauthorized persons from entering into the site thereby standing in the way of construction work or being exposed to danger.

7-1-4 Staking out

The contractor shall under instructions from the Engineer stake out according to the relevant plot plan to confirm the building area, request for the presence of the client and Engineer, and gain their approval.

7-1-5 Scaffolding and Scaffold Boards

Scaffolds and scaffold boards shall be designed to be robust by adopting materials and methods suitable for the type, scale, period, etc., of the construction work so as to assure convenience for construction work and management and safety, with due care to be given for maintenance.

The materials and construction of scaffolds and scaffold

boards shall meet the provisions of relevant laws and regulations.

7-1-6 Temporary buildings

The allocation of storage yards for materials, stores, offices, etc., shall be determined through consultation with the Engineer.

7-1-7 Temporary Privies

Privies shall be provided at proper locations and kept clean.

7-1-8 Storage Facilities for Dangerous Articles and Voltage Transformation Facilities

Storage facilities for explosives, oils, and other inflammable materials and voltage transformation facilities shall be located as much separate from buildings and other storage yards for materials and shall have such construction as specified in relevant laws and regulations, kept completely under lock and key, and provided with proper fire extinguishing facilities.

7-1-9 Engineers' Office

The area of the Engineers' office in Colombo shall be $25 \sim 30\text{m}^2$ times the number of Engineers. (The Engineers' office site may be selected according to circumstances.) Each Engineers' office shall be provided with electric lamps, water supply and drainage facilities, lavatory, and other necessary facilities. It shall also be furnished under instructions from the Engineer with desks, chairs, drawing boards, sample shelves, blackboard, lockers, maximum/minimum thermometers, clocks, airconditioner, telephone, fire extinguisher, kettles cleaner or dusting things,

rubber boots, raincoats, tools and equipment for inspection, and safety equipment.

Engineers' offices in other places than Colombo shall under instructions from the Engineer be built according to circumstances and be furnished with proper facilities.

7-1-10 Contractor's Office and Others

Contractor's office, workers' resting place, privy, etc., shall be provided according to circumstances through consultation with the Engineer.

7-1-11 Temporary Cableway for Transportation of Materials

A temporary cableway shall be provided over a length of about 2.4km between a location near the entrance of mountain climbers' path in the neighbourhood of Andrews Hotel and the top of Mt. Pidurutalagala (about 2.45km in slant height length, one linear section, about 500m in level difference) for the transportation of construction materials, broadcasting equipment, etc., to the top of the mountain.

The net loadage of the cableway basket shall be 0.5 tons and the number of equipment that can be loaded shall be 24.

Of the cables in use, the main cable shall be 28mm in diameter and the winding cable 16mm in diameter. The speed of the cable shall be 1.5m/sec. The required power of the cableway shall be 55kW, 75HP. The rope gauge shall be 2.5m ϕ .

Prior to laying the temporary cableway, make out sufficient site survey and submit a temporary cableway laying plan to the Engineer for approval.

7-1-12 Temporary Power Supply, Water Supply, Drainage and Other Facilities for Construction Work

Power supply, telephone, water supply, drainage, gas, and other facilities necessary for construction work shall be led in at necessary locations at the cost of the contractor who shall pay directly for these works. After completion of the construction work, these facilities shall be completely removed through necessary procedures. For power and water supply to be used for construction work after laying the power and water supply facilities, basic charges for that period shall be paid by the client and rate charges shall be paid by contractors concerned. The charge for sealing water in the water tank and pipes shall be paid by the contractor.

7-1-13 Disaster Prevention

Proper measures shall be taken for preventing hazards, fire, storm, flood, etc., from occurring in connection with construction work, in accordance with relevant laws and regulations. When there is any fear of endangering life, properties, etc., both inside and outside the construction site, the contractor shall prevent hazardous conditions from being encountered due to the drop of materials by providing protective steel nets or protective sheets and fences or by other equivalent methods so as not to endanger life and properties.

7-1-14 Caution against Fire

By setting a hot-water service spot, trash burning place, and smoking area at given locations, strict control shall be exercised over fire. Fire shall not be made at any other place than specified ones. Cigar and cigarette stubs and cinders of a fire made shall be kept under strict control by a responsible person to be assigned separately. In particular, care shall be exercised for blowlamps, spark in welding, naked lamps, etc. All electric wires

to be layed temporarily shall periodically undergo insula-
tion test, inspection and maintenance.

7-1-15 Curing

When there is a fear of damaging or soiling any part of
completed work, proper protection or curing should be
effected by boarding or plasting paper or polyethylene
film.

7-1-16 Clearing up and Cleaning

The site and buildings in the site shall always be kept
in order without accumulated waste, trash or dust which
may be produced by workers or during construction work.
After completion of construction work, tools and equipment,
scaffold members, remaining materials, etc., shall promptly
be cleared away from inside and outside the building and thus
the site and buildings shall be cleaned up.

7-1-17 Restroration of Roads

When a road, street, footway, or curbed portion is excavated
or changed during construction, it shall be restored to the
initial condition.

7-2 EARTHWORK

7-2-1 Scope of Work

(1) Extent

This paragraph stipulates excavation, grading, filling, back filling, and related earthwork necessary for completing the work specified in the relevant drawings and specifications.

- 1) Rough grading of each site shall be accomplished by the Government of Sri Lanka, and the contractor shall accomplish excavation for buildings and structures, removal of underground obstacles as specified in the relevant drawings or by the Engineer, and back filling, filling, and rolling as specified in the relevant drawings or deemed necessary.
- 2) Such excavated materials that have been approved to be suitable by the Engineer may be used for filling or back filling. All unsuitable materials and surplus excavated materials shall be removed to and abandoned at the place specified by the Engineer.
- 3) When additional fill is still necessary for the required grades or subgrades, bring it about from outside the construction site. Such fill to be brought in from outside the construction site shall meet the quality requirements set out by this specification and be from such a place as approved by the Engineer.
- 4) The contractor shall receive the construction site as it is and shall, where necessary for completing buildings, roads, pavements and any other work, clear away all trash, rubbish, etc., prior to the commencement of excavation.
- 5) When lawn or surface soil in the site or a neighbouring lot is damaged by the construction work or material

storage yard, clear way leftovers, etc., and restore the site on lot to the initial condition.

(2) Work not included

The following items of related work are specified in other paragraphs of this specification.

- 1) Excavation and back filling for piping
- 2) Final shaping of subgrade under outside paved areas
- 3) Topsoil placing and finish grading

7-2-2 Bench Marks

Bench marks shall be provided at places free from shifting or damage or on existing buildings and shall be approved by the Engineer, after determining the standard floor level of the building to be constructed. All bench marks, markings, and other reference points shall be maintained with care during the construction work. If disturbed or destroyed, they shall be corrected under instructions from the Engineer.

7-2-3 Position and Height

Batter boards shall be provided for determining the following positions and heights by using stakes, markings, etc.

- 1) All corners of buildings and structures
- 2) Height of fill for slabs on earth
- 3) Lines, grade and height of fill for pavements and sidewalks
- 4) All other items necessary for works set out in this paragraph

7-2-4 Excavation

(1) Planning

The contractor shall prepare excavation drawings

and submit them to the Engineer for approval. These drawings shall contain dimensions, procedures, and the method of excavation.

(2) Dimensions

Excavation shall be made to the specified depth by the specified dimension. Extra-excavation necessary for foundation work and inspection shall also be performed.

(3) Foundation supporting ground

The work shall receive the Engineer's approval at the time of completion of excavation to the foundation embedment depth shown in the drawing.

When the Engineer determines the foundation supporting ground unsuitable, the contractor shall under instructions from the Engineer excavate the ground to the depth deemed to be suitable for the foundation supporting ground at the cost of the contractor.

(4) Shoring

When necessary, shoring, sheet piling, or waling shall be performed at excavations for securing safety.

Shoring shall be removed as the back filling progresses but only confirming that banks are safe against collapse or caving on slopes.

(5) Drainage

The contractor shall exercise care for the grading of the ground around the building, slope to the ground, surface and take proper measures so that water should not enter into excavations or damage the building or structures.

Trenching or pit excavation at the place of foundation work shall be maintained not

to allow water to enter. The contractor shall provide a pump or pumps necessary for allowing water not to be pooled at excavations. When water spring or flow is encountered during excavation, the contractor shall promptly report it to the Engineer and, after digging a channel and leading water to a proper level under instructions from the Engineer, shall drain off.

7-2-5 Disposal of Utilities

- (1) Works set out in this specification shall be accomplished in accordance with laws and regulations applicable to respective public utilities.
- (2) Active utilities shall be protected, removed or relocated under instructions from the Engineer or in accordance with the specifications. When any public active utilities which may not be shown in drawings is found, report it to the Engineer and support, protect, or relocate it under instructions of the Engineer.
- (3) When any unnecessary or unused public utility is found upon excavation or grading, report it to the Engineer and remove, cap or plug it under directions from the Engineer. Unless otherwise stated, such cutting, capping or plugging shall be made at locations at least one meter apart from the outer walls of the building to be constructed or as required by the regulations.

7-2-6 Floor Slabs on Earth and Fill under Floor Slabs

In order to make the level of the ground under concrete floor or terrace floor slabs as indicated, earth or unscreened crushed stone shall be filled, levelled, and tamped as set out in specifications. For filling up to 30cm in depth, earth or unscreened crushed stone may be used. For filling of more than 30cm in depth, unscreened crushed stone or other approved

shall be used. The type and quality of the material to be used for filling shall be approved by the Engineer. Filling and tamping for back filling under slab after casting foundation wall concrete shall be performed at the time of outside back filling or after sufficiently bracing not to damage the wall.

7-2-7 Back Filling for Building and Structures

- (1) Back filling around the footing of the external wall shall be performed with the Engineer's approval after placing slab concrete to support the top of the wall. For back filling, earth shall be layed and tamped so that future settling should be minimized and that wall work, waterproofing, and other works already accomplished should not be damaged.
- (2) Prior to commencing back filling, ensure that trash and rubbish which may attract termites, corruptible or corrosive wastes and other unsuitable things which may give undesirable influence shall all be removed out of the back filling area. Earth for back filling shall be layed into layers of less than 30cm. Back filling earth shall not contain roots of trees, plaster, brick chips, and any other material unsuitable for back filling. Stones with maximum dimensions of more than 10cm shall not be contained in the portion ranging to the depth of 15cm from the surface of back filled earth. Back filling earth shall be layed in successive layers and each layer shall be back filled loosely to have the above-mentioned thickness and then levelled over the entire width. Each layer shall be tamped sufficiently by rolling or compacting with a pneumatic tamper or the like while lightly sprinkling water over the layer.

Fill shall be finished to have the required level and be inclined so that water should not flow toward the building wall. Where settlement is caused, back filling shall be effected to the required level.

7-2-8 Site Grading

(1) Grading on ground

In the entire site area outside the building, subgrades shall be formed to the following level by cutting, filling, compacting of fill, and rough grading.

- 1) Underside of the surfacing or base course determined by the finished grades of pavements, roads, parking areas, service courts, steps, sidewalks, etc.

(2) Filling

In places where filling shall be made on the existing ground outside the building to the specified subgrade level, fill shall be laid and tamped as required. The quality of the fill material to be used shall be approved by the Engineer.

- 1) Clear away corruptible and corrosive wastes and rubbish which may attract termites or any material which may give undesirable influence, out of the specified area of filling. Prior to the commencement of filling, plow up the ground to a depth of 15cm so that the plowed earth should be adapted in water content to the fill to be laid on.
- 2) Fill shall not contain roots, wood chips, or other organic substances. Fill for use in areas to be paved shall not contain clay or loam by more than 15%. Nor shall it contain humus. Stones with dimensions exceeding 10cm shall not be contained in the portion of fill to range up to 15cm from the surface of the fill.

3) Fill shall be tamped by rolling or compacting to 90% of the maximum density at optimum water content. This tamping shall be carried out by using an automatic roller, automatic tamper, or other machine approved by the Engineer. When necessary, sprinkle water to earth or dry it prior to tamping so as to maintain a proper water content. Filling shall not be made on muddy ground.

(3) Curing

Newly graded areas shall be protected from adverse weather. Settlement, runoff, etc., if encountered before handing-over of the work shall be corrected so that the ground shall have the required level and inclination.

7-3 REINFORCED CONCRETE WORK

7-3-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all concrete work and related items of work necessary to complete the work indicated in drawings and described in specifications.

(2) Work not included

The following items of related work are specified in other paragraphs of this specification.

- 1) Concrete curbstone, gutters, and pavement for roadways and footways.
- 2) Suspended ceiling hangers and grid pipe hangers to be fit on concrete floors.
- 3) Inserts and pipe sleeves for electric piping and equipment installation.
- 4) Anchors and others for fixing brick, blocks and stones to concrete. However, metal slots for setting anchors and others shall be included in the work specified in this paragraph.

7-3-2 Shop Drawings

Shop drawings for reinforcing steel work and form work shall in advance be submitted to the Engineer for approval. The approval of the Engineer shall be received prior to fabricating any material or proceeding with the work.

(1) Reinforcing steel drawings

Reinforcing steel drawings shall include bending diagrams, assembly diagrams, splicing and lap-joint drawings, and drawings showing bar arrangement and the shapes,

dimensions, and details of attachments. The reduced scale of any structural drawing shall not be used for determining reinforcing bar length.

(2) Form work drawings

Shop drawings of form work for all reinforced concrete work shall in advance be submitted to the Engineer for approval. These shop drawings shall be completed ones which show the proceedings of the work, dimensions and grades of timber, alignments of panel forms, etc.

These shop drawings shall indicate form layout plans, construction, and control joints together with the method of form assembling. Shop drawings shall also specify the locations and others of inserts, tees, sleeves, and other materials to be embedded. Drawings or descriptions indicating the methods of shoring and reshoring for horizontal concrete members shall also be submitted to the Engineer for approval.

7-3-3 Samples

The contractor shall at his own cost submit samples of the cement, aggregates, and reinforcing bars that he proposes to use for the work to the testing laboratory specified by the Engineer after signing the contract and whenever necessary.

1) After the primary test of concrete the contractor shall prior to starting concrete work submit sand and crushed stone he proposes to use in the work to the Engineer for approval. The quantities of sand and crushed stone to be submitted to the Engineer are as follows.

Sand: 6kg

Crushed stone (coarse aggregate): 9kg

The samples to be submitted shall be specimens of materials delivered to the site. When any sample is rejected, all

the material delivered contractor proposes shall be carried out from the site promptly. The Engineer will periodically perform test to determine whether the quality of the material used meets the specifications of the sample approved.

- 2) The contractor shall submit samples in duplicate of all kinds of reinforcing bars, and the manufacturer's test certificates.
- 3) Sampling shall be performed by the Engineer or under instructions from the Engineer.

7-3-4 Materials

(1) Portland cement

Portland cement to be used for this work shall be of an approval brand and meet the requirements of JIS R5210.

Cement in a bag shall have a net weight of 30kg±1%.

Cement in a barrel or vessel shall have multiple weight of cement in a bag. Cement shall be put in branded bags or vessels and sealed by the manufacturer and carried into the site in baches of not exceeding 100 tones. In the site cement shall be stored separate from the ground in a proper manner in a fully closed room with a roof to prevent solidification. Cement shall be stored in blocks of batches to arrive. Cement bag shall not in principle be stacked more than 10 bags. Cement shall be used in the order of arrival. Cement produced more than 6 months before the expected date of use or stored at the site for more than 3 months, or cement which may have been moistened shall be retested at the presence of the Engineer.

(2) Aggregates

Natural aggregates shall be used for concrete work.

Crushed stone shall be used as the coarse aggregate. For the fine aggregate, river sand shall be used and crushed sand can be mixed. Crushed stone shall have the quality, grading, and shape specified hereunder. The

aggregate shall be clean, hard, solid, and shall not contain dust, soil, slag, or any harmful object. Sea sand shall not be used at all.

1) Coarse aggregate

a) Crushed stone shall have nominal dimensions of less than 20mm and shall meet the requirements of JIS A5005.

b) Blasting of rocks for crushed stone

Blasting shall be controlled by authorized personnel assigned to by the contractor, not to give damage or loss to life or properties. The contractor shall alone be responsible for all damage or loss incurred from blasting and shall relieve the client from all liability for reparation for damage or injury caused by blasting.

c) Quantity calculation of rocks for crushed stone

Blasted rocks shall be corrected and piled up in a square form at the site. Payment shall be made on the basis of the volume of rocks prior to blasting — by deducting 40% from the volume of blasted rocks thus piled in consideration of gaps. When the Engineer determines that the piling is loose, he may order repiling or may effect proper deduction on the basis of his assumption of gaps.

d) The maximum dimension of the coarse aggregate to be used shall be less than 1/5 of the minimum crosssection of the concrete forms and shall not exceed 3/4 of the maximum clear spacing between reinforcing bars.

2) Fine aggregate

The nominal dimension of the fine aggregate shall be less than 2.5mm.

3) The grading of the aggregate shall be such that

shall allow proper, dense concrete with the required strength to be obtained.

The final grading approved by the Engineer shall not be changed without permission.

The standard gradings of coarse and fine aggregates are given in Tables 7-3-1 and 7-3-2, respectively.

Table 7-3-1 Grading of Coarse Aggregate

Nominal Size of Sieve(mm) Size of Coarse Aggregate	Percentage by Weight Passing Sieves (%)									
	50	40	30	25	20	15	10	5	2.5	
Crushed stone, 20mm or smaller				100	100 90	-	55 20	10 0	5 0	

Table 7-3-2 Grading of Fine Aggregate

Nominal Size of Sieve(mm) Size of Fine Aggregate	Percentage by Weight Passing Sieves (%)						
	10	5	2.5	1.2	0.6	0.3	0.15
Sand, 2.5mm or smaller	100	100 90	100 80	90 50	60 25	30 10	10 2

4) Selection and provision of aggregate store yards, the number of stock piles and their sizes, measures to be taken for preventing different aggregates from mixing, etc., shall be approved by the Engineer.

Coarse aggregates with different gradings shall be stocked separately.

When stock piles with different gradings are to be located near each other, they shall be partitioned with bulkheads or the like.

The bottom of stock pile yards shall be made of concrete

or a hard material which shall be constructed to have a sufficient inclination not to allow water to stay. In taking out aggregate from a stock pile, its typical grading shall be maintained and due care should be taken not to break aggregate or mix foreign matters.

(3) Water

The contractor shall at his own cost provide necessary water for concrete, mortar, etc. Water shall be clean and shall not contain dust, vegetables, salt, and any other impurity.

(4) Admixture

Air-entraining and water-reducing admixture of the standard type shall be used with the Engineer's approval.

(5) Reinforcing bars

Reinforcing bars for concrete shall be clean, involve no defect, and be free from loose rust, scale, or any sticking object which may reduce bond of reinforcing bars to concrete.

1) Reinforcing bars

Deformed bars shall meet the requirements of JIS G3112. Reinforcing rods with diameters of 19mm and more shall meet the requirements of JIS G 3112: SD 35. Reinforcing bars with diameters of 16mm and less shall meet the requirements of JIS G 3112: SD 30.

Welded wire meshes shall meet the requirements of JIS G 3551 and shall measure $6\phi - 100 \times 100$.

2) The contractor shall submit manufacturer's test certificates for reinforcing bars. The contractor shall pick up as many test pieces as necessary for conducting 3 times of tension test and 3 times of bending test at normal temperature for every 10 tons of reinforcing bars

carried in and its fractions and for every type and every dimension, under control of the Engineer. These tests shall be performed in compliance with the requirements of JIS Z 2241 and JIS Z 2248. When the average test value of a lot does not meet the requirements of specifications, the whole lot shall be rejected.

- 3) Unless specifically approved by the Engineer, the whole quantity of reinforcing bars to be used shall be those produced by a manufacturer.

(6) Attachments

Attachments for concrete work shall be of those types approved by the Engineer and shall include all spacers, chairs, bolsters, ties and others necessary for supporting and wiring forcing bars in position.

Metal sections of which legs or bases will expose on the finished concrete surface shall be galvanized.

- (7) Reinforcing bars and other materials shall be secured sufficiently before they are used.

7-3-5 Forms

- (1) Forms shall be made of wood, sufficiently withstand all loads to be applied during the work, and be applicable to such shapes and dimensions of concrete as indicated in drawings. Forms shall be arranged along required lines or inclined as required, constructed and secured for concrete to be finished in required shapes, and have such construction as robust and does not cause leakage of paste. A particular care should be paid for preventing forms from bulging. Any such material that may spoil or damage concrete surface shall not be applied to forms.

- (2) Access openings shall be provided for cleaning and inspecting

forms and reinforcing bars. Before placing concrete, remove woodchips and other undesirable matters on forms, clean the forms carefully, and spray water on the forms sufficiently except in freezing weather.

- (3) Shoring under forms shall be sufficiently strong for supporting all working loads applied to the forms under the construction work and reshoring shall be made under all slabs after removing forms under slabs. Support for forms shall be made of wood or steel and have sufficient dimensions and be used at proper intervals for supporting the loads of forms, reinforcing bars, and concrete and working load. Every support shall be provided with an ample brace or braces. Reshoring of supports shall be performed upon removing forms. The number of supports for reshoring and their layout shall be determined on the responsibility of the contractor. Supports for second floor slab forms will, in general, be mounted on a compressible material and due care should be given so that these supports should not subside. Forms shall not be removed until the Engineer approves that the slab strength obtained as the result of all tests is sufficient for the expected loads.

1) Forms

The minimum periods before removing forms are given in Table 7-3-3.

Table 7-3-3 Minimum Periods before Removeing Forms

	Position	Period (days)		
		Mean Air Temperature		
		More than 15°C	More than 5°C	More than 0°C
Forms	Foundation. Sides of beams/girders, colums, walls.	3	5	8
	Soffits of beams and slabs	6	10	16
Supports	Under slabs	17	25	28
	Under beams/girders		28	

- 2) Forms shall be left longer before being removed than the period mentioned above when so determined by the Engineer because of particular condition of concrete, adverse weather or improper heating or unsuitable curing. However, the contractor shall under all circumstances be responsible for all damage and loss which may be caused by disassembling or removing forms, supports, etc.

7-3-6 Inserts and Anchors for Other Work

Fit inserts, conduits, pipesleeves, drainpipes, hangers, metal ties, rack angle supports, anchors, bolts, corner guards, stair nosings, dowels, thimbles, anchor slots, metal flashings, nailing strips, wood brick, grounds, and others necessary for attachment of other works to forms. These things shall be mounted securely and in place prior to casting concrete in cooperation with other contractors and workmen. Opening for passing ducts shall be made slightly larger than actual dimensions through instructions from the Engineer. Sleeves shall not be fit to guarders, beams, joists or columns without the Engineer's approval.

7-3-7 Processing and Arrangement of Reinforcing Bars

- (1) Reinforcing bars shall strictly meet dimensional and positional requirements specified in drawings. Reinforcing bars shall be placed accurately at positions shown, supported securely, and wired to prevent shift prior to or while casting concrete.
- (2) Reinforcing bars shall be supported by wire chairs or other approved supports. The intersecting points of reinforcing bars shall be wired by annealed iron binding wires.
- (3) Prior to bar arrangement, loose rust, scale, and other such foreign materials that may reduce the bond between bars and concrete shall be cleared away.

- (4) Reinforcing bars shall after completion of assembly be inspected by the Engineer. If there is any correction, it shall be made and the bars shall be re-inspected by the Engineer for approval prior to placing concrete.
- (5) The minimum covering of bars by concrete shall be as shown in drawings.

7-3-8 Concrete for Structures

- (1) Concrete shall be made by mixing fine and coarse aggregates, cement, and water and shall meet the following requirements.
- (2) Concrete mixing plan shall be made in compliance with the following general requirements, the properties of the materials to be used, and instructions from the Engineer. Adjustment in mixing, inspection and testing to be made for concrete strength control, and other necessary inspection and testing shall be performed under instructions of the Engineer.
- (3) General requirements for different types of concrete are given in Table 7-3-4.

Table 7-3-4 General requirements for Different Types of Concrete

Type of concrete	Fc 210	Fc 180	Fc 150
Nominal mix. by volume	1:2:4	1:2 1/2:5	1:3:6
Water/cement ratio	0.45 ~ 0.50	0.50 ~ 0.55	0.55 ~ 0.60
Cement, kg/cu.m of concrete	More than 325	More than 290	More than 250
Slump, cm	8 ~ 13	8 ~ 13	8 ~ 13
Required volume of air entrained	4 ± 1	4 ± 1	4 ± 1
Works test cubes, minimum compressive strength at 28 days. kg/sq.cm	210	180	150
Method of compacting concrete for placing	Vibration	Vibration	Vibration or rodding

(4) Concrete to be adopted -

For all building structures, concrete with a 28-day compression strength (F_c) of 210 kg/cm^2 shall be used.

For steel tower foundations and additional concrete on floor slabs concrete with $F_c = 180 \text{ kg/cm}^2$ shall be used. For guy-wire anchors and leveling concrete, concrete with $F_c = 150 \text{ kg/cm}^2$ shall be used. When using other types of concrete than above, the contractor shall receive the approval of the Engineer.

(5) Mixing plan

The contractor shall determine to employ such a water-cement ratio that will allow a proper workability to be obtained for casting and finishing concrete with the specified strength and the dimensions and accuracy set out in drawings and specifications by having, at the time of tendering, knowledge on the manufacturers, types, and plants of cement and aggregates and casting methods to be adopted. Under any circumstances, the water-cement ratio shall not exceed the upper limit given in Table 7-3-4. Furthermore, the amount of cement to be used for 1 m^3 of concrete shall not be less than the minimum value given in the table under any circumstances.

The contractor shall, as promptly as practicable after signing the contract, perform necessary trial mix for obtaining the required concrete strength by adopting the above-mentioned materials and mixing rate and receive the Engineer's approval. The amount of cement shall be increased when necessary for obtaining the required concrete strength.

7-3-9. Batching and Mixing

- (1) All concrete materials shall be batched accurately. Cement shall be batched by weight and water by weight

or volume. Aggregates shall be measured by gauge boxes or vessels with dimensions approved by the Engineer for different dimensions of aggregates.

- (2) Concrete shall be mixed by such batch mixers in good condition that have been approved by the Engineer and that have a drum to rotate around a horizontal or inclined axis. No continuous mixer shall be employed. Each mixer shall be provided with a water measuring device capable of measuring necessary amount of water for each batch at an accuracy of within $\pm 1\%$ without being subject to water pressure variation. For mixing concrete materials, a slight amount of water (about 10% of the total amount of water to be used) shall be poured prior to throwing in cement and aggregates. By rotating the drum, add water little by little, finish pouring the required amount of water by 1/4 of the specified mixing time. Concrete shall be mixed until it becomes uniform in both colour and density. When double-drum high-performance mixers approved by the Engineer are used, the minimum mixing time is about 70 seconds for each mixer. The amount of concrete mixed in any one batch shall not exceed the specified capacity of the mixer. The whole of the batch shall be removed before materials for a new batch to enter the mixer.
- (3) When mixing operation is complete or to be interrupted for more than 20 minutes, the mixer and all concrete transporting and placing tools shall be cleaned up with water. When concrete remains in the drum, put clean coarse aggregate and water into the drum and rotate the drum prior to mixing new concrete.
- Concrete thus mixed shall not be changed in property by adding water or by any other method for ease handling or any other reason.

(4) Slight concrete can be hand mixed with the Engineer's approval when circumstances require it. In such cases, however, the amount of cement shall be increased by 10%.

(5) Testing

1) Compression strength test

Seven-day compression strength test and 28-day compression strength test shall be performed. However, when the required strength is obtained by 7-day compression strength test, 28-day compression strength test may not be performed. When the required strength is obtained by 28-day compression strength test even if the required strength is not obtained by 7-day compression strength test, the concrete shall be determined good. Sampling for compression strength test shall be performed as per JIS A1115.

2) Slamp test

Slamp test shall be performed as per JIS A1101.

3) Concrete air content test

Concrete air content test shall be performed as per JIS A1128, JIS A1118, or JIS A1116.

4) Frequency of test

The frequency of test shall be determined on the basis of the concrete placing plan of the day through instructions from the Engineer.

7-3-10 Placing Concrete

(1) Preparation

Prior to placing concrete, clear away dust, rubbish, water and other foreign matters out of the place where concrete is to be cast. In the case of wood forms, sufficiently

splay water on them or apply a remover to them. Reinforcing bars shall be cleaned so that no sticking substances such as oil shall remain. Forms, reinforcement arrangement, pipes, sleeves, conduits, hangers, anchors, inserts, etc., shall be inspected and approved by the Engineer.

(2) Placing

Concrete shall be handled as much promptly as practicable from the mixer to forms. In order to prevent segregation of concrete due to flowing and others, concrete shall be transported as much near the final position as practicable. While placing concrete, take due care so that reinforcing bars, pipes, wood brick or others to be embedded in concrete shall not shift. Concrete of high columns shall not be placed up rapidly in short periods of time. In normal cases, concrete for beams shall be placed by one operation from the bottom to the slab top. Concrete shall be moved to the required place by a hoes or the like, sufficiently contacted to all surfaces of forms and bars by hand or a vibrators, and levelled to have a flat surface suitable for finish. Concrete having partially hardened or contained foreign matters shall not be used. All concrete shall be placed on clean, wet surfaces and shall not be deposited on ground with standing water, on soft muddy earth or on dry porous ground. For bearing walls and columns, concrete shall be placed and allowed to settle 2 hours before the succeeding placing. For placing concrete, more than 2 vibrator operators plus more than 5 personnel for spudding and tamping shall be provided. Concrete for parapets, eaves, etc., shall in principle be cast monolithically with the supporting body.

(3) Placing with vibrator

Concrete shall be placed with vibrators (more than 2 sets). Vibration shall be given directly to concrete unless

specifically directed by the Engineer. The strength of vibration shall be such that allows concrete to be flown to the required position and set there. Vibration shall be given only to places where concrete has been deposited and places where concrete has been newly placed.

The vibration time shall be such as to sufficiently set concrete and completely embed reinforcing bars and other materials to be embedded and shall not be so long that may cause segregation of any material. In order to guarantee a uniform, dense surface with no honeycomb, vibrating operation shall be aided by tamping rods along the corners or surfaces of forms while concrete is in its plastic condition by means of vibration. While using vibrators and tamping rods, take due care not to damage the inside of forms or shift reinforcing bars and other materials to be embedded.

7-3-11 Construction Joints

- (1) Construction joints shall be formed according to drawings or with the approval of or under instructions of the Engineer. Dowels or keys may be provided as specified or when necessary.
- (2) The amount of concrete to be placed, method of placing, and the arrangement of bulkheads on joints shall be planned so that the day's concrete work can be continued without interruption.
- (3) Joints in reinforced concrete slabs, joists, beams, and girders shall be at right angles to the axis or surface of the member jointed and at the center of the span. When there is an intersecting member at the point of jointing, the joint shall be located at a point of minimum shearing stress.

- (4) Unless particularly directed by the Engineer, joints in walls, columns and piers shall be made at the top of floor. When it is necessary to stop the work of the day or when the work is to be interrupted by some reason or other, the work shall be stopped at the center of the slabs or beams or at the position specified by the Engineer. Concrete of cantilever slabs and cantilever beams shall be placed monolithically with the main body and shall not be jointed.
- (5) Temporary wooden bulkheads shall be applied so that joints shall become at right angles to the main bar axis. By applying a wood strip with a thickness of 5cm and a width equal to 1/3 of the concrete slab thickness to each wooden bulkhead, form a tongue and groove joint.
- (6) Prior to restarting concrete placing work, the surfaces of previously placed concrete shall be roughened, cleaned, wetted with grout immediately before placing concrete newly. Grout shall be made with Portland cement to sand ratio of 1:2.

7-3-12 Weather Condition

- (1) When, during temperature drop, the atmospheric temperature falls below 3°C in the shade, all concreting work shall be stopped. Concreting shall not be restarted until the rising temperature becomes 2°C in the shade. When the temperature in the shade reaches about 37°C and is still rising, care shall be exercised particularly for the followings in placing concrete.
 - 1) Cement at high temperatures shall not be used.
 - 2) Aggregates exposed to intense heat for a long time shall not be used as they are. Coarse aggregates

- shall be used after spraying water or the like.
- 3) Water to be used shall be as much low in temperature as practicable.
 - 4) When necessary, consult with the Engineer on the use of air-entraining and water-reducing admixture of delay type depending on the required time before placing after the mixing of concrete.
 - 5) Water spray on shuttering before placing shall be elaborated.
 - 6) The time from the start of mixing concrete to the end of placing shall be less than one hour.
 - 7) Concrete shall not be casted directly on hot concrete or fill. When the temperature in the shade rises above 43°C, concrete shall not be placed.
- (2) The contractor shall record dates of placing concrete, mixing rate to be employed and atmospheric temperatures at the time of placing concrete for different sections of the work. This record shall be kept so that it can be submitted to the Engineer when requested.

7-3-13 Protection and Curing

- (1) Concrete placed newly shall be protected from rain, sand storm, chemical change, and other harmful heat and wind actions, water flow, shocks and vibration, etc. Protection and curing shall be continued until concrete becomes sufficiently hardened not to be subject to the above-mentioned factors. The Engineer will determine the time of releasing protection and curing, but under any circumstances it shall be more than 24 hours after placing concrete.
- (2) Concrete shall be cured by water spraying for at least 7 days through instructions from the Engineer. Concrete and cement

finishes shall be wetted while adjusting the frequency of water spraying depending on the dryness of the surfaces during the curing period. Concrete and cement finishes shall, unless specifically directed, be covered with cotton mat, canvas, and other approved covering within 24 hours after placing or finishing and shall be kept under desirable condition until final finish work will be elaborated. Any covering material shall not spoil or discolour concrete. Wood forms shall also be frequently wetted by water spary to prevent being dry during the period of curing.

7-3-14 Concrete Floor Slabs on Earth

- (1) Concrete floor slabs on earth shall be placed on well-compacted subgrade. Fill under floor slabs shall, in principle, be compacted to 1/2 in thickness at every layer of 30cm. For this purpose, unscreened crushed stone not containing clay by more than 5% shall be used. Crushed stone fill shall be sufficiently rolled until the required thickness and height can be obtained.
- (2) On crushed stone fill polyethylene film of 0.15mm in thickness or reinforced waterproof kraft paper shall be laid with edges being folded by 15cm. For the paper and film, the specified product of large size shall be used. Spread the film or paper by stretching edges, and place weights on the edges and folds until concrete is placed, so as not to disturb the film or paper. Immediately after laying film or paper, place concrete of required thickness and finish at proper level to receive final finish specified.
- (3) Unless specifically directed, a continuous expansion joint material shall be laid at sections where edge of floor slab abuts vertical surface. Joint materials and

portions around pipes penetrating floor slabs shall be completely sealed. For the joint seal material, coal-tar pitch shall be used. At sections where floor waterproof is necessary, no expansion joint shall be used but the slab shall be connected to the wall.

7-4 BRICK MASONRY

7-4-1 Scope of Work

The work specified under this paragraph consists of all brick masonry work and related items of work necessary to complete the work indicated in drawings and described in specifications.

7-4-2 Shop Drawings

All shop drawings shall be submitted to the Engineer for approval. Shop drawings shall illustrate reinforcements, masonry joints, lintels, and details of the work including accurate dimensions, materials to be used, and other related items. Detailed and accurate drawings shall be submitted to the Engineer sufficiently prior to commencing the work so that the Engineer can give approval for the dimensions of door frames and other items.

7-4-3 Samples of Materials

The contractor shall prior to commencing the work submit to the Engineer three sample pieces of each material he proposes to use in the work.

7-4-4 Materials of Brick Masonry (Brick)

High-quality brick made by hand or machine shall be used. The surfaces of brick shall be free from streaks, hollows, cracks or the like. Brick shall be baked completely so that the bulk should become uniform.

The dimensions of brick shall not differ greatly from the following.

Brick dimensions: 220mm(wide) x 105mm(deep) x 65mm(high)

Brick shall meet in all points the requirements of the standard of Sri Lanka for general masonry brick.

7-4-5 Material for Mortar

(1) Portland Cement

See Paragraph 7-3-4 "Materials."

(2) Sand

Sand to be used for mortar shall be clean, be stable both chemically and in construction, and shall meet the grading given in Table 7-4-1.

Table 7-4-1

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

(3) Water for mixing

See Paragraph 7-3-4 "Materials," item (3) "Water."

7-4-6 Storage of Materials

Materials shall be stored at dry places with covers and in such ways that prevent damage or entry of foreign matters. Under such weather conditions that may cause icing, brick shall be covered with sheets or other proper materials and stored under covers or the like which will permit circulation of air and not cause excessive absorption of moisture.

Cement shall be stored in a watertight warehouse with an elevated floor. Reinforcing bars shall be protected against rain and wind and free from loose rust, ice, and other foreign matters which may hinder or lessen the bond of bars to concrete before being used.

7-4-7 Mortar

- (1) Mortar mixing shall be made at a Portland cement to sand volume ratio of 1:4. When a plasticizer for mortar is employed, the Portland cement to sand ratio shall be 1:6.
- (2) For the plasticizer for mortar, the product of a manufacturer approved by the Engineer shall be used in accordance with instructions of the manufacturer.

7-4-8 -Mixing of Mortar

All cement materials and sand shall be mixed (by) a mechanical batch mixer for at least 5 minutes. The consistency of mortar shall be such that the bricklayers are satisfied. Minimum amount of water shall be used for achieving good condition in using mortar and adjustment for this, shall be made using only water. When mortar begins to harden partly because of the vaporization or absorption of a part of the mixing water, add water and retemper the mortar promptly. All mortar shall be used within one hour and a half from the time of initial mixing. Mortar having begun to set shall not be used.

7-4-9 Cautions and General Remarks

- (1) When the outside temperature is below 5°C, masonry shall not be laid unless the materials are heated, the work is protected from the cold and freezing, and measures are taken

to allow mortar to set without freezing under instructions of the Engineer.

to allow mortar to set without freezing under instructions of the Engineer.

(2) Prior to closing a pipe, duct, or similar space or shaft, insure to clear away rubbish and foreign matters in it and clean it.

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(3) Brick masonry joints having partially or completely hardened shall be cleaned and lightly wetted by water and spraying to obtain the best possible bond with new work. Loose units and mortar shall all be removed. When a horizontal course of masonry is to be interrupted on the way, brick shall be cracked back at a length of a half brick in each course.

(4) Measures shall be taken through consultation with other trades concerned so that their items of work to be followed can be performed without chipping and patching. In the work related to this work and specified in other paragraphs, materials indicated to be assembled shall be processed as required according to the proceeding of the work. Fill sufficient spaces around the vertical and upper frames of doors with mortar. Window anchors and clips shall also be embedded.

7-4-10 Brick Masonry

- (1) English bond shall be employed for all brick masonry unless otherwise specified. Broken brick shall not be used except where required.
- (2) All bricks shall be laid after applying mortar. Joints shall have a width of 10mm and shall be filled with mortar completely over the whole wall thickness at each course.

- (3) All brick shall be used after being impregnated with water. The top bricks of wall left by the interruption of brick laying shall be wetted with water prior to restarting brick laying. Wall surfaces shall all be kept clean by removing mortar droppings and splashes.
- (4) Unless specifically directed, check level and plumbing at each 4 brick courses.
- (5) For walls, bricks shall be laid uniformly so that any part of them shall not be left more than 1.5 meters lower than another part unless approved by the Engineer. When the work is interrupted at different levels left, raching back shall be employed for the stepped section.
- (6) Flashing, wooden brick, access door panel, and others shall be provided as indicated in design drawings.

7-5 WATERPROOFING

7-5-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all waterproofing work and related items of work necessary to complete the work indicated in drawings and described in specifications.

(2) Work not included

The following items of related work are specified in other paragraphs of this specification.

- 1) Concrete topping over water resistant layer
- 2) Surface treatment of water resistant layer bed
- 3) Roofing

7-5-2 General

- (1) Materials for waterproofing shall be carried in, the site sealed in manufacturer's original packings with the name of manufacturer and trademark on.
- (2) Deviation from specifications will be permitted only by the Engineers approval , and the contractor shall guarantee the work for specified periods of time.

7-5-3 Guarantee Period

Water resistant layers to be provided in this work shall have performance capable of guaranteeing for a period of 10 years.

7-5-4 Samples

Two samples of the following material shall be submitted to the Engineer for approval. Approval shall be gained prior to carrying in the material.

Colded application type asphalt waterproofing materials

7-5-5 (1) Colded application type asphalt waterproofing

1) Asphalt primer

Asphalt primer is suitable for the adhesion of asphalt. The quality of asphalt primer is given in Table 7-5-1. Such asphalt primer that has changed its composition shall not be used.

Table 7-5-1

Quality of Asphalt Primer		
Item	Quality	Remarks
Dry to finger touch	Within 8 hours	Tests shall be made in accordance with JIS K 5400 (General tests for paints)
Remnants after heating	Not less than 35%	
Specific gravity	Less than 1.0	

2) Colded application type asphalt waterproofing materials

By impregnating a base cloth made of a synthetic fiber with high-class asphalt (Class 3 or Class 4 or better set out in JIS A 6011) and then placing a layer of rubber asphalt with high adhesiveness on the base, asphalt waterproofing materials are obtained. A waterproofing material has rubber asphalt layers on both sides of the base (which is designated waterproofing material A) and another waterproofing material has a rubber asphalt layer on one side (which is designated waterproofing

material B). The surfaces of both rubber asphalt layers are covered with special separating sheets which can be easily removed upon work. Each rubber asphalt layer employs the above-mentioned asphalt as the base which is mixed with proper amounts of special synthetic rubber and synthetic resin.

Colded application type asphalt waterproofing materials are produced basically as above but those waterproofing materials having equivalent performance may be used.

(2) Heat storage tank

- 1) Clean the bed elaboratedly, and after the bed is sufficiently dried, apply or spray asphalt primer at a rate of $0.3\ell/m^2$.
- 2) Apply waterproofing material A to the rising portion by removing the separating sheet and, at the same time, apply waterproofing material A to the horizontal portion by at least 20cm. After applying the waterproofing material, roll it sufficiently by a hand roller or the like. The lap of waterproofing material A shall be 10cm.
- 3) Apply waterproofing material A on the whole surface of the horizontal portion by removing the separating sheet on the under side. The lap of waterproofing material A shall be 10cm. On the rising portion, the waterproofing material shall be overlapped on the previously applied waterproofing material A by raising it by 10cm.
- 4) Foaming polystyrene boards with a thickness of 5cm (as per JIS A 9511) shall be attached on the whole surface

of waterproofing material A by removing the separating sheets.

- 5) Apply waterproofing material A on the foaming polystyrene board previously attached on the whole surface by removing the separating sheet on the under side of the waterproofing material. The method of application shall be as stated in item 3) above.
- 6) Apply waterproofing material B to lap over the waterproofing material A previously attached over the whole surface after removing both separating sheets. Horizontal portions should preferably be rolled by a press roller or the like. The lap of waterproofing material B shall also be 10cm and shall not come on the lap of the waterproofing material A.
- 7) Waterproofing material B on the horizontal portion shall be expanded to the longitudinal direction as it is to finish the rising portion. For the rising portion in the lateral direction of the material, waterproofing material B shall be cut into a length convenient for work and applied to run from the horizontal portion to the rising portion and finish the rising portion. Waterproofing material B shall be applied by raising it by another 5cm or more than the waterproofing material A under the waterproofing material B.
- 8) The laps of waterproofing material horizontal and rising portions shall be attached pressed while being heated with a propane gas burner or blow lamp.
When fire can not be used, stick them by strong calking.

- (3) In the case of water tank materials A and B on both
The procedure of Paragraph 7-5-5 (2) but with items 4) and 5) deleted shall apply.

(4) Curing

Waterproof surfaces applied shall be cured not to be damaged until the wall and floor finish described in other paragraphs of this specification are performed.

7-6 ROOFING & GUTTER APPLICATION

7-6-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all roofing, gutter application, and related items of work necessary to complete the work indicated in drawings and described in specifications.

(2) Work not included

The following items of related work are specified in other paragraphs of this specification.

Wood construction of roof

7-6-2 Shop Drawings

The shop drawings of roofing and gutter application shall be submitted to the Engineer for approval. The approval shall be gained prior to commencing the work. The shop drawings shall specify the thickness, dimensions, and fitting and fixing methods of respective sections.

7-6-3 Samples

The contractor shall submit to the Engineer each 2 samples of the following materials for approval. The approval shall be gained prior to carrying in materials or commencing the work.

- 1) Roof tiles
- 2) Corrugated asbestos-cement sheets
- 3) Metal plate materials
- 4) Hard PVC gutters

7-6-4 Clay tile roofing

Roof tiles to be used shall be clay tiles produced in Sri Lanka and shown in the drawing. Roof tiles shall be laid securely and in good order by using mortar so that they shall not cause damage, deformation, or water leakage by wind and rain, with due consideration for the roof tile work specifications established in Sri Lanka.

7-6-5 Roofing with Corrugated Asbestos-Cement Sheet

- (1) For corrugated asbestos-cement sheet, highest-quality large corrugated sheets produced in Sri Lanka shall be used. These corrugated asbestos-cement sheets shall have a thickness of more than 6mm and use special tiles on their ridges.
- (2) For fixing parts, galvanized hook bolts with a diameter of more than 6mm, special nails with a diameter of more than 5mm (which go into the purin to a depth of more than 40mm) or threaded nails with a diameter of more than 5mm (which go into the purin to a depth of more than 25mm).
- (3) Washers shall be galvanized ones with a diameter of 30mm and a thickness of more than 1.6mm. Washers use felt, having a thickness of more than 5mm and impregnated with asphalt, as the filler.
- (4) Fixing at the crest of corrugation shall be employed at more than 2 positions on every one sheet width for each purin. For ridge capping, 4 fixing metals shall be used for each sheet.
- (5) The side laps of corrugated asbestos-cement sheets shall

not be less than 1.5 corrugations and the end laps shall not be less than 150mm.

- (6) Due consideration shall be given to the corrugated asbestos-cement sheet work specifications established in Sri Lanka.

7-6-6 Metal Gutters

- (1) Metal gutters shall be made by using PVC covered steel plates having dimensions and shapes as indicated in drawings and for those sections indicated in drawings. Unless otherwise specified, gutters shall have an inclination of 1cm per 1.5m toward the downpipe.

(2) Gutter outlets and scuppers linings

- 1) Provide gutter outlets and the scuppers linings, as indicated in drawings or when necessary.
- 2) Gutter outlets and scuppers linings shall be made of PVC covered steel plate of 0.8mm in thickness. Gutter outlets or scuppers linings shall be soldered or welded to the linings of gutters. The dimensions of gutter outlets and scuppers shall be 20mm smaller than those of openings on walls and slabs.
- 3) For gutter outlets, stainless steel basket type wire strainers which can be dismantled and remounted shall be provided.

7-6-7 Cap Flushing

- (1) Cap flushing shall be provided at locations indicated in drawings. Cap flushing shall be made of PVC covered

steel plate having a thickness of 0.5mm.

- (2) At other locations than requiring short cap flushing, cap flushing shall be processed to a minimum length of 1.2m with the edge overlapped 7.5cm without soldering.
- (3) Cap flushing at corners shall be embodied monolithically.

7-6-8 Hard PVC Gutters

- (1) Hard PVC gutters and their adhesives shall be products of a manufacturer, in compliance with JIS A 5706.
- (2) Gutter hooks shall be made of galvanized steel with a thickness of 2.8mm and a width of more than 25mm or shall be a product already manufactured.
- (3) Gutter hooks shall be fitted at intervals of less than 1.5m in the case of down pipes and at intervals of less than 1m in the case of eaves gutters.
- (4) Gutter hook work
 - 1) For down pipe clips, steel rings shall in principle be hinged with each steel ring being tightened to the steel anchors with 2 small bolts.
 - 2) For fitting down pipe clips, anchor shall in principle be split, bended at both edges and embedded to a depth of about 60mm in the case of reinforced concrete construction. In the case of wooden structure, nails or screws shall be used for fixing.
 - 3) Eaves gutter hooks for a wooden structure shall be driven or nailed into purlins or the like.
 - 4) Eaves gutters shall be bound to gutter hooks with

copper wires for binding gutters (1.2mm in diameter).

- (5) After completion of fitting gutters, clean and perform water running test.

7-7 PLASTERING

7-7-1 Scope of Work

The work specified under this paragraph consists of all plaster work and related items of work necessary to complete the work indicated in drawings and described in specifications. A mixing table for the nominal mix of cement and sand is given in Table 7-7-1.

Table 7-7-1

Mixing Table		
Nominal mix	Cement kg	Sand cu.m
1 : 1	1,450	1.0
1 : 1 1/2	1,000	1.0
1 : 2	750	1.0
1 : 2 1/2	600	1.0
1 : 3	500	1.0
1 : 4	350	1.0
1 : 5	300	1.0

7-7-2 Thickness and Number of Coats

(1) Thickness

Unless otherwise specified, plaster thickness ranging from the lath, brick, or concrete face to the plaster finish face shall be at least as follows.

- 1) External Portland cement plaster and floor plaster finish: 30mm
- 2) Interior Portland cement plaster (excluding ceilings): 20mm
- 3) Interior Portland cement plaster on ceilings: 15mm

(2) Number of coats

Apply 3 coats of plastering to brick, block, and concrete surfaces excluding floors and ceilings. Give 2 coats to the soffits of concrete ceiling.

7-7-3 Materials

(1) Basic materials

1) Portland cement

See Paragraph 7-3-4, item (1) "Portland cement."

2) White Portland cement to be used shall be such a product of Sri Lanka that meets the requirements of JIS R 5210 or a product approved by the Engineer.

3) Slacked lime to be used shall be such a product of Sri Lanka that meets the requirements of JIS A 6902 or the equivalent.

(2) Sand

Sand to be used in plastering shall be clean, fine, and chemically and physically stable. Sand shall pass sieves and shall have such grading as given in Table 7-7-2.

Table 7-7-2

Table of Grading -(Percentage by Weight Passing Sieves)							
Nominal Size of Sieve (mm)		5	2.5	1.5	0.6	0.3	0.15
Sand (%)	Scratch coat, Brown coat	100	100 ~ 60	85 ~ 35	60 ~ 20	35 ~ 10	10 ~ 2
	Finish coat		100	100 ~ 50	80 ~ 30	45 ~ 15	10 ~ 2

(3) Water

See Paragraph 7-3-4, item (3) "Water."

7-7-4 Carrying in and Storage of Materials

(1) All products shall be carried in packed in packages, containers or the like branded with the name and trademark of the manufacturer. Unless specifically stated herein, mixing and application of all products shall strictly meet the requirements of the specification of the manufacturer or manufacturers.

(2) Cement, laths, and all other plastering materials shall be protected against moisture until they are used. These materials shall be stored under a roof and separated from walls which may cause dew condensation and other moist surfaces. Metals shall be stored not to cause rust. Rusted metals shall not be used in the work.

7-7-5 Samples

The contractor shall submit 2 samples of each lath, etc., he proposes to use in plastering to the Engineer for approval.

7-7-6 Metal laths

(1) Application

Metal laths shall be used at all locations indicated in drawings as plaster bases.

When concrete and adjacent brick surfaces to be plastered are on a line with each other, metal laths shall be applied so as to cover at least 15cm over each surface.

(2) Types and weights of laths

Laths to be used shall be such flat metal laths that

meet the requirements of JIS A 5505, Type 2 and have thickness of 0.4~0.7mm and weight of more than 0.5kg/m² or equivalent.

7-7-7 Types and Mix Proportion of Scratch and Brown Coats

For all scratch coats under all cement plaster, standard portland cement plaster shall be used. The Portland cement-sand ratio to be employed for scratch coats shall be 1:2 in volume ratio. The Portland cement-sand ratio to be employed for brown coats shall be 1:3 in volume ratio.

7-7-8 Application of Plaster Base Coats

(1) Preparation

By inspecting the plaster base, confirm that plastering can be achieved at the required thickness. Inspect metals, corner laths, and bridging laths, etc., to confirm that they are mounted securely. Check whether there is rust or whatever may discolour plastered surface and, if any, effect corrective plastering as required. When necessary, wet the brick, block, or concrete surface to be plastered with a brush or spray prior to starting plaster work.

(2) In the case of 2-coat work, apply scratch coat with sufficient material and pressure to adhere firmly to the plaster base. Before this first coat has set, form a sufficiently smooth surface by using a wood float and leave the plaster rough to become ready to receive the finish coat.

(3) In the case of 3-coat work, apply scratch coat with sufficient material and pressure to adhere firmly to the plaster base. Before this first coat has set, scratch

it with a scarfier or scratcher to produce a suitable coat for brown coat. Apply brown coat to form a smooth surface, screed the surface to less than 3mm in both horizontal and vertical directions, and apply a wood float to make the surface ready for the application of finish coat. Brown coat shall be applied after the scratch coat has been dried.

7-7-9 Types, Coats and Mix Proportion of Finish Plaster

For finish coat, Portland cement plaster shall be applied on brown or scratch coat. The mix proportion of finish coat shall be 1:3 (Portland cement : sand) by volume. For interior work, a proper amount of admixture shall be used in addition. The amount of admixture shall be such that shall not give any remarkable influence to the strength of the plaster.

7-7-10 Application of Finish Coat

(1) General

Finish coat shall be applied at a thickness of about 3mm. Finish coat shall be applied after the base coat dries partially or completely and then wetted uniformly but not excessively. In general, the base coat is properly dampened in compliance with the specification of the manufacturer of the base coat and finish coat materials. Finish coat shall be cured in wet condition for at least 48 hours after application.

(2) Trowel finish

After applying finish coat uniformly on the base coat, wait until water disappears. When water disappears,

finish with a trowel not to cause blemishes and irregularities, by using a proper amount of water.

7-7-11 Application of Waterproofed Plaster

(1) Waterproof agent

For the waterproofing agent, the product of the specified manufacturer shall be used.

(2) Mix proportion

The mix proportion of cement to sand shall be 1:2 by volume and the waterproof agent shall be used as specified in the specification of the manufacturer of the waterproof agent.

(3) For waterproofed plaster, materials shall be measured accurately and mixed sufficiently. Waterproofed plaster shall be applied to a thickness of 15mm with a trowel elaborately. For walls, waterproofed plaster shall be applied in two coats.

7-7-12 Cautions and Preparation for Plastering

(1) Temperature and ventilation

While plastering and curing, a maximum temperature of 65°C shall be kept in places to be plastered for at least 7 days. Plaster shall be protected from freezing, nonuniform or abrupt drying. Plaster shall not be applied on any frozen surface. After the plaster has set, proper ventilation shall be effected to prevent dew condensation.

(2) Concrete surface

When applying plaster directly on a concrete surface

with no metal lath, ensure to remove foreign matters such as rubbish and plaster dregs on the concrete surface with a wire brush and remove grease, oil, efflorescence, etc., by a solution of hydrochloric acid (1) : water (10) or an alum solution approved by the Engineer.

(3) Masonry surfaces

Masonry surfaces on which plaster is to be applied shall be cleaned free from mortar chips, brick chips, grease, oil, acids, etc. Masonry surfaces shall be properly dampened as required to prevent excessive suction.

(4) Plastering procedure

Plastering of rooms or areas requiring sound absorbing treatment shall be performed prior to applying sound absorbing materials. For rooms to be tiled with ceramic tiles by using plaster, finish plaster on walls shall not be applied until the tiling work is complete.

(5) Curing of adjacent surfaces

Prior to applying plaster, sufficiently cure such adjacent sections already finished as tiles, stone, frames, doors, windows, and partitions and protect these sections from damage and loss, soil, and stain. For curing, cover these sections with damp-proofing kraft paper or polyethylene sheets and seal joints with tape or adhesives. For metal frames, masking tape which can be removed later or stain preventing material approved by the Engineer may be used in compliance with instructions given in the specification of the manufacturer. The curing material shall be maintained sufficiently during the plaster work and shall be removed after completion of the plaster work.

(6) Inspection of plaster base

Prior to plastering, inspect the plaster base of each room or section elaborately. When any incomplete section or condition is found, report it to the Engineer. Plastering shall not be performed unless necessary base treatment is completed.

7-7-13 Mixing of Plaster

Plaster shall be mixed by machine mixers, although it can be mixed by hand when approved by the Engineer. As many mixers as necessary for the plaster work shall be used. Plaster shall be measured by volume or by weight, whichever specified. Freezed, hardened, or solidified materials or partially hardened materials shall not be used. Nor partially set materials shall be retempered for use.

7-7-14 Corrections

After completing the plaster work, effect corrections on flawed or defective portions. Correction shall be made to assure harmony in texture and finish with adjacent portions and to form flush and smooth surfaces.

7-7-15 Spraying of Plaster for Decoration

(1) Materials

Plaster spray materials to be used shall meet the requirements of JIS A 6907 (Plaster spray materials).

(2) Procedure

- 1) When a crack or cracks are involved on the concrete base and others, chip portions involving cracks in

V form as required and patch up cracks with cement paste fill harmless to finishing. Unevenness if found shall be corrected by sandering.

- 2) Prior to applying finish coat, add water of 50% of the total amount of water to be used to the materials, mix them sufficiently, and then add the remaining water to them. For the base coat, the total amount of water may be added at a time.
- 3) Such an amount of plaster shall be mixed that can be applied within one hour.
- 4) Base coat shall be sprayed after the base surface to be sprayed has set sufficiently. When the base is excessively dry, dampen it.
- 5) Finish coat shall be applied more than 24 hours after applying the base coat.

7-8 CARPENTRY

7-8-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all carpenter work and related items of work necessary to complete the work indicated in drawings and described in specifications.

(2) Work not included

The following items of related work are specified in other paragraphs of this specification.

Studio interior work

7-8-2 Shop Drawings

(1) Shop drawings for carpentry shall in advance be submitted to the Engineer and approval shall be received for all requirements specified hereunder.

(2) Shop drawings shall specify materials, kinds of trees, matching and arrangement of panels, full size profiles of mouldings, thickness, dimensions, construction, fastenings, blocking, clearance, assembly and erection details, finish materials, surface finishes, build-in hardware, connections with associated work, etc.

7-8-3

(1) Samples

The contractor shall submit two samples of each of the following materials and assemblies to the Engineer for approval. Prior to commencing assembly or fabrication, the contractor shall receive the Engineer's approval.

- Timber a) Timber for structure (depending on the
kind of tree)
b) Timber for fixture (depending on the kind
of tree)

(2) Prior to using solid timber or laminated timber, submit samples of the timber to be used to the Engineer for approval.

7-8-4 Materials

(1) General

- 1) Sizes given in drawings shall be finished sizes.
- 2) Timber to be used shall be such that are sufficiently seasoned and planed smooth, straight and true and free from cracks, cuts, breaks, loose or dead knots, vermiculation, and any other defect.
- 3) All timber shall be straight and true, and timber with distortion or twist shall be rejected.
- 4) Anti-termite treatment shall be effected to all timber specified herein. The method of anti-termite treatment shall be such as authorized in Sri Lanka.
- 5) Unless otherwise specified, materials for carpentry shall be those available in Sri Lanka and approved by the Engineer.

(2) Moisture content (average)

- 1) Timber for framework, sheathing and exterior finish
woodwork: less than 20%
- 2) Timber for interior finish woodwork: less than 15%

(3) Grades and kinds of timber

- 1) The grades and kinds of timber, plywood and fixture
shall be as described hereunder, unless otherwise

specified. Timber and plywood shall be identified by authorized grade marks given on them so far as there is no hindrance to natural grain finish. In the case of natural grain finish, a certificate or certificates issued by the timber grading organization or inspection organization approved by the Engineer shall be submitted upon delivery of the materials.

2) Timbers for frames and frameworks

- a) For floor joists and beams, first-class timber or equivalent shall be used.
- b) For studs, sills, upper plates, ridge diagonal bracings, furrings for walls and ceilings, throating, wood brick, nailing strips, etc., second-class timber or equivalent shall be used.

3) Timber for exterior finish woodwork

For door frames, first-class timber approved by the Engineer shall be used.

4) Timber for interior finish woodwork

- a) For trims, door and window frames, window boards, ceiling boards, and exposed wood parts made in finish woodwork and others, first-class timber approved by the Engineer shall be used.
- b) For concealed parts made in finish woodwork, second-class timber approved by the Engineer shall be used.

7-8-5 Carpentry for Structure

(1) Jointing

All frameworks shall be jointed by optimum jointing methods. Joints shall transmit required loads and withstand stresses, to which they will be subjected and shall be approved by the Engineer. Unless otherwise stated, all joints shall be fixed with as many nails of a proper type as required. Butt joints shall be fixed with side board by nailing from the side board side (when there is a side board).

Joint surfaces shall be contacted smoothly over the whole surfaces prior to using fastenings.

Nails, screws, or bolts shall not be used on breaks at the ends of timber. When there is a possibility of causing a break, bore a hole with a diameter not exceeding $4/5$ of the diameter of the nail to be driven by using a gimlet prior to nailing. When screws are to be used, bore holes in advance. When using bolts, bore holes with a diameter 1.6mm larger than that of the bolts to be used from both sides of timbers to be jointed.

Nuts shall be tightened securely while taking care not to damage wood immediately under washers.

Holes on structural members shall be bored after fastening with clamps or spikes.

(2) Covering materials

Frames and frame works shall be arranged and assembled so that all supports and fastenings necessary for mounting covering materials shall be fitted as required.

(3) Frames

For columns, studs, beams, binders, joists, rafters, and purlins, one piece of timber extended between the supports or the base on which it is to be fitted shall be used. However, when inevitably it is necessary to joint at an intermediate position, such a method that has been approved to cause no hindrance in structure shall be employed.

(4) Anchors

Structures to be fixed to prevent roof frames, trusses, and others from being deviated shall be fitted with proper anchors at joints or fixed by using binding hardware on all supporting sections.

(5) Beams and binders

For beams and binders between supporting points, timber in one piece and one length shall be used. For continuous joints, scarf joint or splice joint shall be used and reinforcement by bolts, plates or metal straps shall be employed to fix the joints securely.

7-8-6 Roof Trusses

(1) General

Timber available at proper price by proper method in Sri Lanka and approved by the Engineer shall be used.

(2) The joints of roof trusses shall be elaborated accurately by the most suitable method and shall be connected securely by nails, binding hardware or the like.

7-8-7 Furring

(1) Furring shall be fitted as indicated in drawings and described hereunder.

(2) When necessary, use wood shims or the like so that the surface shall become true to line and plumb.

7-8-8 Joinery/Finish Carpentry

(1) Exposed faces

Unless otherwise stated, exposed faces shall be wrought or sanded for finish.

(2) Necessary tolerance shall be considered on all joints between fixture and structure, whether of brick or concrete, to provide allowance against errors

in construction or fitting and other movements.

(3) Arrangement, jointing and fitting of all fixtures shall be made not to detract the strength and external view of the finished work and not to give loss or damage to adjacent materials or structures even if shrink is caused in any portion or to any direction.

(4) All such items of work necessary for suitable joints as provision of mortises, tenons, and grooves, ship lap, and tonguing shall be performed.

Metal plates, screws, nails, and other fixings specified by the Engineer, and fixings necessary for proper framing and lining or fitting them to buildings shall all be set as required.

(5) All fixture work and finish wood work shall be performed as indicated in drawings. Unless otherwise specified, jointing shall be performed by the method suitable for the section to be jointed.

Other general requirements to be met are as follows.

- 1) Cut shall be made accurately and true to line.
- 2) For assembling, nailing and adhesion shall be used in combination.
- 3) Blind nailing shall be employed as much as possible.
- 4) Nailing on exposed surfaces shall be made so as to allow puttying.
- 5) Trims for doors and windows shall be in single length.
- 6) Marking-off, mitter joint, and other joints shall be elaborated accurately.
- 7) After sanding along wood grain at the factory, finish the surface with sandpaper in the site. Traces of the

machine or tool shall not remain on the finished surface.

- 8) Exposed parts shall not involve defects.
- 9) The rear side of a flat trim shall be more tapered than on the front side or grooved.
- 10) Trims shall be fitted securely by using thin nails for finish. Those sections to be fitted particularly solid shall be fixed with screws and adhesives in combination.
- 11) Interior finish materials shall not be carried into buildings before mortar or plaster dries sufficiently.

7-9 DOORS, WINDOWS, AND GLAZING

7-9-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all doors and window work, glazing, and finishing hardware work necessary to complete the work indicated in drawings and described in specifications.

(2) Work not included

The following items of related work are specified under other paragraphs of this specification.

- 1) Hardware for fixture work
- 2) Toilet compartments
- 3) Curtain rails and their hardware
- 4) Soundproof door and soundproof observation window

7-9-2 Manufacturing Drawings and Others

Three copies of each manufacturing drawing, hardware list, installation manual, etc., shall be submitted to the Engineer for approval. In the case of a product manufactured by a recommended manufacturer, these documents may be inspected and approved by the representative of the Engineer residing in Tokyo if there is a written request by the contractor.

7-9-3 Samples

Unless specifically directed by the Engineer, the contractor shall submit samples of the following materials to the Engineer for approval.

- 1) Clear sheet glass
- 2) Patterned glass

- 3) Putty for glazing
- 4) Lock
- 5) Hinge
- 6) Door stop
- 7) Casement window latch and arm
- 8) Pull
- 9) Push plate
- 10) Flush bolt
- 11) Door check

7-9-4 Types and Quality of Glass

Those panes of glass shall meet the requirements of JIS R 3201, 3202, and 3203.

7-9-5 Materials for Glazing

(1) Putty

Oil putty meeting the requirements of JIS K 5592 or a product approved by the Engineer shall be used.

(2) Blocks and spacers

Blocks and spacers to be used for glazing shall be ones made of neoprene, processed wood, or lead and formed to have the required dimensions. These blocks and spacers shall match the compound and sealant to be used upon glazing. The compound and sealant shall not discolour or spoil fittings.

7-9-6 Dimensions, Handling and Storage of Glass

- (1) The dimensions of glass to be indicated in drawings shall be rough dimensions and actual dimensions shall be determined by measuring frameworks to be glazed or by the guaranteed dimensions of the manufacturer of the fitting. Dimensions

of glass and glass holding surroundings shall be determined to provide the following minimum clearance.

- 1) On each of the four peripheries of the pane, a clearance equal to the thickness of one pane shall be provided.
 - 2) The space for sealant between the pane and fixed frame or glazing bead shall be minimum 1.5mm plus dimensional errors of the pane and sash and shall be minimum 3mm, on both indoor and outdoor sides.
- (2) These panes of glass shall be carried in a case for protecting them from weather conditions and breakdown. These panes of glass shall be stored at a safe place so as to minimize breakdown or damage, under instructions from the Engineer. As many panes of glass as include the number of panes which may usually be broken shall be carried in.

7-9-7 Glazing

(1) General

Putty, compound for glazing, sealant and glazing tape and gasket shall be used to effect uniform glazing with accurate cornering and chamfering. Excessive putty and compound shall be removed from the pane or sash. For the thinner, cleaner, and solvent, use recommended products. Putty, compound, and sealant shall not be cut or thinned without permission of the Engineer. Upon glazing, make good contact with the pane and frame. For wood or metal fitting, first apply primer and glazing shall not be made until the primer dries sufficiently. Putty, compound or sealant shall not be used at temperatures below 5°C and shall not be applied to wet or spoiled surfaces. After glazing a fitting, close the doors and the movable sections of the windows to fix them until putty and compound dry sufficiently. Remove excessive sealant on the pane or adjacent surfaces during the working time (within 2 ~ 3 hours)

of the material. When it is necessary to embed blocks and spacers for glazing into putty, compound, or sealant, apply putty, etc., to the blocks and spacers to be embedded prior to glazing, fit the blocks and spacers at the required locations, and let the putty, etc., set sufficiently.

(2) Inspection of fitting and preparation

Carefully inspect the surfaces of the fitting to be glazed. Glazing shall not be made before defects and faults which may hinder proper glazing are corrected. Before commencing glazing, the glazier shall check to determine whether the following requirements are met or not.

- 1) Sashes and frames are fixed securely in place and plumb with the accuracy being within 3mm of the nominal dimensions given in the approved manufacturing drawings.
- 2) Flat rivets, screws, bolts, nail heads, welding fillets, and other projections shall be removed from the rabbet on the frame to provide the required clearance.
- 3) All corners and fabrication intersection shall be sealed and sashes and frames shall be watertight.
- 4) The drain hole on the sill shall be bored toward the outside. The rabbet on the frame to be glazed shall have a sufficient depth and width and allow necessary overlap to be obtained for glazing.
- 5) Base coat shall have been applied on wood and steel sashes and exposed portions of the frame.

(3) Treatment of pane and frame

Clean the edges of the pane, rabbet, and the inner face of stop bead, elaborately, prior to applying compound or sealant. Only such products of solvent and detergent

that have been recommended by the compound manufacturer may be used.

(4) Glazing

Put the pane at the center of the rabbet on the frame and set the pane so that the required clearance can be obtained around the 4 edges of the pane. Hold the pane, and provide the sealing thickness of minimum 3mm on both sides of the pane. When the dimensions of the pane are more than 1.2m, provide setting blocks at the sill and spacers on all four sides. Setting blocks shall be provided at locations 1/4 of the length of the pane from both ends of the pane.

(5) Stop bead glazing (by using putty or compound)

Unless otherwise specified for materials and method to be employed, putty shall be used in the case of wood frames and elastic compound for glazing in the case of metal frames, as follows.

- 1) Sufficiently fill the rabbet to mount the pane on with back putty or compound so that when the pane is put and pushed, back putty or compound shall come out to completely cover the pane in the rabbet. Setting blocks and spacers shall be provided as required. The pane shall be pushed into the required place for glazing.
- 2) Fix the pane by using stop beads. By providing the required clearance between the pane and frame and applying putty and compound in the rabbet, fix stop beads properly. Surplus putty or compound pushed out on both sides of the pane shall be removed. On this occasion, a slight inclination shall be given upon finishing to have a good appearance and to facilitate throating.

(6) Face putty glazing

- 1) Apply putty or sealant on the rabbet fitted with spacers or shims so that putty or sealant shall come out when the pane is put and pushed down.
- 2) Fix the pane by using glazing points in the case of wood frames and clips in the case of metal frames.
- 3) Apply putty on the front side of pane edge in the rabbet to form an inclined flat face from a line 1.5mm inside of the frame surface. At corners the surface of putty shall form mitred joint. Surplus putty or sealant shall be scraped off. Excessive putty on the rear side shall be shaved off. The putty surface shall form a slight angle to slope away from the pane.

7-9-8 Wood Fittings

The dimensions and design of doors are shown in the detailed drawings. The doors shall be fabricated as indicated in detailed in shop drawings approved by the Engineer.

(1) Flush doors

- 1) After assembling the door frame, affix a plywood with a thickness of 4mm on both sides to make the base for painting.
- 2) Doors shall be edged with hardwood strips on the surrounds of the door and shall be fitted and hung to the frames.
- 3) Doors shall be reinforced by using solid core materials to receive locks and other hardware.
- 4) Windows or louvered doors shall be designed and made as indicated in drawings and shall be fitted with glazing beads or inclined slats.

(2) Framed doors

- 1) The stiles and rails of the frame shall be mortised and tenoned together or jointed by dowels.
- 2) Doors with windows shall be fitted with glazing beads with shapes and dimensions indicated in drawings.
- (3) Windows shall have shapes and dimensions indicated in design drawings and shall be fabricated as detailed in approved shop drawings. Window frames shall be fixed with metal anchors or subframes. Window frames shall employ tenon joint and be assembled to be robust without warp. Sashes shall be as indicated in design drawings and detailed in approved shop drawings. Sashes shall be framed together with mortise and tenon joints, glued, wedged, and blind nailed.
Windows shall be shaped not to cause twist and distortion. Exposed surfaces shall have bases corresponding to printing bases. For insect nets for windows and doors, 16-mesh stainless steel wire net with a diameter of 0.19mm shall be used unless specifically directed by the Engineer. Insect nets shall be used at locations indicated in design drawings.

7-9-9 Steel Fittings

(1) Materials

Steel materials shall be those meeting the requirements of the following standards or equivalent.

1) Hot rolled mild steel

JIS G 3131 SPHC

2) Cold finished steel

Mild steel, rolled or drawn, free from scale, accurate to size or gauge, conforming to JIS G 3141 SPCC.

3) Steel materials for structure

JIS G 3101, G 3106 or 3350.

4) Stainless steel sheets

JIS G 3405, SUS 304 and 430

(2) Steel sheet thickness

Unless otherwise stated, steel sheet thickness shall not be less than that given in Table 7-9-1.

Table 7-9-1 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 1.8m	2.3
	Architrave, auxiliary frame, etc.	1.6
	Door saddle	2.3
	Rail, stile, panel plate, flush plate	1.6

(3) Factory finish

For rustproofing of all steel fittings, apply the primer specified in Paragraph 7-13 "PAINTING" after phosphoric acid treatment. The primer shall meet the specification of the paint for use on the steel in the site. The exposed portions of stainless steel shall be satin finished.

(4) General

Door and louvers shall be fit to have dimensions as indicated in drawings. Unless otherwise stated, the door thickness shall be 40mm. Hinged doors shall provide a clearance of 3mm at jambs and heads, 6mm at meeting stiles of pairs of doors, and 6mm at bottom, unless

otherwise specified.

(5) Work

Doors, windows, grilles, and louvers shall have specified forms and appearances in order. Joints shall be made by welding or by mechanical fastenings. Jointing shall be performed with strength not to hinder the structural strength of members to be connected. Welding joint shall be made uniformly, have surplus metal removed and exposed portions and contact surfaces finished smooth. Mechanical joints shall be such that jointed portions shall be stucked to each other and kept watertight.

(6) Sealing of door against water

The top and bottom ends of hollow doors shall be closed to be watertight, by forming part of the door construction as stated above or by welding channel steel or a proper section steel with face sheets.

(7) Preparation of hardware

All doors shall be mortised for fitting mortise type hardware, reinforced, drilled, and threaded at the factory. In the case of a door to be fitted with surface applied hardware, the portion to put the hardware on shall be reinforced except push and facing plates. For surface applied hardware door frame shall be drilled and threaded in the construction site. Lock and mortise type hardware mounting portions shall be fitted with reinforcing steel plates. Reinforcing steel plates for surface applied hardware shall be used as required. The thickness of the reinforcing steel plates shall be as recommended by the manufacturer of the hardware and shall meet the thickness of the door but it shall be more than 3.2mm.

(8) Accessories

Necessary fasteners, clips, anchors, glazing beads, and other parts necessary for fitting windows and doors shall all be fitted. Unless otherwise specified, anchors and fasteners shall be made of hot dipped galvanized steel.

(9) Frames

Steel frames shall be fabricated from steel materials to have specified forms and dimensions. Frames shall be complete products having monolithically worked trims and welded members, as indicated in approved manufacturing drawings.

(10) Reinforcement

Reinforcement for hardware shall be employed on the back side as required. The thickness of the reinforcing steel plates shall be as recommended by the manufacturer of the hardware and shall meet the type, shape, and dimensions of the frame.

(11) Design and fabrication

Finished products shall have high strength, high stiffness, and neat appearance, free from defects. Moulded members shall be assembled to be straight and true with corner joints being formed as required and fasteners and others to be hidden on the back side being fitted at practical locations.

Frames to be fitted on walls to be finished by plastering shall be fitted with plastering flanges and grooves as required, conforming to detailed drawings.

(12) Jointing of corners

Jointing of frames' corners by welding shall be mitered or butted joints by using continuous arc welding over the entire width and thickness. Contact surface at ends

shall all be enclosed and welding on exposed surfaces shall be finished smooth and flush. For joints with bolts, use vibration proof type nuts.

(13) Provision of hardware

Frames shall be prepared at the factory for the installation of hardware. Frames shall be mortised for receiving mortised hardware, reinforced, drilled, and threaded, by using templates. Frames to receive surface applied hardware shall be furnished with reinforcing steel plates only. Cover boxes shall be fitted to the back of hardware cut outs.

(14) Position of hardware

Unless otherwise specified, hardware shall be fitted at locations specified hereunder.

(15) Structural reinforcements

When structural reinforcing materials are required on mullions, transoms, and other portions, use structural section steel as part of the framework.

(16) Wall anchors

Anchors shall be set at intervals of less than 60cm the upper and lower ends and at intermediate point on vertical frames. Frames to be fitted to concrete or masonry walls already placed shall be fixed to anchors or subframes suitable for intended purposes by using bolts.

(17) Floor anchor

Fit steel sheet floor clips with a thickness of more than 1.6mm under vertical frames, and fix frames to the floor structure. Clips shall be fitted to frames which shall be drilled to have anchor bolt holes with a diameter of 9mm.

(18) Transportation

Frames made by welded joint shall be fitted with temporary steel spreaders across bottom of the frames. On the back side spreaders may be left in place after installation. If this is not achievable, spreaders shall be removed after setting and anchoring frames. Instead of using spreaders, frames may be strapped together in pairs with heads inverted for bracing during shipment. Knock-down type frames shall be strapped together into faggots or packaged for shipment. Each frame shall have a metal or plastics tag describing where to fit, dimensions, hand of door, and other related items prior to shipment.

(19) Installation

By setting the frame to be fitted plumb at the required position and temporary fixing it securely, fix it to the anchor. Fix bottom of the frame with fastening bolts or fitting hardware driven in. Anchors for walls shall be built in walls or fixed to adjacent structures. When frames requires ceiling struts or other types of upper structure ties, these members shall be set securely to the ceiling or upper structure framework.

(20) Flush doors

Doors indicated in drawings as flush doors including those with glazed and louvered openings shall have the following construction.

(21) Construction of flush door

Flush doors shall use steel sheets of more than 1.6mm in thickness as door panels on both sides with edges welded and finished flush. A flush door shall not have any joint or seam on the faces or edges. For door panels,

interlocked channel steel or Z-shaped steel with a thickness of 2.3mm shall be provided vertically at intervals of less than 30cm and spot welded to the door panels to reinforce the panels. On the upper and lower portions of the door continuous channels shall be welded for reinforcement. Where specifically stated, cork, fiber board, lock wool board, or asbestos filler shall be filled between reinforcing channels. Steel materials with thickness of less than 1.2mm shall not be used for moulding.

(22) Airtight doors and their frames

1) Construction

Neoprene sealant shall be applied continuously to the frame of the airtight door to be fabricated so as to prevent air leakage through the gap between the door and frame.

2) General

Doors to be fitted to the studios, control rooms, and sound lock rooms shall be soundproof doors meeting the requirements of Paragraph 7-15 "STUDIO INTERIOR WORK."

(22) Installation of doors

Doors shall be installed by technically superior and skilled workers sent from the manufacturer. Doors and windows shall be installed accurately at the required locations in conformity to the specifications of the manufacturer and approved manufacturing and fitting drawings. Frames shall be fitted with proper temporary supports not to cause twist or deformation. Cure doors and operating portions sufficiently, then close doors not to be spoiled by cement or other building materials, and fasten doors to the frames by wires.

After installation of doors, check fittings for their operating functions and rainwaterproof functions.

(24) Mastic sealant

Apply mastic sealant recommended by the manufacturer of the door to all exterior metal to metal joints, such as door frames, mullions, and mullion covers. Surplus sealant shall be removed before it sets.

(25) Anchors

Fix door frames to masonry construction and other adjacent constructions as indicated in detailed drawings and approved manufacturing drawings. When fitting doors to masonry walls already finished, necessary anchors and fastenings shall have been set during wall work. Anchors and fastenings shall be built into, anchored or bolted to the jambs of openings and shall be fixed securely to the frames and adjacent constructions. Unless specifically indicated in drawings, anchors shall be fitted to the door head, jambs and sill at intervals not exceeding 45cm. All anchors shall have strengths capable of holding members securely.

(26) Adjustment after installation

After installation, doors and hardware shall all be adjusted to allow smooth operation, prior to commencing painter's work. Hardware and related parts shall be lubricated as required.

(27) Steel rolling shutters

Materials

- 1) For steel sheets for treated galvanized steel sheets with a zinc attachment of more than 180g/m^2 shall be used.
- 2) Guiderails and lintels shall be made of stainless steel.

- 3) The thicknesses of steel and stainless steel sheets shall be as follows.

	Motor-driven shutter	Hand-operated shutter
Slat	1.6mm	0.8mm
Shutter case	1.6mm	1.6mm
Guiderail	1.5mm	1.5mm
Lintel	1.5mm	1.5mm

- 4) Motor-driven heavy type shutter shall be installed at Mt. Pidurutalagala Transmitting Station and hand-operated (spring type) lightweight balance type shutter at Kokavil Transmitting Station.
- 5) Each shutter shall be furnished with one cylinder dead lock.

7-9-10 Finishing Hardware

(1) Materials

- 1) Finishing hardware shall be products meeting the requirements set out hereunder or products of manufacturers approved by the Engineer. As much finishing hardware as possible shall be by the same manufacturer to maintain continuity of finish and style and to simplify maintenance and replacement.
- 2) Fastening to be exposed shall be finished to keep harmony with neighbouring finishing hardware.
- 3) Hardware shall be fitted by using template and fastening suitable for fitting to metal frames and hollow metal doors.
- 4) Metal frames shall use box type strike plates.
- 5) Nickel plated Phillips screws shall be used for the work described in this specification.

6) General requirements for locks

- a) Lock cases shall be made of steel or materials having equivalent strength and durability and shall withstand stress, abrasion, and damage with proper safety factors for use over long periods of time. The mechanical parts of locks shall be of such material and design that they also meet identical requirements and are capable of withstanding ordinary rough handling over long periods of time.
- b) Lock sets shall have both latch and dead bolts (excluding dead locks).
- c) Lock sets shall be those suitably fitted to metal and wood doors of 35~45mm in thickness.
- d) When the dead bolt of a lock to be fitted to an entrance door is projected fully, it shall protrude at least 20mm out of the facing plate surface.
- e) Lock sets to be used for hollow metal doors shall be capable of being equipped with an expansion brace type device for preventing vibration and looseness. This shall be fitted additionally to screws for fastening lock to the face plate.
- f) Lock sets to be used on entrance doors shall use dead bolts incorporating hard steel cores to prevent intrusion by sawing the bolt.
- g) The spring mechanism of the lever handle shall be manufactured with materials and strength so that when the lever handle is in the horizontal neutral position, no drooping nor looseness shall be caused.
- h) Cylinder lock sets shall be such that when they are operated over 100,000 times, no visible nor detectable damage shall be caused on the mechanism, case, and key and that no visible or perceptible change shall

be caused in the operation and functions of the lock sets.

(2) Finish

- 1) Locks and latches shall be finished by stainless steel satin finish.
- 2) Hinges for doors shall be of stainless steel satin finish.
- 3) Push plates and door pulls shall be of milk-white acrylic resin.
- 4) Other hardware shall be of stainless steel satin finish.

(3) Flush bolts

For flush bolts for general doors, products approved by the Engineer, made of brass or bronze to have a height of 30cm and a width of 25mm, and finished by dull chrome plated finish, shall be used. When fitting a flush bolt on a door without doorsill, a proper metal socket shall be embedded on the floor.

(4) Door stops

For door stops, products approved by the Engineer, made of brass or bronze with chrome plated finish and fitted with rubber head, shall be used.

- 1) Fastening devices suitable for receiving surfaces shall be incorporated.
- 2) When floor type door stops are not suitable, wall type door stops shall be used.
- 3) Door stops for outside doors shall be furnished with door holders.

(5) Key box

The contractor shall supply wood key box finished by paint and of type approved by the Engineer.

- 1) Key box shall have a spare space corresponding to 25% of the total number of keys.
- 2) All keys shall have tags and be arranged in the key box.

7-9-11 Keys

- (1) Every lock shall be furnished with 3 keys. Each key has a key number and a number or letter indicating the combination, all engraved on the key.
- (2) Bit key locks and cylinder locks shall respectively be master keyed and shall be supplied with 3 keys for each combination.
- (3) Master keys shall be sent to the Engineer by registered mail.

7-9-12 Packing and Identification

- (1) Different items of finishing hardware shall be packed in different packages together with screws, keys, special wrenches, instructions, and installation templates necessary for accurately locating, setting, adjusting, and attaching hardware.
- (2) Each package shall have the description of the number of the door or window to which the hardware item is to be fitted and the item number corresponding to the hardware item given in the hardware schedule of the contractor.
- (3) Upon completion of the work the contractor shall deliver all installation instructions, templates, and adjusting tools to the Engineer.

7-9-13 Acceptance and Storage

- (1) The contractor shall provide a store furnished with necessary shelves and counters for grouping finishing hardware and assembling hardware before distribution and installation. The store shall be such that can be locked.
- (2) All keys shall be labeled with tags indexed, and arranged in the key box as specified.
- (3) Hardware shall be inspected after carrying in to the construction site and before installation.

7-9-14 Mounting Position

- (1) Prior to mounting hardware, the contractor shall receive approval of the Engineer for the mounting position of each part of hardware. This includes the accurate positions of all items of hardware, for example, locks, bolts, push plates, pulls and hinges.
- (2) Unless otherwise stated or specified, distances from the center line of respective items of hardware to the floor area as follows.
 - 1) Locks for doors
From finished floor surface to center of strike: 950mm
 - 2) Door pulls
From finished floor surface to center of pull: 950mm
 - 3) Push plates
From finished floor surface to center of push plate: 1100mm
 - 4) Bar type pulls
From finished floor surface to center of the bar
(or the center of the combination when more than
2 bars are used): 950mm

5) Top hinges

To meet the standard of the manufacturer. The distance between the head of frame and the center of hinge shall not exceed 250mm.

6) Bottom hinges

To meet the standard of the manufacturer. The distance between the finished floor surface and the center of hinge shall not exceed 300mm.

7) Intermediate hinges

Intermediate hinges shall be provided at intermediate points between the top and bottom hinges but in intervals not exceeding 900mm.

8) Latches

From finished floor surface to center of strike plate: 950mm

9) In the case of dead lock only

From finished floor surface to center of strike plate: 950mm

10) When a dead lock is furnished with another latch or pull

From finished floor surface to center of strike plate: 1250mm

(3) Hardware for windows

Hardware mounting locations shall be in compliance with the standard of the manufacturer of the window.

7-9-15 Installation

- (1) Hardware shall be installed accurately, fixed securely, and adjusted elaborately. Hardware shall be installed according to the instructions of the manufacturer. Take due care not to damage other items of work during installation of the hardware.
- (2) Installation of hardware shall be performed properly by using boring jigs, mortising tools, and other equipment

and devices intended exclusively for the installation of the hardware.

- (3) When necessary, the door shall be removed and replaced to finish painting for the top and bottom portion of door.
- (4) Exposed hardware shall be covered with masking tape or thick cloth until finish painting is complete.

7-9-16 Curing and Cleaning

(1) Curing of doors and windows

Doors and windows shall be handled carefully during shipment and in the construction field. Doors and windows shall be stored upright on pieces of lumber located in a dry, roofed store. After installing doors and windows, protect them against damage from other works to follow.

(2) Cleaning of metal doors and windows

Mortar chips, plaster, paints and other foreign matters on the inside and outside metal faces of doors and windows shall be removed to present neat appearances. Flashes, drip caps, etc., shall be cleaned not to hinder operation of hardware.

7-9-17 General Principles on Installation of Hardware for doors

Note: Doors having heights of more than 2.5m or widths of more than 1.2m shall be furnished with 4 hinges.

(1) Outside doors

Unless otherwise specified, the following shall apply.

1) Steel double swings doors

	<u>Q'ty</u>
Hinges	150mm x 110mm 6
	150mm x 144mm 6

(in the case of heavy doors)

Q'ty

Mortise cylinder lock (made of stainless steel,
with a knob and more than 64mm back sets) 1 set
Flash bolt 1 set
Door check 1 set
Stop with holder, floor type 1 set

2) Wood single swinging door

Hinges 127mm x 100mm 3
Mortise cylinder lock 1 set
Door check 1 set

3) Wood double swinging doors

Hinges 127mm x 100mm 6
(Heavy doors: 8 hinges)
Mortise cylinder lock 1 set
Flash bolt 1 set
Door check 1 set
Stop with holder, floor type 1 set

(2) General inside doors

Unless otherwise stated, the following shall apply.

1) Steel single swinging door

Hinges 150mm x 110mm 3
Mortise cylinder lock 1 set
Door check 1 set

2) Steel double swinging doors

Hinges 150mm x 110mm 6
Mortise cylinder lock 1 set
Flash bolt 1 set
Door check 1 set
Stop with holder floor type 1 set

- 3) Wood single swinging door Q'ty
- Hinges 127mm x 100mm 3
- Mortise cylinder lock 1 set
- Door check 1 set
-
- 4) Wood double swinging doors
- Hinges 127mm x 100mm 6
- Mortise cylinder lock 1 set
- Flash bolt 1 set
- Door check 1 set
- Stop with holder, floor type 1 set
- 5) Double acting door for doorway of makeup room
(per door)
- Double acting spring hinge 2
- Push plate 2
-
- 6) Steel inspection door (on wall)
- Hinges 127mm x 100mm 2
- Mortise cylinder dead lock 1 set
-
- 7) Steel shutter
- Cylinder dead lock 1

7-9-18 General Principles on Installation of Hardware for Window

- Top-hinged outswinging window (per window)
- Hinges 75mm x 75mm 2
- Casement turns 1 set
- Arms 2 sets

7-10 TILING

7-10-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all tiling work and related items of work necessary to complete the work indicated in drawings and described in specifications.

- 1) Unless otherwise specified, back of built-in wall cabinets shall not be tiled.
- 2) When tile wainscot work is to be performed by the conventional cement mortar setting method, tiling shall be accomplished prior to the application of finish coat in the plastering of walls above wainscot.

(2) Type of setting bed

Conventional cement mortar bed shall be used as the setting bed in tiling.

7-10-2 Shop Drawings

Prior to the commencement of tiling, the contractor shall submit shop drawings to the Engineer for approval.

7-10-3 Samples

The contractor shall submit colour samples of wall tile and floor mosaic tile available to the Engineer for approval.

7-10-4 General

Ceramic tile shall meet the requirements of JIS A 5209.

7-10-5 Materials

- (1) Unless specifically directed, wall tile shall be coloured or white matt glazed tile with a minimum thickness of 4.0mm and cushion edges, with nominal dimensions of 98mm x 98mm, fitted with spacer lug or shall be equivalent.
Floor mosaic tile shall have a minimum thickness of 4.0mm and nominal dimensions of 24.5mm x 24.5mm.
- (2) Provide wall tile trim shapes as required trim shapes shall be identical to wall tile in type, colour, thickness and finish.

7-10-6 Materials for Tiling

- (1) Portland cement
See Paragraph 7-3 "REINFORCED CONCRETE WORK."
- (2) White cement
See Paragraph 7-7 "PLASTERING."
- (3) Sand
See Paragraph 7-7 "PLASTERING."
- (4) Water
See Paragraph 7-3 "REINFORCED CONCRETE WORK."

7-10-7 Joint Plan

Where possible, layout work so that no tile less than half size occurs. In the vertical direction on which scale is indicated, layout work so that a height nearest to the required height can be achieved by using full-size tile. Both vertical and horizontal joints shall be kept straight.

7-10-8 Mixing and Mix Proportion

Fine aggregate shall be measured by using a gauge boxes approved by the Engineer. Cement shall be measured in one bag unit. Water shall be measured by volume. Materials shall be mixed on the basis of the applicable specifications given in Paragraph 7-3 "REINFORCING CONCRETE WORK." The mix proportion shall be as given in Table 7-10-1. Change in mix proportion shall be allowed only when written approval of the Engineer is gained in advance.

Table 7-10-1 Mixing Table

Nominal Mix	Cement (kg)	Fine Aggregate (cu.m)
1 : 2	750	1.00
1 : 4	350	1.00

7-10-9 Procedure (Wall Tile)

(1) Preparation

Concrete surfaces and masonry brick surfaces shall be cleaned and moistened immediately before applying scratch coat.

(2) Buttering method

Prior to tiling, properly dampen scratch coat. In order to show a finished tile surface, lay tile at places on scratch coat, apply setting mortar (1:4 in mix proportion) on the back of every tile, and lay tile plumb and flush following tiles already laid.

Apply sufficient amount of mortar over the whole surface on the back of each tile uniformly.

(3) When mortar setting bed is found to have sufficiently set, clean the tile face with clean water prior to grouting. Grouting shall be made by pushing mortar for pointing onto

joints by trowelling or other proper method so that joints shall be finished flush and true to line. Surplus mortar shall be wiped off before setting and tile faces shall be cleaned.

(4) Thickness of wall tile finish

The finish thickness including setting mortar and tile shall be 30mm when glazed wall tile or other tile with a thickness of less than 1cm is used.

7-10-10 Procedure (Floor tile)

(1) Preparation

Same as Paragraph 7-10-9 item (1).

(2) When the tiling area is small:

Sufficiently dry mix sand and cement, lay properly dampened mortar, and set tile by using cement paste. The mix proportion of the bed mortar shall be 1:4 or so.

(3) When the tiling area is large:

Bed mortar shall be finished by smoothing with a trowel observing proper water decrease in mortar and taking care for the inclination. For laying tile, pass leveling strings on the basis of the joint plan, lay tiles to become true to line and level, following tiles laid first at corners and other important points, and clean the face of tiles and bottom of joints as required.

Through joint plan, lay tiles to an area of about 2.5m² for use as reference, and lay other tiles by using these tile for a scale.

(4) Prior to pointing, clean joints. Grouting shall be accomplished as soon as possible after laying tile.

Joints shall be moistened properly depending on the dryness of the joints. Pointing shall be performed by using cement paste.

7-10-11 Cleaning

Unless specifically directed by the Engineer, no acid shall be used for cleaning of tile. When the work is complete, clean tile faces by soap-suds with a brush or the like, and wash tile surfaces with water sufficiently. Metal cleaning devices or brush or abrasive shall not be used.

7-11 TERRAZZO WORK

7-11-1 Scope of Work

The work specified under this paragraph consists of all terrazzo cast in place, terrazzo block, and related items of work necessary to complete the work indicated in drawings and described in specifications.

7-11-2 Shop Drawings

- (1) All shop drawings on this work shall be submitted to the Engineer for approval before commencing the work.
- (2) Items to be specified in shop drawings:
Type, grade, and producer's name for variety of stone, layout, elevation and section, full-size profiles of joints, detailed drawings, thickness, dimensions, finish and surface treatment method, fixing method, joint compound, and necessary connections to work of other contractors.

7-11-3 Samples

The contractor shall submit samples of the following materials and built-up members to the Engineer for approval before carrying in materials or commencing the work.

- 1) Terrazzo block for floors
- 2) Finish samples of terrazzo cast in place
Size: more than 20cm x 20cm
- 3) Terrazzo blocks for use at skirting, coping, staircase, toilet, and make-up room

7-11-4 Terrazzo Block Materials and Their Producing Method

- (1) General

Marble chips for terrazzo work shall be standard stones with dimensions, colours, and types approved by the Engineer. Chippings shall be 10mm as standard and shall not exceed 12mm.

(2) Producing method

- 1) Terrazzo blocks shall all be products of Sri Lanka. Blocks shall be such that are processed and shaped by using accurately constructed watertight forms. The mix proportion and dimensions of these blocks are given in Table 7-11-1.

Table 7-11-1 Terrazzo Block

Total Thickness (mm)	Thickness of Facing (Minimum) (mm)	Facing Mix	Thickness of Backing (Maximum) (mm)	Backing Mix
20	6	1 : 2 1/2	14	1 : 5
25	8	1 : 2 1/2	17	1 : 5
30	10	1 : 2 1/2	20	1 : 5
60	10	1 : 2 1/2	50	1 : 5

- 2) Block are composed of a finished layer produced by mixing white cement, colour cement, or pigment-added white cement with granular marble chippings (at a mix proportion of 1:2-1/2) and a bed obtained by mixing Portland cement with sand (at mix proportion of 1:5).
- 3) Grinding shall be done wet by using #80 carborundum abrasive. Filling shall be carried out with grout of the same colour and same proportion with that used as finish material by using a wooden trowel. Surplus grout shall be wiped off with dry cloth. After leaving as it is for at least

24 hours, polish in wet condition by using #140 carborundum as abrasive.

7-11-5 Terrazzo Block Work

(1) Hardware

- 1) Anchors, dowels, and clamps shall be as given in Table 7-11-2. Clamps to be used for reinforcing partition heads shall be made of stainless steel (SUS 304) and be 6mm in diameter and 60mm in effective length.

Table 7-11-2 Hardware (mm)

Hardware Thickness of Block	Brass		
	Anchor	Dowel	Cramp
less than 40	3.5φ	3.5φ	3.5φ
		Length 40	-
40 ~ 70	4.2φ	4.2φ	4.2φ
		Length 50	-

- 2) Anchor hooks shall be made of the same material as that of anchors and shall in advance be embedded in terrazzo blocks.
- 3) Fixing metals, reinforcing plate bolts, etc., to be exposed on the front of partitions shall be made of brass.

(2) Setting of terrazzo blocks

- 1) Skirtings shall be about 90cm in length. After

cleaning the bed, lay terrazzo blocks true to level and plumb without unevenness by using wedges driven in, and apply back filling mortar over the whole surface for fixing.

- 2) For fitting top rails of balustrades, embed steel bars of 9mm in diameter as anchors in advance into concrete at intervals of about 40cm on the center line of balustrade and weld steel bars of same size with them at their heads. The length of each top rail shall be about 90cm. After cleaning the bed, fit hook embedded at each joint of top rails to the steel bars above mentioned and apply back filling mortar so that top rails shall be true to line and have no unevenness, and fix.
- 3) For fixing terrazzo block partitions to a wall, support each block partition with hardware previously fitted and fix the partition with mortar not cause inclination or twist. Connection of the partition heads shall be made securely by using a reinforcing palte or a clamp using adhesives together. The connection of the partition with another partition shall be made securely by using a dowel using adhesives together or by using anchor bolts.
- 4) Joints shall in principle be closed joints with a fine chamber. In the case of pointed joint, flash point finish shall be made by using a joint material such as a pigment matching the colour of terrazzo blocks and white cement.
- 5) The finished surface shall be cured by using vinyl sheet as required for protection against dust and foreign matter. Protective covers made of a synthetic resin or wood shall be used especially over external corners for protection. When the installation of terrazzo blocks is complete, clean and wash with water at a proper time. In principle, hydrochloric acid or the like shall not be used for cleaning terrazzo block surfaces. When polishing

terrazzo block surfaces indoors, wipe with dry, clean cloth.

(3) Setting mortar

The mix proportion of mortar to be used for setting terrazzo blocks shall be cement 1: sand 3.

7-11-6 Cast-in-Place Terrazzo Work

(1) General

Cast-in-place terrazzo for floor finishing shall be laid directly on floor slabs. In principle, its total thickness shall be 30mm and the thickness of finish coat 12mm, as standard.

(2) Joint strips

Joint strips shall be made of brass, 3mm in thickness and 25mm in height.

Joint strips shall be laid at an interval of less than 1.5m in both vertical and horizontal directions. Joint strips for boundaries between different finishes shall be made of brass of an intermediate hardness, measure 6mm in thickness and 25mm in height, and have a crosssection suitable for anchoring and straight edges. Joint strips for the boundaries shall be used at places where terrazzo floor adjoins floor with resin elastic covering.

(3) Preparation of concrete slab surface

Before placing the underbed for cast-in-place bonded terrazzo floors, clean the floor slab surfaces and remove plaster, mortar chips, oil, dust, and any other foreign matter which may prevent bonding of the underbed to the concrete slab surface. After wetting the slab surface, apply neat cement with a broom before placing the underbed.

(4) Underbed

1) Underbed mortar to receive terrazzo topping shall have a mix

proportion of cement 1 : sand 4; add water and sufficiently mix to have proper hardness.

2) Placing underbed

Underbed mortar shall be spread and screed to a true, level or plumb surface so that the finishing surface shall come not less than 9mm back of the finished face of skirting and more than 12mm below the finished level for the floor, except as indicated otherwise.

(5) Placing joint strips

While the underbed mortar is plastic, fit joint strips promptly and accurately at the required height. Where joints intersect, fit joint strips so that they can be jointed tight. Joint strips for finish boundaries shall be placed so that the resin elastic floor shall come on a level with the adjacent terrazzo finishing surface. When a joint strip is placed at a door, set the joint strip to come under the center of the door.

(6) Terrazzo finish coat

1) Mixing proportion

Terrazzo finish coat shall be prepared by a mixing proportion of white Portland cement 1 : marble chips 3. When directed by the Engineer, add mineral colour pigment.

2) Application

When the underbed mortar has set sufficiently to withstand rolling, apply finish coat, but within one day after placing the underbed. Sufficiently wetting the underbed and wiping off surplus water, apply neat cement using cement and pigment with a colour identical to that of the finish coat with a broom or the like immediately before the finish coat, and then apply terrazzo finish coat of the required thickness. Finish coat shall be uniform in composition and the

same marble chips (that appear on surface) shall be used for entire thickness.

Place base mortar with a trowel by using proper forms. Roll the floor with a heavy roller until surplus cement paste and water shall be pressed out. Finish the surface level with a trowel so that joint strips shall appear on a levels with finishing surface.

(7) Curing

Cure terrazzo surface by keeping it damp for at least 6 days after placing. Curing shall be made by using soil-proofed strengthened kraft paper, plastic sheet, curing mat, sand, or a clean curing agent approved by the Engineer.

(8) Surface finishing

After curing, rough and finish grinding by using water and a proper polishing sand corresponding to the extent of the finish. For rough grinding, use No.24 polishing sand. For finish grinding, use No.80 polishing sand. Exercise care not to grind down the surface of the joint strips. Where machine grinding is not achievable, grind by hand.

By applying creamy cement paste to the portion to be ground after initial grinding, fill all voids. For the cement paste, use one identical in kind and colour tone with the cement used for finish coat. Paste shall be kept applied on the surface to be ground for at least 2 days and until finish grind be performed. Finish grinding shall be so accomplished that the surface shall have same texture as approved samples.

The finished surface shall correspond to samples approved and have marble chips appearing on the surface by about 70%. Terrazzo finish shall be accomplished to be level and plumb without

involving any error exceeding 3mm between any two adjacent joint strips. While grinding, protect walls, floor, and other portions adjacent to terrazzo floor from being solid by grinding work.

7-12 METAL WORK

7-12-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all metal work and other items of related work necessary to complete the work indicated in drawings and described in specifications.

(2) Work not included

The following items of related work are described and stipulated in other paragraphs of this specification.

- a) Access doors and panels
- b) Anchors, bolts, sleeves, supports, metal connectors and miscellaneous hardware necessary for work specified in other paragraphs, except those specified herein.
- c) Hardware except those specified herein
- d) Metal doors and frames
- e) Metal gate doors
- f) Structural steel work not specified herein
- g) Shape steel inside hollow metal, aluminum or stainless steel frames
- g) Metal roof and related work
- i) Joint strips other than specified herein

7-12-2 Shop Drawings

Submit shop drawings on all metal work to the Engineer for approval. The approval for the drawings shall be obtained prior to the commencement of fabrication. The shop drawing shall indicate fabrication, assembly, and erection details. They shall illustrate also the dimensions of all members, fastenings, supports and anchors, patterns, clearances, and

all necessary connections with other work.

7-12-3 Samples

Submit 2 samples of each of the following materials to the Engineer for approval. Approval shall be achieved prior to carrying in to the construction field or the commencement of fabrication.

7-12-4 Materials

Materials used for metal work shall be suitable to the construction and functions of each hardware and meet the requirements of the BS, ASTM, and/or JIS. Materials for each hardware shall be approved by the Engineer prior to carrying in to the construction field or commencement of fabrication.

7-12-5 Fabrication and Installation

- (1) Metal surfaces shall be clean and free from mill scale, flake rust and rust pitting and shall be well formed and finished to required shapes and sizes. Permanent connections shall be welded or riveted. Welds and rivets on surfaces to be exposed after installation shall be finished flush and smooth. Avoid using screws and bolts as much as possible, but when using them, they shall be screwed up tight with their heads countersunk and their threads nicked to prevent loosening.
- (2) Castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Castings shall conform to the dimension specified with a tolerance of $\pm 3\text{mm}$ (allowable errors), except in the dimensions the allowable errors of covers and openings to

receive covers shall be limited to $\pm 1.5\text{mm}$. The surfaces of castings shall be processed to be sufficiently clean and smooth by an approved method such as shot blast. Covers and others on roads and footways shall have horizontal bearing surfaces which have been machine processed and finished. Likewise, the bearing or contact surfaces for other joints shall be machine processed when specifically directed or necessary.

(3) Fastenings shall be concealed as much as practicable. Metal materials shall have ample thicknesses and structure of members and supports shall be sufficiently strong and solid. Joints to be exposed to weather shall be formed not to allow water to enter. Provide holes and connections for other related work.

(4) Materials for metal work to be performed for other related work shall be carried in to the construction field and set in place at appropriate time.

(5) Painting and protective coating

All ferrous metal surfaces, excluding stainless steel, galvanized surfaces, and castings to be left unpainted, shall be sufficiently cleaned and given two coats of red lead or zinc chromate rustproof paint. Anchors that are built into masonry shall be coated with asphalt paint unless specified to be galvanized. Hardware to be embedded in concrete shall be left unpainted unless specified or noted otherwise. Where hot-dip galvanized or zinc-coated metal is specified or shown, it shall not be shop coated unless specifically required. Castings that are to be left unpainted shall be cleaned and coated with coal-tar.

(6) Zinc coating

1) Types of zinc coating on steel are given in Table 7-12-1.

Table 7-12-1 Types of Zinc Coating

Classification	A	B	C
Method of surface treatment	Hot-dipped zinc coating shall comply with JIS (Hot-dipped zinc coating) Type 2, H8641	Chromating treated after electrical zinc coating by JIS (Electrical zinc coating) Type 2, H8610	Galvanized steel sheet with surface treated

a) The amount of zinc coated on steel by Hot-dipped zinc coating shall be as indicated in Type B in Table 7-12-2.

Table 7-12-2 Coat Weight of Hot-Dipped Zinc (g/sq.m)

Classification	A	B	C
Weight of zinc to be coated on one side	More than 500	More than 350	More than 250

b) The type of electrical zinc coating to be employed shall be Type B given in Table 7-12-3.

Table 7-12-3 Types of Electrical Zinc Coating

Classification	Type and Class	Thickness of Coat (μ)
A	JIS H8610 (Electrical zinc coating), Type 2, upper than Class 5	More than 20
B	JIS H8610 (Electrical zinc coating), Type 2, upper than Class 4	More than 13
C	JIS H8610 (Electrical zinc coating), Type 2, upper than Class 3	More than 8

- c) Galvanized steel sheets with surfaces treated shall be as follows.
 - i) Nominal coat weight of zinc shall be more than 180 g/m² for both sides.
 - ii) Chemical treatment by phosphate or chromic acid shall be made on galvanized surfaces on continuous line.
- 2) For the thickness measurement of zinc coats, an electric film thickness tester may be employed.
- 3) Testing of zinc coated surfaces shall be made as follows, with its application as specifically noted.
 - a) Zinc coat weight test of hot-dipped zinc coating shall be performed as per the weight method or antimony chloride method (indirect method) specified in JIS H 0401 (Hot-dipped zinc coating test method) and uniformity test by the uniformity test method specified therein.
 - b) Anti-corrosion test of electrical zinc coating shall be based on JIS Z 2371.

7-12-6 Lightweight Steel-Frame Ceiling

(1) Materials

- 1) Ceiling joist, double ceiling joist, and channels shall be such that are obtained by rolling galvanized steel sheets with treated surfaces as mentioned in Paragraph 7-12-5, item (6) and shall have nominal zinc coat weight of 180 g/m² for both sizes, unless otherwise noted.
- 2) The types of ceiling joists shall be as given in Table 7-12-4, and special forms of ceiling joist shall be such that have undergone slit processing for nailing. Unless otherwise specified, general forms of Type B shall be used.

Table 7-12-4 Types of Ceiling Joists, etc. (mm)

Classification	A	B
	General Form	General Form Special Form
Ceiling joist	Height. Width. Thickness	Height. Width. Thickness.
	More than 25 x 25 x 0.5 More than 22 x 22 x 0.7	More than 19 x 25 x 0.5 More than 22 x 22 x 0.5
Ceiling joist, double type	More than 25 x 50 x 0.5 More than 22 x 44 x 0.7	More than 19 x 50 x 0.5 More than 22 x 47 x 0.5
	More than [-38 x 12 x 1.6	More than [-38 x 12 x 1.2

- 3) Hangers for channels and clips shall be such that have been galvanized to the extent to which ceiling joist shall be galvanized.
- 4) Inserts shall be made of steel and hanger bolts shall be 9mm in nominal diameter and rustproofed treated.
- 5) Bracings for reinforcement shall be rustproofed ones.

(2) Installation

- 1) Channels and inserts shall be installed at intervals of about 900mm, and in surroundings they shall be installed within 150mm from the edge.
- 2) Inserts shall be arranged upon assembling forms.
- 3) The top of each hanger bolt shall be fitted to an embedded insert in the case of reinforced concrete construction and the bottom shall be furnished with a channel hanger. Connection of ceiling joists with channels shall be made by clipping.
- 4) Interval of ceiling joist
 - a) General form

- i) When there is a backing, ceiling joists shall be placed at intervals of 360mm.
 - ii) When finishing material is to be applied without backing or wall paper or painting base is to be applied, intervals shall be less than 455/2mm.
 - b) Special forms
 - Ceiling joists of special forms shall be laid at intervals of less than 225mm.
- 5) When ceiling joists are to butt against walls and ceiling joints are to be provided with no backing, □ type or □ type galvanized steel sheet of more than 0.5mm in thickness shall be put in or attached to the ends of ceiling joists. When ceiling joists run in parallel to a wall, double ceiling joists shall be employed as the end ceiling joists.
- 6) Openings indicated in design drawings shall be reinforced as follows.
- a) When ceiling joists are cut to provide openings for lighting fixture or duct outlet, the opening shall be reinforced by using the same material as that of the ceiling joist or channel.
 - b) Opening portions of ceiling access door designed to pass men shall be reinforced with the same material as that of the channels.
- 7) Ceiling joists shall not be projected over 150mm out of channels.
- 8) Pendent walls
- When adjoining ceilings are not on a level on boundaries between pendent walls and partition walls or the like, reinforcing bracings using the same material as channels or with dimensions of 30 x 30 x 3(mm) shall be applied.

- 9) When height of plenum area above ceiling exceed 1.5m, reinforcement by bracing shall be effected by using round steel bar.
- 10) Welded portions or portions cut by welding shall be coated by rustproofing paint.

7-12-7 Indoor Manholes

(1) Materials

Manhole frame and cover shall be cast iron coated by coal-tar baked coating overall surfaces, shall provide ample strength against externally applied pressure, and shall be of complete waterproof type. The dimensions and locations of manhole frame and cover to be set shall be as indicated in drawings.

(2) Installation

The frames of manholes shall be fitted by the mounting-before-concrete-placing method when waterproofing and smell-proofing are required and by the mounting-after-concrete method in other cases.

7-12-8 Floor Trenches

(1) Materials

Provide hard aluminum alloy ready-made floor trench frames and covers or steel frames and covers as indicated in drawings.

- 1) Hard aluminum alloy ready-made trench frames shall have undergone alumite treatment. Cover plates shall be galvanized steel plates of 3.2mm thick with the same surface finish as the floor. Covers of more than 350mm wide shall be reinforced with Γ type galvanized steel plate reinforcement. The cover length shall be 600mm as standard and more than one stainless mortise handle shall be provided for every 3 covers.

2) Steel floor trenches

Frames shall be made of steel and cover plates shall be made of chequered steel plates of 4.5mm thick with both sides finished by SOP. Covers of more than 500mm wide shall be furnished with L angle steel reinforcement. Covers shall be 600mm long as standard and more than one notch shall be provided for every 3 covers.

(2) Installation

Trench frames shall be held in place and level without twist and fixed securely by welding anchors to joint bars at 500mm pitch. After welding anchors, mortar shall be applied to the outside of frames for fixing.

7-13 PAINTING

7-13-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of all painting and related items of work necessary to complete the work indicated in drawings and described in specifications.

(2) Work not included

The following items of work are not included herein and stipulated in other paragraphs of this specification.

- 1) Shop painting of metal work
- 2) Finish work at shop
- 3) Caulking
- 4) Painting and finishing work of mechanical, electrical, and piping work

7-13-2 Samples and Colours

(1) The contractor shall submit to the Engineer a set of colour cards which shows all colours to be painted and shall prepare under instructions from the Engineer a colour schedule which shows colours to be used at different places. Then the contractor shall prepare 2 examples of each colour and each type of finish on hardboards or steel plates to measure 15cm x 30cm. Preparation of the samples of painting shall be made at the construction field and after obtaining the approval of the Engineer for colours and finish, the contractor shall carry in paints to be employed.

(2) The contractor shall submit a list of materials to be used for approval. Prior to commencing painting

work, the contractor shall paint and finish one room or section or anything necessary for embodying the colour schedule as an examples, in which proposed colours, finished texture, materials and finishing methods shall be applied.

After approval by the Engineer, the room or items thus prepared as examples shall be referred to as the standard for similar work throughout the painting work.

7-13-3 Materials

(1) General

- 1) Paints, varnishes, stains, fillers, etc., shall be used with the Engineer's approval.
- 2) For such painting materials as turpentine oil, thinner, polishing compound, etc., products of the highest class so labeled on their vessels for identification.
- 3) All paints shall be enclosed in sealed vessels at the manufacturer and carried in. Each label on these vessels shall have the description of the name of manufacturer, type of paint, colour, directions for dilution, etc.

Those types of materials other than specified or approved shall not be carried in.

Paints shall be stirred sufficiently and shall not have caused deposition, solidification, or concentration in their vessels. By stirring in advance the paint to be used with a spatula or the like, consistency shall be obtained to provide excellent workability.

4) Storage of materials

- a) All paints and tools for painting shall be stored at a specified place or places.

- b) Floors and walls shall be protected not to be damaged or influenced by painting.
- c) Necessary measures shall be taken to minimize the occurrence of fire.
- d) The place or places used for the storage of paints shall be kept cleaned with its surface finish being equivalent to that of other places having the same features.

7-13-4 General

- (1) Prior to the commencement of painting work, inspect all surfaces to be painted or finished.
 - a) Prior to commencing painting work, clean up all sections concerned.
 - b) All surfaces to be painted shall be dry.
 - c) All surfaces shall be free from foreign matters before painting or finish.
 - d) Wood portions to be finished by clear coat shall have been finished to the extent of applying sandpaper lightly.
 - e) Intervals between coats shall be determined properly depending on the types of materials to be employed and weather condition.

- (2) Hardware, accessories, nameplates, lighting fixtures, shop finished products and other similar articles shall be dismantled or protected by some means or other. After completion of painting of each section, all dismantled articles shall be remounted in place. Dismounting, remounting, and protection shall be made by skilled workers.

- (3) Doors shall be removed for painting their tops and bottoms.

7-13-5 Surface Treatment

(1) General

- 1) Surfaces to be painted shall be clean, dry, and sufficiently protected against moisture.
- 2) Surfaces to be painted shall be level and smooth and shall form complete surfaces.
- 3) Surfaces to be painted shall be free from any foreign matter which may adversely affect adhesion or appearance.

(2) Wood portions

- 1) Wood portions shall be finished by sandpaper to even and smooth surfaces and then be cleaned by a vacuum cleaner.
- 2) Knots, resin pitches, and sapwood shall all be coated with shellac varnish.
- 3) After primer dries up, apply putty to nail holes, cracks, and joints.

(3) Concrete and mortar surfaces

fill all small holes on concrete and masonry surfaces to obtain uniform texture over the entire surfaces.

(4) Ferrous surfaces

- 1) Remove dirt and grease with mineral thinners.
- 2) Remove rust, mill scale and defective paint to obtain sound surface or texture, by using scraper,

sandpaper, or wire brush as required.

When necessary, grind off shoulders at edges of sound paint so that mottle shall not be caused by flow.

- 3) Touch up all spots having shop coats damaged with specified rust resisting paint.

7-13-6 Colours

Colours shall be in compliance with the colour control samples approved by the Engineer. The colour schedule will be prepared by the Engineer prior to the commencement of the work. Prepare the colour control samples on the basis of the colour schedule and submit these samples to the Engineer for approval.

7-13-7 Schedule of Painting

The schedule of painting shall be as given in Table 7-13-1.

Table 7-13-1 Schedule of Painting

a) Ready Mixed Paint (Synthetic Resin, Long Oil Type) SOP (Ferrous Metal Surafces)		
Pretreatment	Etching Primer	0.18 kg/sq.m
Under Coat (2 coats)	Anticorrosive Paint,	0.11 kg/sq.m
	Lead-Zinc Chromate or Lead Cyanamide	
Touch Up	do.	
Middle Coat	Ready Mixed Paint, (middle coat type)	0.08 kg/sq.m
Top Coat	Ready Mixed Paint	0.08 kg/sq.m

Note: Etching primer is to be applied on zinc-coated surfaces.

(Continued)

b) Ready Mixed Paint (Synthetic Resin, Long Oil Type)... SOP
(Wooden surfaces)

Sealer	Shellac Varnish	
Under Coat	Ready Mixed Paint (Under coat type, white)	0.09 kg/sq.m
PUtty	Putty, Vinyl Resin	
Middle Coat	Ready Mixed Paint	0.08 kg/sq.m
Top Coat	do.	0.08 kg/sq.m

c) Synthetic Resin Emulsion Paint A-EMP
(Cement and Sand Plaster, Concrete, Asbestos
Cement Board/Sheet, etc.)

Under Coat	Sealer, Emulsion	0.11 kg/sq.m
Putty	Putty, Emulsion	
Middle Coat	Synthetic Resin Emulsion Paint	0.10 kg/sq.m
Top Coat	do.	0.10 kg/sq.m

Note: For exterior surfaces and for indoor damp
places paint for exterior use shall be applied.

d) Lacquer Clear CL
(Wooden Surfaces)

Under Coat	Lacquer Wood Sealer	0.08 kg/sq.m
Filler	Wood Filler	
Middle Coat	Lacquer Sanding Sealer	0.12 kg/sq.m
Top Coat (2 coats)	Lacquer clear	0.15 kg/sq.m

(Surfaces of Woodboard Ceiling)

Under Coat	Lacquer Wood Sealer	0.08 kg/sq.m
Filler	Wood Filler	
Top Coat	Lacquer Clear	0.15 kg/sq.m

e) Stain OS
(Wooden Surfaces)

Stain (2 coats)	Stain, Oil Type	
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7-13-8 Application

General

- 1) Paint with a brush unless specifically directed or approved by the Engineer.
- 2) Each coat shall be applied uniformly without leaving brush marks or holding.
- 3) Each coat shall be flowed on smoothly and free from sags and runs.
- 4) The rate of application shall be as given in Table 7-13-1. Each coat shall be accomplished without involving holidays or skips, gaps, pinholes, etc.
- 5) Paint enclosed in a vessel may be thinned according to the directions of the manufacturer immediately before using it.
- 6) The number of coat or the number of finishing coats shall be increased if necessary for obtaining uniform colour and appearance.
- 7) When part of the wall painted is damaged or faulty, do not correct partially but repaint the whole wall.
- 8) The minimum dry time shall be as recommended by the manufacturer. Before a coat dries up, the succeeding coat shall not be applied.
- 9) Before applying a coat, sand with abrasive paper of a proper No. to the coat.
- 10) Painting of portions adjoining other members or portions with different colours of paint shall be accomplished smooth and sharp without overlapping boundaries.
- 11) Portions to be glazed shall be coated with a primer prior to glazing.

7-12-9 Curing

- (1) Portions other than those to be painted shall be protected against damage, soil, etc., by painting materials or tools.
- (2) Furniture and other movable objects, equipment, appliances, accessories, etc., shall be relocated for protection and, after completion of work at the area concerned be restored to the initial positions.
- (3) All works of which finish has been completed shall be protected by a hanging screen with proper size but without any hole or the like.

7-13-10 Cleaning

Upon completion of the work, remove all paint attached on the surfaces of fittings, glass, furniture, fixtures, hardwares, etc. Cleaning shall be effected elaborately without scratching or marring the finished surface.

7-14 INTERIOR FINISH WORK

7-14-1 Scope of Work

The work specified under this paragraph consists of all interior finish work and related items of work necessary to complete the work indicated in drawings and described in specifications.

7-14-2 Shop Drawings

Shop drawings and manufacturing drawings on all interior finish work shall be submitted to the Engineer for approval. The approval shall be obtained prior to starting the fabrication.

7-14-3 Samples

Two samples of each of the following materials and products shall be submitted to the Engineer for approval. The approval shall be gained prior to carrying in the material or commencing the fabrication.

- 1) All interior finish material described in this paragraph.
- 2) Others directed by the Engineer.

7-14-4 Materials and Method

When any material or method stipulated in another paragraph of this specification is applicable to work specified in this paragraph, the provision of that paragraph shall be applied to the work.

7-14-5 Vinyl Asbestos Tile

- (1) Sope of Work

The scope of work and the sections of work shall be as indicated in the drawing. Distribution shop drawings, etc., shall be submitted to the Engineer for approval prior to starting the work. Shop drawings, etc., shall specify the types of materials, patterns, colours, details of work, connection with other work, and all other related items.

(2) Dimensions and shape

Vinyl asbestos tile shall be 2.0mm in thickness and 303mm x 303mm or 304.8mm x 304.8mm (nominal 30cm x 30cm) each.

(3) Application

Vinyl asbestos tile shall be applied, as indicated in shop drawings, to the dimensions and shapes of door sills, column corners, and floor trenches and shall be cut or jointed not to cause gaps.

(4) Adhesives

Polyvinyl acetate adhesives shall be used, which shall be applied uniformly over the bed to be stuck on the whole surface without causing unevenness and non-uniformity. After application of tile, wipe off surplus adhesives that has come out, push down tile surfaces by rolling or other proper method so that air shall not remain on the adhered surfaces, and protect vinyl tile until the adhesives set under instructions from the Engineer.

(5) Surface finish

When the adhesive is observed to have set, clean the surface with warm water or neutral detergent and water, and after the surface has dried sufficiently, finish with water-soluble wax.

The wax shall be such as specified by the manufacturer.

(6) Inspection of bed

Prior to application of tile, inspect the bed for normality. Application shall not be commenced before defects are corrected.

The allowable error of the bed surface shall be within $\pm 3\text{mm}$ in any of 2m distance and within $\pm 1.5\text{mm}$ in any 30cm distance. When unevenness exceeding the above range is caused, correction of unevenness shall be made by using bed material and adhesives set out in this specification.

(7) Temperature keeping and curing

The portion to be worked shall be kept above 15°C for more than 24 hours before the work and for more than 48 hours after the work. Portions on which application has completed shall be cured until the adhesive sets sufficiently. Curing shall be made by using thick curing paper in general and by using plywood or the like when the floor may be damaged by workers to pass by during the construction work.

7-14-6 Soft Vinyl Skirting

(1) Scope of Work

The scope of work shall be as shown in drawings.

(2) Dimensions and shape

Each soft skirting shall measure 75mm high, 2mm thick, and 2m long. Chamfering at the top shall be about 3mm in curvature and that at the bottom about 5mm in curvature.

(3) Bed

Sufficiently inspect floor and wall to which skirting shall be applied, correct unevenness, and clean. The

allowable error shall be as specified in Paragraph 7-14-5, item (6).

(4) Application

Apply sufficient amount of adhesives uniformly on the wall and back of the skirting, then stick, and elaborately push down the skirting with a hand roller. The adhesives shall be as specified in Paragraph 7-14-5, item (4).

(5) Bending treatment of external corner's skirting

Skirting material for external corners shall be formed by pushing it at a corner to be bent while heating the back of the portion to be bent by a hair drier or blowtorch.

(6) Surface finish

When adhesive is observed to have set sufficiently, clean the surface with warm water or neutral detergent and, after sufficiently drying the surface, finish it with water-soluble wax.

The wax shall be such that has been specified by the manufacturer.

(7) Temperature keeping and curing

As per Paragraph 7-14, item (7).

7-14-7 Wood skirting

(1) Scope of work

As shown in drawings.

(2) Dimensions and shape

Hardwood of 150mm high and 24mm thick.

(3) Bed

When the bed is wood, apply a machine planer. When the bed is mortar, use wood brick at 450mm pitch and apply a machine planer on the surface.

(4) Application

Skirting for internal corners shall be fixed by miter joint and skirting for external corners by face miter joint. Put the soffit of skirting on floor boards, apply brackets or wedges and, after proper alignment, apply nails with broken heads.

(5) Finish

Hardwoods shall be planned, cleaned, and sandpapered before being fixed. Joints, holes, and cracks shall be filled with putty and made flush.

After thus preparing the bed, colour with oil stain. With wood sealer, apply one base coat, 2 intermediate coats and sandpaper. Then, apply 2 coats of clear lacquer by spraying so as to finish.

After this, cure carefully.

7-14-8 Glass wool mats

(1) Scope of work

Apply glass wool mats in the machine room and others for the purpose of sound absorption.

(2) Dimensions and shape

Each glass wool mat shall measure 910mm x 610mm x 50mm(thick). Glass wool board No.2, 24K specified in JIS A 6306 shall be employed with the surface being covered with cloth and clipped by special clips.

(3) Bed

The bed shall be finished with mortar to a thickness

of 20mm by using a trowel. Special clips shall be fixed to the surface of the mortar bed by means of adhesives.

7-14-9 Cemented excelsier boards

(1) Scope of work

Cemented excelsier boards shall be laid on the ceiling of the machine room, etc., for the purposes of sound absorption and heat insulation, as indicated in drawings.

(2) Dimensions and shape

Each cemented excelsier board shall be 25mm in thickness and shall meet the requirements of JIS A 5404.

(3) Laying

Prepare distribution shop drawings, and submit them to the Engineer for approval. Put basic marking on forms as indicated in drawings, and lay cemented excelsier boards according to the basic marking not to cause gaps on joints. Nail the boards, but not on corners, to such extent that shall not cause warp by arranging bars or placing concrete.

(4) Finish

Cemented excelsier boards need not be finished to maintain sound absorbing capability. However, boards shall be selected for coordination in colour and texture upon being laid on forms and only cleaning for removing cement paste shall be made after removing forms. When a board involves check, break, etc., remove the board and mount a normal board by using adhesives and special fittings together under instructions from the Engineer.

7-14-10 Gypsum Boards

(1) Scope of work

Gypsum boards shall be used as indicated in drawings for obtaining a smooth bed for finish and sound insulation effect.

(2) Dimensions and shape

Gypsum boards shall meet the requirement of JIS A 6901. Each board shall measure 910mm x 1820mm x 9mm (thick).

(3) Bed and fixing

When wood bed is used, boards shall be fixed by galvanized or chrome plated flat head steel nails. When suspended steel frames are used for receiving members, boards shall be fixed by the specification of the manufacturer of steel frames.

Cutting shall be made accurately by an electric cutter. Although gypsum boards are used mainly as bed materials, distribution shop drawings shall be prepared and submitted to the Engineer for approval prior to commencing the work.

Fittings on the surrounds shall be set more than 10mm inside the edges of the board and at intervals of 90 ~ 100mm, and fitting on each member receiving the board shall be set to line at equal intervals of 120 ~ 150mm.

7-14-11 Rock Wool Ceiling Boards

(1) Scope of work

Rock wool ceiling boards shall be laid on the ceilings of control rooms and others. The scope of work to be covered is indicated in drawings.

(2) Dimensions and shape

Each board shall measure 300mm x 600mm x 12mm (thick) or 303mm x 606mm x 12mm (thick). With chamber.

(3) Bed and fixing

Gypsum boards mentioned in Paragraph 7-14-10 shall be used to form the bed. Gypsum boards shall be laid doubled in the rehearsal room and singled in other rooms. Gypsum boards shall be fixed by spot fixing with nail and adhesives in accordance with the specification of the manufacturer. Boards shall be fixed at room humidity of less than 30%. Prior to fixing boards, prepare distribution shop drawings, perform dimensional adjustment with facilities and electrical fixtures, and gain the approval of the Engineer.

7-14-12 Asbestos Boards

(1) Scope of work

Asbestos boards shall be laid as indicated in drawings.

(2) Dimensions and shape

Each asbestos board shall be 6mm thick and meet the requirement of JIS A 5410. High-quality asbestos boards made in Sri Lanka shall be used.

(3) Bed and fixing

Hardware shall be as specified in JIS A 5410, Table 19-8-2, unless otherwise stated.

Cutting of boards shall be made by a saw for slates or a rotary cutter. Holes for sticking shall be bored by a drill to have a size a little larger than the hardware dimensions and a counter sink shall be provided when necessary. To be fixed by Phillips flat head screws. Holes for sticking

shall be located 18mm from the edge.

Unevenness which may be caused upon fixing shall be sandpapered to obtain a level surface. Soil or stain if found after laying boards shall be remove by sandpaper.

7-14- 13 Miscellaneous Works

(1) Curtain rails

Ready-made stainless steel curtain rails to be supplied with runners and other accessories shall be used.

Samples shall be submitted to the Engineer for approval.

(2) Cabinets

High-quality hardwood shall be used for the material. Hinges, pull, magnet catch, latch and, if necessary, hardware such as lock for cabinet use shall be fitted. Cabinets shall be fixed to a wall by using anchor bolts and wood brick or strip as the receiving material. Shop drawings involving these items shall be prepared and submitted to the Engineer for approval before commencing the work. The dimensions, shapes, and quantity of cabinets shall be as indicated in drawings.

(3) Make-up tables

Make-up tables shall be made of lumber core plywood with the upper surface being covered with polyester plywood and hardwood edges finished by clear lacquer. The dimensions and shapes of make-up tables shall be as indicated in drawings. Shop drawings including brackets and wood brick for fixing shall be prepared and submitted to the Engineer for approval, prior to the commencement of the work.

(4) Scene dock

Scene dock shall be provided in the scenery props

room. Structural wood shall be used for its material and planed and finished by oil stain, as indicated in drawings.

Scene dock shall be fixed securely to the floor by means of anchor bolts. Scene docks shall be fixed together as is the case with wooden roof trusses. Shop drawings shall be prepared and submitted to the Engineer for approval.

(5) Work bench

Work bench shall be provided in the scenery props room as indicated in drawings. Structural wood shall be used for the material and planed and finished by oil stain. Anchor need not be used. Shop drawings shall be prepared and submitted to the Engineer for approval.

(6) Sink

Ready-made sink shall be provided in the kettle room as shown in drawings. The sink shall measure 1800mm wide, 600mm deep and 850mm high, approximately, including a gas table measuring 600mm wide, 600mm deep, and 700mm high, approximately.

Space for piping and flushing board shall be 100mm in width, as indicated in drawings. The catalogue and test data of the sink and gas table shall be submitted to the Engineer for approval. The sink top shall be covered with SUS 304 and sink shall be furnished with swinging front doors. A suspended cabinet in the upper portion shall also be included in the set, which shall be made of polyester plywood and also furnished with swinging front doors as is the case with the sink. Layout shall be nearly as indicated in drawings.

(7) Receptionist's Counter

The dimensions and shape of the receptionist's counter

shall be as indicated in drawings. The structure of counter shall be of brick masonry and terrazzo shall be used for the counter top. External wainscot shall be finished by clear lacquer on plywood, and skirting by terrazzo blocks. Internal wainscot shall be finished by mortar A-EMP finished and skirting by terrazzo block.

(8) Sliding wall

Sliding wall shall be provided in the conference room as indicated in drawings. The sliding wall shall use aluminum press out frames, plywood, cloth and rock wool core. Panel thickness shall be 47mm and frame depth about 52mm.

Sound resisting type.

The catalogue and test data shall be submitted to the Engineer for approval.

(9) Corner beads of ceiling

When either wall or ceiling or both are made of boards as indicated in drawings, corner beads of ceiling shall be provided by using a synthetic resin press out member.

Samples shall be submitted to the Engineer for approval in advance.

(10) Provide caulking materials for flashing and sound insulation, as indicated in drawings.

Caulking material composed mainly of polysulfide resin shall be used unless otherwise specified. Samples, catalogues and test data shall be submitted to the Engineer for approval in advance.

(11) Expansion joint

Expansion joint shall be provided in a section of Colombo Studio Center, as indicated in design drawings.

1) Foamed polystyrene sheets (JIS A 5911) of 50mm thick

shall be laid for the floor portions under concrete slabs so as to have no contact with structure and which shall be furnished with aluminum ready-made product or caulking material as indicated in drawings.

- 2) Wall portions shall be treated as the floor portion.
- 3) Expansion joint shall be provided on part of the equipment foundation of the equipment room, as indicated in drawings. By laying formed polystyrene sheets (JIS A 5911) between the foundation and structure indulation between them shall be obtained and the expansion joint shall be finished by using asphalt compound. For the expansion joint cover to be used on part of the floor and external walls, ready-made product using aluminum pressed-out material, which can follow deformation of 50mm in the horizontal direction and 9.5mm in vertical direction, shall be used.

7-15 STUDIO INTERIOR WORK

7-15-1 Scope of Work

This work includes all interior work of the studio, subcontrol, and sound lock rooms after completion of the building structure. Since each room is designed with due care for acoustic effects such as sound insulation and absorption for TV programme production and broadcasting, the work shall be accomplished with thorough understanding and utmost care to meet the requirements.

(1) TV Studios

Each TV studio to be used for producing TV programmes shall adopt interior design suitable for programme production and at the same time shall be furnished with facilities for television broadcasting, such as grid types and floor pits for water supply and drainage. Floor shall be finished to be level and smooth not to cause vibration or fluctuation upon camera movement.

(2) Dubbing studio

Dubbing studio is intended for announce talk. The floor, ceiling, and four walls of the dubbing studio shall be insulated from the concrete structure by using vibration-proof rubber and a floating structure furnished with interior walls of light soundproof structure (by applying gypsum boards), while providing sound absorbing interior walls inside. For the doorway and observation window, studio fittings shall be used each of which shall be mounted to interior wall of floating structure. A particular care should be exercised for the sound insulation and vibration proofing of these sections during the work.

(3) Subcontrol and sound lock rooms

Each TV studio shall be provided with a subcontrol and

sound lock rooms. Both subcontrol and sound lock rooms shall incorporate interior walls for sound absorption in the concrete structure but will not adopt floating construction walls. All doorways of these rooms shall be furnished with studio fittings and due care shall be exercised for sound insulation upon laying studio fittings. A wiring trench shall be provided on the floor of subcontrol room for passing wires for broadcasting.

(4) Curing

Studios, subcontrol rooms, and sound lock rooms provide very few openings to the external atmosphere, so that materials to be used for interior finishings in these rooms shall be cured sufficiently against moisture. A particular care should be exercised for curing of studio fittings designed to be particularly precise. Prior to commencing interior work, care shall be exercised for dryness of the portion for which interior work to be performed by using a temporary ventilating equipment or dehumidifier. In addition, particular care should be taken for safety and sanitation of personnel to be engaged in this work and related equipment work.

7-15-2 Related Work

The interior work is related with many other items of general architectural work. These items of related work shall in principle be stipulated by respective specifications and, in addition, shall meet the requirements set out hereunder.

(1) Concrete work

Honeycomb and others caused on concrete portions around a studio will degrade sound insulation effect both inside and outside the studio, so that honeycomb, etc., shall be removed completely and hard mixed mortar shall be pressure placed over these portions.

Likewise, temporary holes and other defective portions produced during the work shall be filled with mortar and corrected sufficiently. The thickness of concrete to be placed shall be as indicated in drawings.

(2) Masonry work

Joints on masonry walls shall be filled up with mortar. In particular, gaps if caused on both side edges of a wall and on the upper and lower edges shall be filled with mortar without fail. When a double wall is to be built by forming a masonry wall in addition to the concrete structure wall, no support shall be provided between two walls.

(3) Plastering

Brick walls for sound insulation to be built inside or outside studios shall be coated by cement mortar. Plastering shall be made elaborately to keep a width of 20mm and not to cause cracks or exfoliation. Surfaces shall be finished to be smooth and level with a trowel.

(4) Carpentry

Wood to be used for interior furnishings shall have true dimensions and shape indicated in drawings and shall be well-seasoned. The bed under the finishing material shall be plane finished. The water content of wood to be used shall be less than 15%. Wood carried in shall be stored under proper ventilation and protected completely from moisture, rainwater, etc. For jointing wood, halving joint shall be used in principle. Table 7-15-1 and attached drawings specify examples of joints and connections of wood used in Japan. In carpentry, methods suitable for the respective joints and connections shall be selected from among those employed in Sri Lanka by referring to these examples.

Table 7-15-1 Jointing and Connecting Methods

Framework Member	Kind of Joints and Connection	Description	Attached Drawing No.
Ground sill	Joint	The ground sill shall be jointed to its counterpart by applying "Okkakedaisen-tsugi(1)" (refer to Drawing No.1), at a point approximately 150mm away from the column center or within 150mm away from the bolt used for fixing the vibration-proof rubber.	(1)
	Connection	The ground sill shall be connected to its counterpart by applying "Eriwaire-tsukitsuke(2)" (Refer to Drawing No.2) and shall then be fixed to noe another with a clamp driven to the same effect as is available with the horizontal brace.	(2)
Sleeper	Joint	The sleeper shall be jointed to its counterpart by applying "Koshikake-ari-tsugi(3)" (refer to Drawing No.3), and shall then be fixed with two nails. The sleeper shall be jointed to point approximately 150mm away from the vibration-proof rubber.	(3)
	Connection	The sleeper shall be connected to the ground sill by applying "Koshikake (4)" and shall then be fixed with nails.	(4)

(Continued)

Framework Member	Kind of Joints and Connection	Description	Attached Drawing No.
Ground sill and horizontal angle brace	Connection	The ground sill and horizontal angle brace shall be connected with each other by applying "Katagi-Oire (5)" and they shall then be fixed with a bolt having a diameter of 13mm (refer to Drawing No.5).	(5)
Floor joist	Joint	In case the floor joists are set on a sleeper to a protrusion of less than 60mm from the bracket's upper bed, they shall be jointed to one another by applying "Tsukitsuketsugi(6)" (refer to Drawing No.6) halfway in the width of the sleeper. When the floor joists are set on the sleeper to a protrusion of more than 60mm from the bracket's upper bed, they shall be jointed to one another by applying "Mechigai-tsugi(6)" (refer to Drawing No.6) halfway in the width of the bracket.	(6)
	Connection	The floor joist shall be connected to a sleeper after being set on it, and they shall be fixed to each other with nails, or the floor joist shall be connected to the sleeper by applying "Watariagokake (7)" (refer to Drawing No.7) and they shall then be fixed to one another with two nails driven aslant to position.	(7)

(Continued)

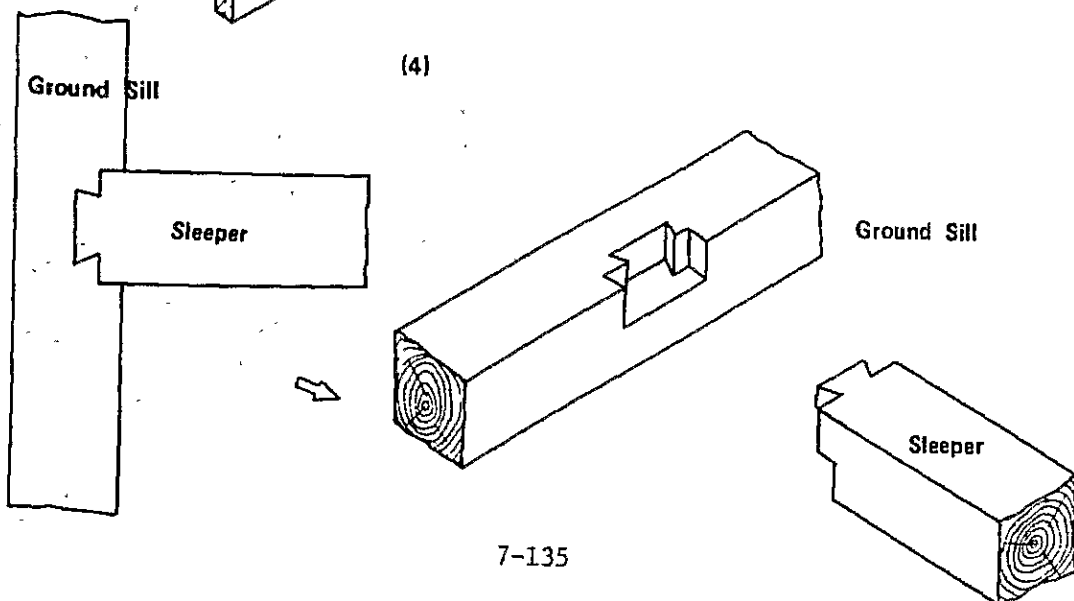
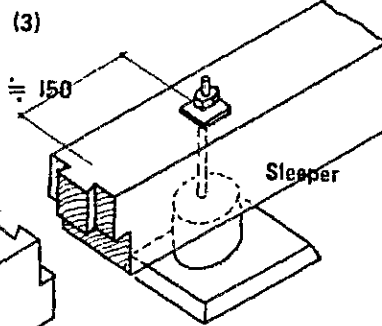
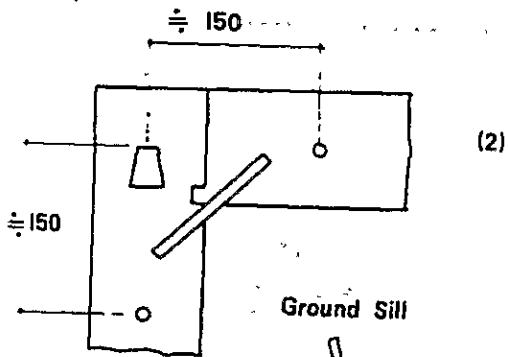
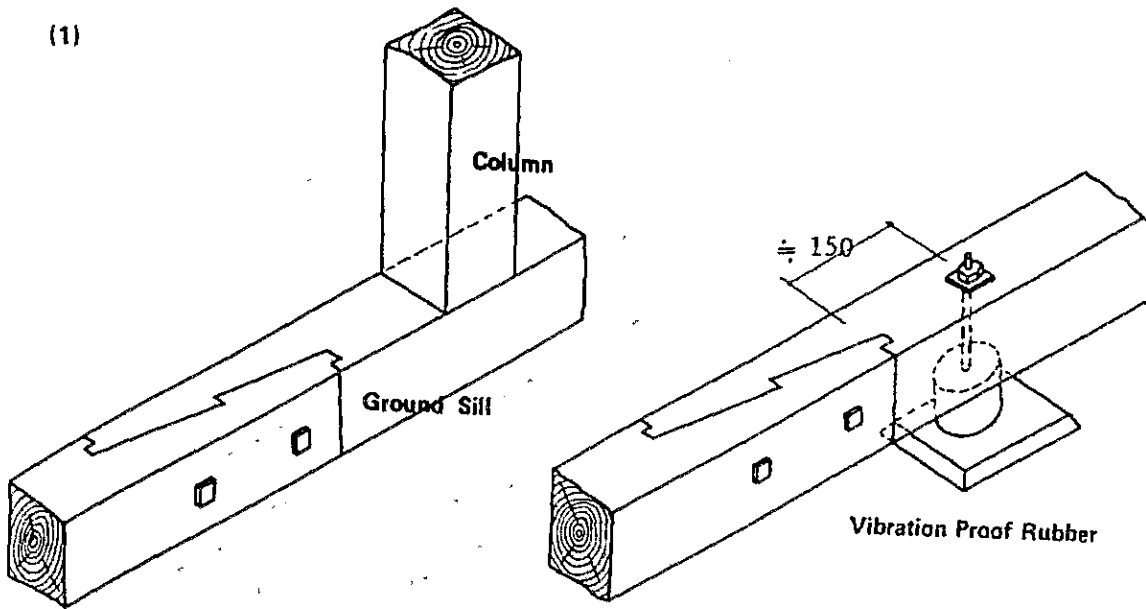
Framework Member	Kind of Joints and Connection	Description	Attached Drawing No.
Column	Connection	The column shall be connected to a wall girder and a ground sill with two nails after being set to them with the column's upper and lower stub tenons driven into positions in the wall girder and the ground sill.	(8)
Stud	Connection	The stud shall be connected, respectively, to a wall girder and a ground sill after being set to them with the stud's upper and lower stub tenons driven into positions in the wall girder and the ground sill, and it shall then be fixed to them with two nails driven aslant.	(9)
Wall girder	Joint	The wall girder shall be jointed to another wall girder by applying "Okkakedaisen-tsugi(10)" (refer to Drawing No.10) at a point approximately 150mm away from the center of the column.	(10)
Beam	Connection (with a wall girder)	The beam shall be connected to a wall girder by applying "Oirekabutoarikake (11)" (refer to Drawing No.11) and they shall then be fixed to one another with the strap bolt having a diameter of 13mm.	(11)

(Continued)

Framework Member	King of Joints and Connection	Description	Attached Drawing No.
Horizontal angle brace	Connection	A horizontal angle brace shall be connected to a wall girder by applying "Katagi-oire (12)" (refer to Drawing No. 12), and they shall then be fixed to one another with a bolt having a diameter of 13mm.	(12)
Floor	Sub floor (24 thick Japanese cryptomeria)	The sub floor boards shall be arranged diagonally and they shall be fixed to positions with toothed nails.	
	Strip floor boards (15mm thick Japanese cypress)	The strip floor boards shall be fixed to each floor joist with blind nails driven into positions and they shall then have two toothed nails driven at a right angle.	
	Waterresisting plywood sheathing (6mm thick)	The plywood shall be fixed to position in combined use of paste and nails.	

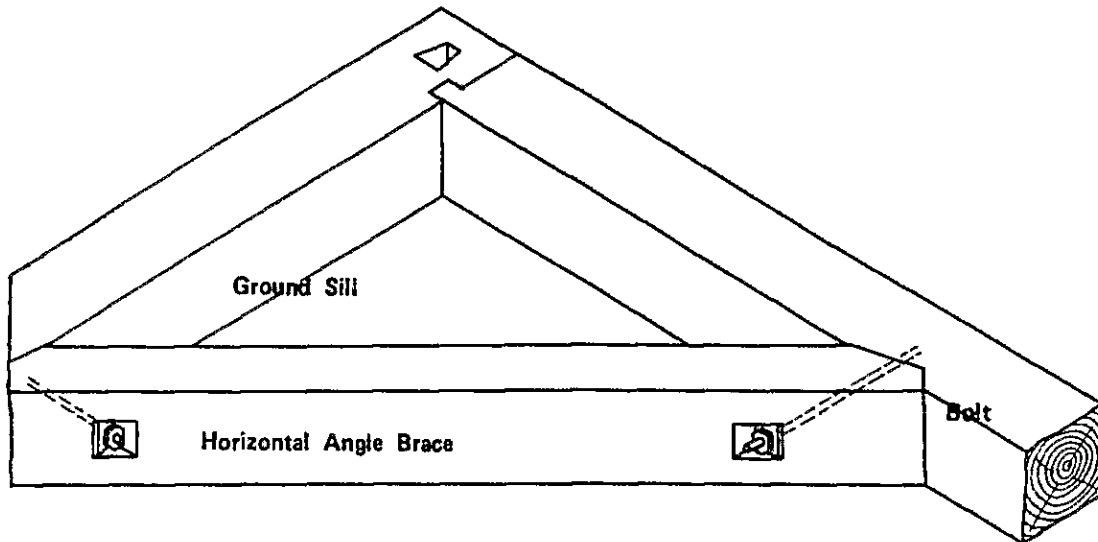
Attached Drawings

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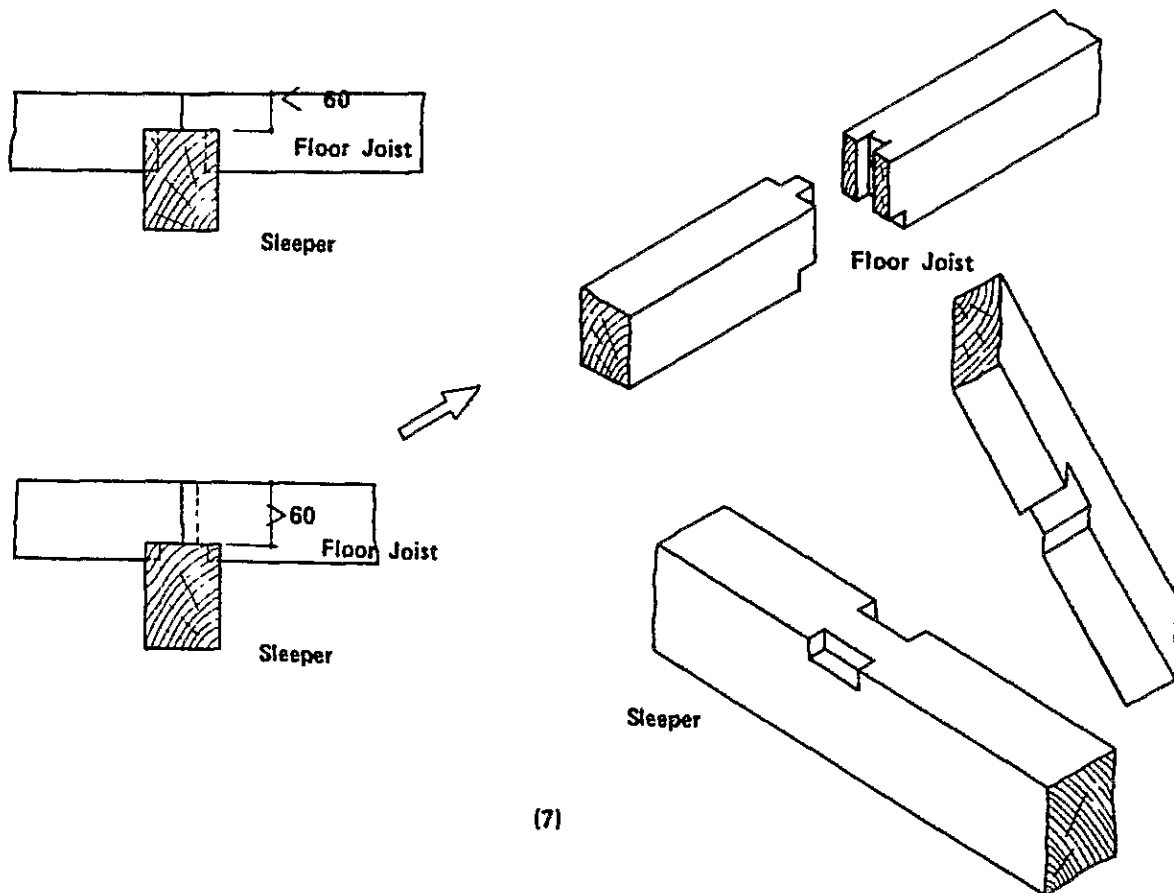


Attached Drawings

(5)



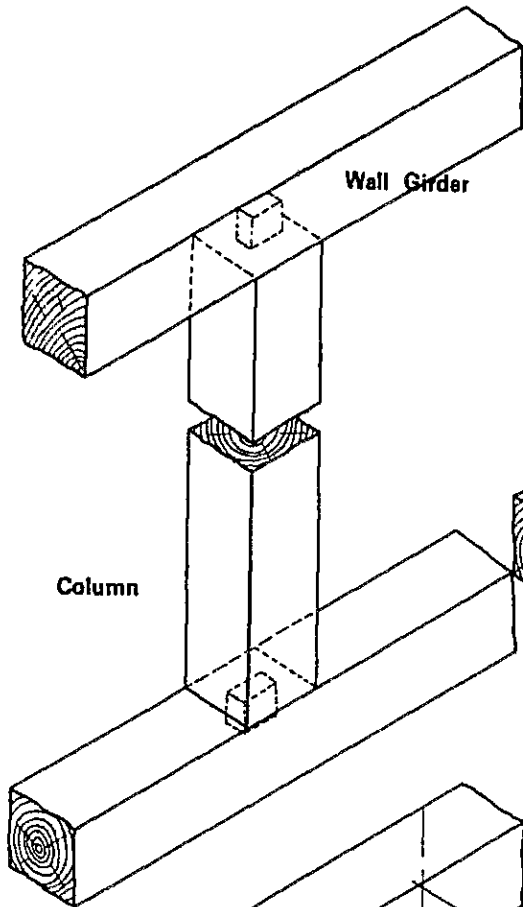
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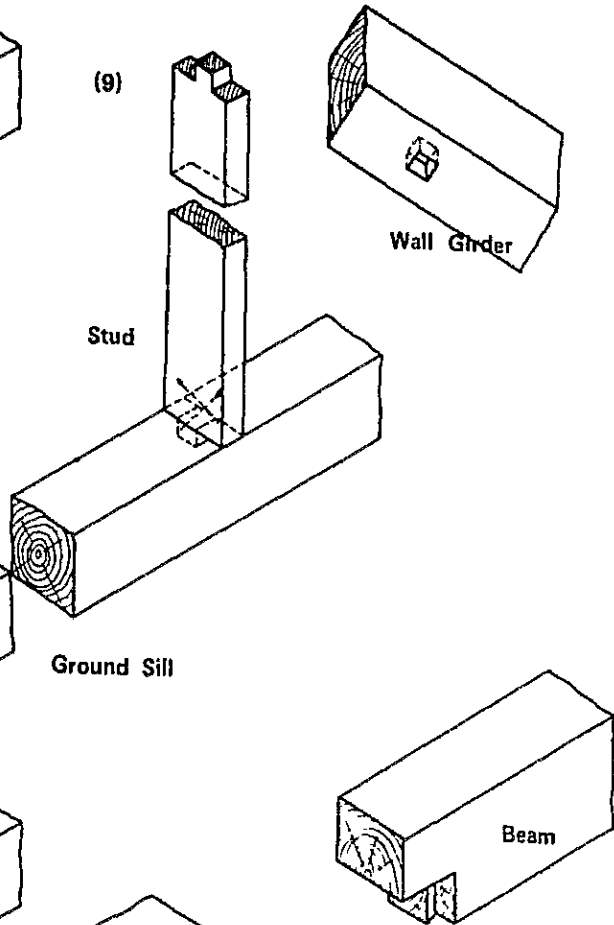
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Attached Drawing

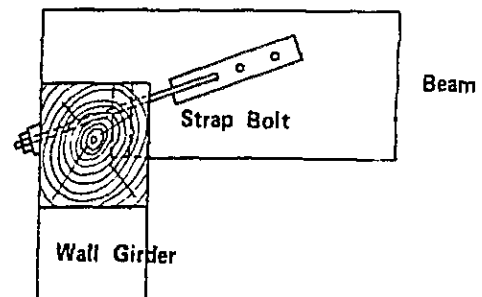
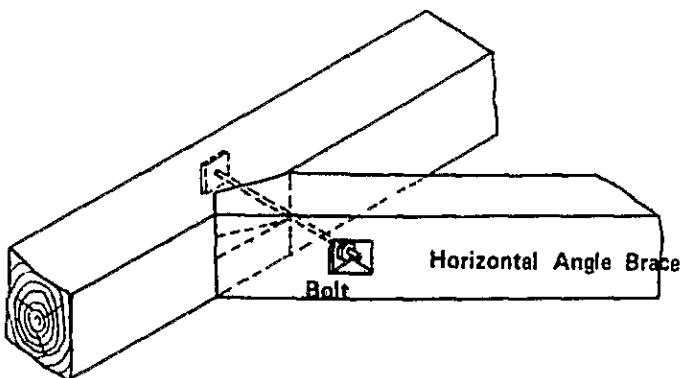
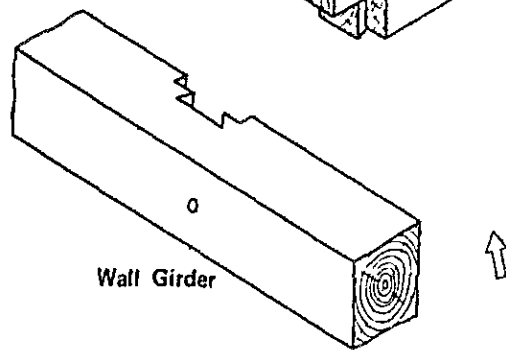
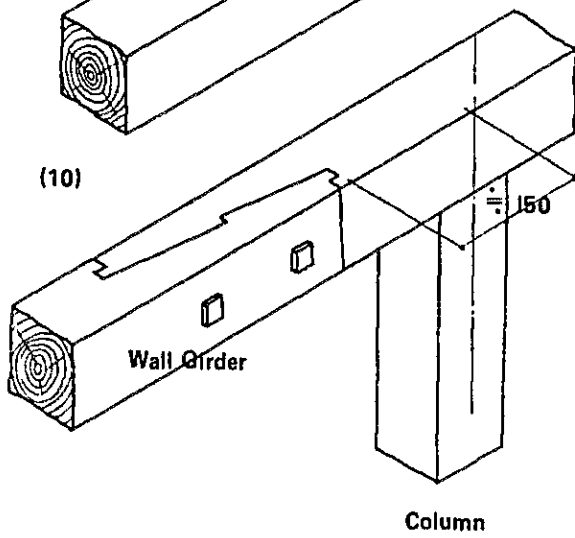
(8)



(9)



(10)



Space between the surface of interior furnishing sound installation layer (gypsum board) and the back of interior furnishing boards shall be kept strictly as specified in drawings for achieving the required sound absorption effect.

(5) Vibration-proof rubber

Materials for vibration-proof rubber shall meet the requirements of JIS K 6385 and 6386. Provide required vibration-proof rubber at required locations specified in drawings. Since several types of vibration-proof rubber will be used, due care should be taken not to use wrong vibration-proof rubber at these locations.

1) Under floor and under ground sill vibration-proof rubber

Cement mortar of specified thicknesses shall be placed at specified locations to provide vibration-proof rubber mounting bases. In mounting vibration proof rubber, the height of the vibration-proof rubber shall be determined by using a leveling string and a level so that the upper ends of vibration-proof rubber shall be on a line with each other. After vibration-proof rubber has been set securely, sills and sleepers shall be constructed. The positions of the sills and sleepers shall be determined so that the upper edges of the sills and sleepers shall be arranged flush with each other and level, by using a leveling string and a level. When a gap is produced between the lower edge of a sill or a sleeper and the upper edge of the vibration-proof rubber, the gap shall be corrected by using packing. Sills and sleepers shall be fixed to vibration-proof rubber after determining the positions of the sills and sleepers, but on this occasion, ensure not to tighten nuts excessively to cause distortion on vibration-proof rubber. When the stop screws of vibration-proof rubber protrude remarkably, they shall be cut by a saw but shall not be blown off by gas or electric blow. When temporary supports are provided

between sills/sleepers and floor slabs upon constructing the sills and sleepers, they shall be removed after completion of the work. Vibration-proof rubber are designed to be compressed by about 2mm upon application of the final load, and due care shall be taken upon determining the floor height.

2) Ceiling mounted vibration-proof rubber

When supporting hanger bolts with suspension type vibration-proof rubber, vibration proof rubber will be compressed by about 2mm and the length of hanger bolts shall be so adjusted that the cradling of the ceiling shall be inclined as shown in drawings.

Care shall be exercised so that hanger bolts supported by vibration-proof rubber shall not contact any beam or electric or any other piping and that hanger bolts shall be plumb.

(6) Laying sound insulation gypsum boards

Gypsum boards conforming to JIS A 6901 shall be used. Boards shall be used in standard or half size and not cut them to odd size as much as possible.

Gypsum boards shall be arranged and stuck to the counterpart in double layers of the staggered joint pattern (one joint in one layer to be located halfway in the length and width of one gypsum board in another layer). Butt joint shall be used for jointing so that joints between respective layers shall not overlap and that joints shall come on cradings or stud centers.

Boards shall be cut elaborately so that no gap shall be produced in contacting portions. For the first layer, nails of 25mm shall be used. For the second layer, galvanized nails of 30 ~ 32mm shall be used at intervals of 150mm, or so. For corners, such as a wall corner, wall-cutting corner, etc., caulking materials shall be applied sufficiently as indicated in drawings. For the caulking material, samples shall be submitted to the Engineer for approval, prior to the commencing the work. Clean those portions to be filled, then press out caulking material from a caulking gun

not to cause any gap, and push in the caulking material by a metal spatula to form a level surface.

(7) Laying surface boards

Punched board of waterproofed plywood (Japanese linden) specified in JAS, Class 2 shall be used as indicated in drawings. These boards, each measuring 450 x 600mm as standard, shall be shop processed and shall, in principle, not be formed or punched in the construction site. The diameter and intervals of holes on punched boards shall be as shown in drawings. Boards shall have slight chamfers and be stuck applying butt joint. Boards shall be laid by means of galvanized round head nails of 25mm at intervals of about 150mm. For finishing, A-EMP specified by the Engineer shall be applied after filling. Base coat shall be applied on boards prior to laying them. Both base and finish coats shall be applied not to stop up holes.

(8) Sound absorbing glass wool work

Sound absorbing glass wool conforming to JIS A 6306 (Sound Absorbing Glass Wool Board No.2, 24K) shall be used as the material. Thickness of the material shall be indicated in drawings. The material shall be cut to the dimensions and shape to match the framework indicated in drawings, and inserted into the frame work. The framework shall be furnished with metal lath so that the material shall secure the required position, as indicated in drawings.

(9) Laying polyethylene film

Black-coloured soft polyethylene film produced by the high-pressure method and having a thickness of 0.02mm and a density of about 0.925g/cm² shall be used. The quality certificate of the manufacturer shall be attached. Samples shall be submitted to the Engineer for approval in advance. Polyethylene film shall be used on the back of punched boards.

Take due care not to damage film during the work.

When using polyethylene film on the surface of sound absorbing glass wool, fix the four corners of the film with flat head nails. When it is used on the back of punched boards, apply adhesives on the edges of the board, put the film on the board in a natural condition and stick it to the board. In either case, care should be exercise not to lay film tensed.

(10) Hemp cloth hanging

For television studio interior furnishing, hemp colth shall be laid on the surface of polyethylene film laid, as mentioned in Paragraph 7-15-2 item (9), on sound absorbing glass wool board mentioned in Paragraph 7-15-2 item (8).

Hemp cloth shall have the colour specified by the Engineer and be laid as specified in Paragraph 7-15-2 item (9), but lay film tensed.

(11) Diagonal wire netting

On the interior finishing surface of each TV studio, diagonal wire netting indicated in drawings shall be laid. Diagonal wire net shall be galvanized one meeting the requirement of JIS G 3552. Joint of diagonal wire netting shall be made by special joiners to be fixed to studs or ceiling joints at intervals of 90cm by using aliminum battens and screws.

(12) Simple floating floor work

- 1) The floor of each TV studio shall be a simplified floating floor obtained by placing concrete on glass wool.
- 2) Glass wool to be used shall meet the requirement of JIS A 9505, No.2, 96K. Thickness of glass wool shall be as indicated in drawings.
- 3) Hard polyethylene film produced by the high-pressure method

shall be employed with a thickness indicated in drawings.

- 4) Glass wool shown shall be laid in two layers on concrete surface. The two layers of glass wool shall be zigzag laid. For jointing, butt joint shall be used not to cause any gap. At the bottom of walls, glass wool shall be raised up as shown. Polyethylene film shall be laid on the surface of glass wool thus laid. Lay also polyethylene film on the rising portion at the bottom of the wall, wrap up glass wool, and completely waterproof it. Polyethylene film shall have a lap of more than 15cm. Lay also waterproofed lauan plywood conforming to JAS Class 1, place concrete containing welded metal netting, and finish the floor.

(13) Grid pipes and other hardware work

When fitted to walls, grid pipes shall be fixed to concrete walls with anchor and hanger bolts, to line and in place, as indicated in drawings. For others, see Table 7-15-2.

Table 7-15-2

Item	Material, Shape and Size	Finish	Remarks
Grid pipes	Steel gas pipe 48φ Pipe fitting piece, etc. Refer to the drawings for details	S.O.P. shall be applied to the exte- rior of the grid pipes after the pipes are applied with rust preven- tive paint.	Pipes shall be tightened to one another at their cross points using bolts with slip- proof washers.

(Continued)

Item	Material, Shape and Size	Finish	Remarks
Hanger bolts for the above	Turnbuckle 16φ, etc. Refer to the drawings for details.	S.O.P. shall be applied to the exterior of hanger bolts after they are applied with rust preventive paint.	After length adjustment, spot welding shall be applied to retain the nut to position. The hanger bolts shall be provided with a sound-proof sleeve.

(14) Horizontal cyclorama

Horizontal cyclorama to be installed at TV studios 1 and 2 shall be set as follows.

- 1) Water-resisting plywood of 3mm thick shall be arranged and stuck to the counterpart in double layers of the staggered joint patterns (one joint in one layer to be located halfway in the length and width of one board in another layer) by using galvanized nails.
- 2) Joints shall be filled with putty to be prepared at a mix proportion of gypsum 7 : putty 3. Then, dry for 5 hours.
- 3) Lay victoria lawn with a synthetic resin adhesives. Dry for 24 hours.
- 4) Fill the boards with putty (0.2kg/m²), and finish with #100 trowel. Dry for 10 hours.
- 5) Sandpaper (#320) with water.
- 6) Give one coat of wood sealer (0.15kg/m²). Dry for 24 hours.

- 7) Apply 2 coats of synthetic resin emulsion paint (acrylic or synthetic rubber type (0.2kg/m²)) by spraying.
Munsell N-8. Gloss 30%.

7-15-3 Rehearsal Room Floor Expansion Work

In order to separate the floor of the rehearsal room from the concrete structure, foamed polystyrene (JIS A 9511) of 50mm thick shall be laid around concrete slabs and foamed polystyrene of 100mm thick shall be laid on the upper bed of tie beam in the central part of ground floor slab.

7-15-4 Studio fittings installation work

(1) General

Sound proofing fittings shall be set by competent skilled workers sent from the manufacturers of the fittings. Two types of fittings shall be used in the studios, control and sound lock rooms: one made of steel and the other made of aluminum. These two types of fittings can still be divided into several types by performance. All these fittings shall be manufactured and fixed elaborately and accurately so as to achieve the required acoustic effects.

1) Steel and aluminum doors

a) Types and performance

Three types: A, C, and D

Reference: Transmission losses of the respective types of doors at 500Hz shall be as given in Table 7-15-3.

Table 7-15-3 Transmission Losses

Type	Transmission Loss Directly with the Steel Door	Total Transmission Loss
Type A	Over 50dB	Over 40dB
Type C	Over 35dB	Over 30dB
Type D	Over 25dB	Over 22dB

b) Shape construction and dimensions

The shape construction and dimensions of doors shall be as indicated in design drawings. Height and width shall be as indicated in drawings. Dimensions not indicated in design drawings shall be determined and entered by the manufacturer. Doors with effective heights of less than 2500mm shall be classified as regular type doors and those with effective heights exceeding 2500mm large type doors.

c) Locations and method of mounting

Steel and aluminum doors shall be used in TV studios, dubbing studio and control rooms. The method of mounting and the loca-

Table 7-15-4 Methods of Door Mounting

Door Type	Installation Location	Mounting Method
Type A	Between dubbing studio and subcontrol room	The door frame shall be mounted on floating construction.

(Continued)

Door Type	Installation Location	Mounting Method
Type C	Between TV studio and sound lock Between subcontrol room of dubbing studio and master control room Between subcontrol room and sound lock	The door frame shall be mounted on concrete structure.
Type D	Between master control room and maintenance room Between master control room and corridor Between sound lock and corridor	The door frame shall be mounted on concrete structure

2) Observation window

a) Types and performance

Types B and C specified in Table 7-15-5 shall be used.

Reference: The transmission losses of the respective types at 500Hz shall be as given in Table 7-15-5.

Table 7-15-5 Transmission Losses

Type	Thickness of the Glass Plates Combined	No. of Floating Construction	Transmission Loss
Type B	3 plates, 10mm, 5mm and 8mm	1	Over 50dB
Type C	2 plates, 10mm and 8mm	None	Over 35dB

b) Shape construction and dimensions

The shape construction and dimensions of doors shall be as indicated in design drawings. Height and width shall be as indicated in drawings. Dimensions not indicated in design drawings shall be determined and entered by the manufacturer.

c) Locations and method of mounting

The locations and the methods of mounting of the respective types shall in principle be as given in Table 7-15-6.

Table 7-15-6 Methods of Mounting

Type	Installation Location	Mounting Method
Type B	Between dubbing studio and master/subcontrol rooms	The window shall be mounted on the floating construction on the studio side.
Type C	Between TV studio and subcontrol room	The window shall be mounted on the concrete structure.

(2) Materials steel

1) Stainless steel shall meet the requirements of JIS G 4305
Stainless shall meet the requirements of JIS G 4305
(cold rolled stainless steel sheet No.27).

2) Steel

Shape steel and bar steel shall meet the requirements of JIS G 3101 (rolled steel materials for general structures) and steel sheets shall be the first class finished steel sheets meeting the requirements of JIS G 3131. These materials shall not involve strain, flaw, and rust.

3) Aluminum materials

Shall meet the requirement of JIS H 4100 (aluminum and aluminum alloy press-out materials).

4) Airtightening material

The airtightening material to be furnished around door frames shall consist of vinyl chloride high polymer molded type material and sponge rubber filler. H type rubber for mounting the panel boards of doors and observation window glasses shall be of a molded material produced by mixing vinyl chloride and nitrile rubber, and have JIS hardness of 65°. The airtightening material to be furnished at door lower rails and the insulating material on connections of observation window frames shall both be of molded type with pressed-attached portions being sufficiently soft and flexible.

The shapes and dimensions of the above-mentioned airtightening material shall be as shown in design drawings.

5) Glass wool filler

Shall meet the requirements of JIS A 6306 and 1967 (sound absorbing glass wool board No.2, 2K).

6) Polyurethane form

Hard polyurethane form (liquid) shall be poured into the inside of the door frame at a fitting manufacturing factory shall be inserted. When the polyurethane sets after being formed, the density shall be more than $0.03\text{g}/\text{cm}^3$.

7) Screws and bolts

Stainless steel Phillips head (+) screws shall be used for exposed screws and galvanized steel Phillips head (+) or slotted (-) screws shall be used for hidden screws.

(3) Fabrication

1) Approval of drawings

The manufacturer shall prepare manufacturing drawings on the basis of architectural design drawings in consideration of well-balanced fixing and shall commence fabrication after obtaining the

approval of the Engineer.

2) Method

a) Dimensional accuracy

Height, width, and diagonal dimension tolerance shall be as given in Table 7-15-7. Twist and bend of doors and frame shall not exceed 1mm.

Table 7-15-7 Dimensional Tolerance

Fittings	Height	Width	Diagnal Length
Steel and Aluminum door	Below 2mm	Below 2mm	Below 3mm
Observation window	Below 2mm	Below 2mm	Below 3mm

b) Fabrication

Shape steel and steel plates and sheets shall be cut accurately to size by a cutter, processed accurately by a miller, press, boring machine, etc., and corrected elaborately not to cause burrs or the like.

Important portions such as frame ends, rail and stile ends shall all be welded, and other portions shall be fabricated by using screws, rivets, or welding depending on the shape and construction, but all portions shall be assembled elaborately to size and solid. Inert gas welding shall be used from the back side not to influence exposed portions. When jointing with screws, adhesives and steel doubling plates with sufficient thickness shall be used not to cause screws loose.

c) Surface treatment

For rust-proofing of steel fittings, apply phosphate film treatment and then apply primer as set out in Paragraph 13 "PAINTING."

After galvanization, 2 coats of primer shall be applied by spraying.

Damaged rust-proofed portions if caused during the fabrication shall be corrected. Stainless steel to be used for door sills shall be finished by hair line finish. Aluminum surfaces shall be coated by such an anode oxide film of 9 microns thick that is stipulated in JIS H 8601 and then coated by a synthetic resin paint.

d) Assembly and adjustment

After completion of the fabrication of sub door frame, door frames, and doors, fit required hardware and attachments and assemble the doors and others. After assembling the doors and others, set and install them to their positions and adjust hinges and fastenings so that door shall operate securely and smoothly, that airtightening material shall be compressed uniformly, and that the clearance allowance between doors and door frames shall become within $\pm 0.5\text{mm}$. For type B windows, assemble both frames and adjust respective portions.

3) Shop inspection

After completion of products, all products shall be inspected for construction, shape, dimensions, operating conditions, etc., on the basis of specifications and drawings on the responsibility of the manufacturer. Specifically inspect to check whether airtightening materials are compressed as required or not. Inspection tables shall be prepared on which shop inspected items shall be stated. Defects found by inspection shall be corrected promptly and the results of correction thus made shall be written on the inspection tables and submitted to the Engineer.

4) Mounting

a) General

Upon mounting, use reinforcing materials when necessary for

preventing deformation or damage by externally applied force.

b) Mounting of sub door frame

When sub door frames are to be mounted either on a floating construction or on concrete structure, first determine mounting positions of sub door frames adjusting for level and verticality, fix sub door frames to the wood structure by means of bolts or to the concrete structure by welding anchors to reinforcing bars. Damaged rust-proofed portions caused during the work shall be corrected promptly.

c) Mounting of door frames and casings

When the interior finishing work is progressed and the fear of damaging or spoiling the frames is lessened, mount door frames and casings accurately in place through adjustment if necessary with reference to the sub door frames. In mounting door frames, the horizontal and vertical tolerances shall be less than 1/2000.

Mortar or pea gravel concrete shall be placed or glass wool or rock wool shall be applied securely around door frames, sub door frames, and casings, as indicated in drawings or under instructions from the Engineer. If necessary, apply caulking material so that sound shall not leak through door frames, etc. After completion of work, inspection of the Engineer shall be performed. Succeeding interior finish work shall not be progressed prior to this inspection.

d) Mounting of doors

When the interior finish work is nearly complete and there is no fear of damaging or spoiling doors, set doors to door frames, and adjust so that the airtightening material is compressed with the door surfaces securely and uniformly and that the clearance allowance between door frames and doors shall be within -0.5mm to +2.5mm. Take due care so that sound shall not leak around doors. Promptly mount door stays and door

stops as required, and adjust them as in the above-mentioned item on assembly and adjustment.

Door stays and stops shall be mounted to the required positions both up and down, and shall be adjusted elaborately so that the door surface shall contact with both upper and lower stops at a time.

e) Mounting of window frames

When the structural wall work is over but before the interior work is commenced, set window frames on the concrete structure side in place, level and plumb, and weld anchors of window frames on the concrete structure side to reinforcing bars to fix the window frames securely. Window frames on the floating construction side shall be supported by temporary supports.

Damaged rust proofed portions caused during the work shall be corrected promptly. Apply mortar around window frames and, if necessary, apply caulking material sufficiently so that sound shall not leak around the frames, as indicated in drawings or under instructions from the Engineer.

When the work is complete, it shall be inspected by the Engineer.

Interior finish work shall not be progressed prior to this inspection.

As the interior finish work is progressed, fix window frames on the floating construction firmly to frame works of the floating construction. For joints of interior sound insulation layer and frames, apply caulking material and glass wool sufficiently so that sound shall not leak through the joints. After the work is over, it shall be inspected by the Engineer.

f) Painting

Steel and wood portions shall be painted after the installation of fittings as indicated in drawings or under instructions from the Engineer. In painting, sufficiently cure so that the paint will not attach to the airtightening material. Paint if attached on hardware or other portions shall be cleaned off.

g) Fitting of panes

For glazing, use panes of polished glass with the required thickness. Cut and shape the pane accurately in consideration of the dimensions of the part of the pane to be set in H type rubber. The pane shall be fitted when the studio is dried up and there is no fear of breaking the pane. Prior to fitting, the inside of the frame and the pane shall be cleaned sufficiently. Fit the pane so that the joint of the H type rubber shall come at the center of the upper portion of the frame and the wedge rubber at the center of the lower portion of the frame. The wedge rubber fitting side shall be as shown in drawings.

h) Cleaning and curing

After completion of fitting, clean up the fitting, hardware, and attachments and cure with laminate paper or polyethylene sheet so as to prevent damage or soiling during the work to follow.

i)

Tools for roller strike (2 hexagon screwdrivers) and spacers for roller strike shall be submitted as spares.

(4) Curing

For those items to be disassembled upon transportation, each disassembled portion shall have a description of identification number and where to use. Hardware shall not be disassembled. In order to prevent deformation, damage, and soiling from occurring during transportation or storage in the construction field, products shall be cured by means of laminate paper or polyethylene sheet, packed in corrugated cardboard or wood boxes, and reinforced or supported by proper reinforcing or supporting material.

(5) Studio fittings hardware and accessories

1) Materials and surface treatment

All hardware shall be made of brass and plated with dull chrome to a thickness of more than 20 microns.

2) Hinges

Type A door shall be furnished with pivot hinges and Type C and D doors with butts. On each door, both upper and lower hinges shall be fixed on the door frame so that the door can readily be dismantled from the frame.

3) Door locks

For Type A, C, and D doors, roller type door locks shall be used. For large steel doors, handle-driver, double-step door locks shall be used. The shape, construction, and dimensions of these door locks shall be as indicated in design drawings. These door locks shall have such mechanism that the airtightening material may be compressed uniformly and securely when these door locks are operated and that sound caused through the door locks in use is minimum.

4) Door stays and door stops

All doors shall be furnished door stays and stops. The shape and dimensions of door stays and stops shall be those suitable for the weight of the door. Samples of the door stays and stops to be used shall be submitted to the Engineer for approval. In principle, door stays and stops shall be provided at two locations, up and down, on the wall. The locations of the door stays and stops shall be determined through consultation with the Engineer.

5) Flush bolts

Flush bolts shall be fitted on double swinging doors. Flush bolts shall be of flush mount type. The shape, construction, and dimensions of flush bolts shall be as indicated in design drawings. All flush bolts to be employed shall be suitable for the weight and dimensions of the door and shall have such construction that airtightening material

may be compressed securely and uniformly.

7-15-5 Insulation

In the interior finish of floating construction, such frames and casings as indicated in drawings shall be proofed against vibration and insulated. Soft sponge rubber packing material covered with neoplane film shall be fitted to these portions indicated in drawings. The packing material to be used shall be such that has been approved by the Engineer. Packing shall be fitted so that it will be compressed by more than 1mm to assure complete airtightness.

7-15-6 Noise Proofing

Wiring ducts to be laid between each studio and neighbouring rooms are apt to cause leakage of sound, so that glass wool shall be applied from both sides through inspection, after completion of related work.

7-15-7 Acoustic Inspection

Acoustic inspection shall be performed among a series of inspection upon completion of work. The contractor shall make cooperation for measurement.

1) Purpose

This inspection is intended to determine whether the work is good or not from the acoustic standpoint.

2) Items of acoustic measurement

- a) Reverberant characteristics
- b) Sound proofing characteristics
- c) Noise sound pressure spectrum
- d) Noise level

3) Repair and modification for achieving specified acoustic effects

When, as a result of the inspection, a discrepancy is observed in acoustic condition, the Engineer will examine the cause through cooperation of the contractor. When the cause of the discrepancy is ascribable to a defect in the work, the contractor shall promptly correct it under instructions of the Engineer. When the discrepancy is ascribable to any other cause than the above-mentioned cause, obey instructions from the Engineer.