

2-14 STUDIO INTERIOR WORK

2-14-1 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 sound programme production and broadcasting, the work shall be accomplished with thorough understanding and utmost care to meet the requirements.

(1) Radio Studios

Radio studios are intended for music-studio, production studio, announce-studio and talk-studio. The floor, ceiling, and four walls of the studios 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.

(2) Subcontrol and sound lock rooms

Each sound 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.

(3) 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.

2-14-2 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 20 mm 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, shape and strength 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 2-14-1 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 Nepal referring to these examples.

Table 2-14-1 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)

(Continued)

Framework Member	Kind of Joints and Connection	Description	Attached Drawing No.
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)
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)

(Continued)

Framework Member	Kind of Joints and Connection	Description	Attached Drawing No.
Floor joist	Joint	<p>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.</p> <p>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.</p>	(6)
	Connection	<p>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.</p>	(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)

(Continued)

Framework Member	Kind of Joints and Connection	Description	Attached Drawing No.
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)
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)

(Continued)

Framework Member	Kind of Joints and Connection	Description	Attached Drawing No.
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.	

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

- 1) 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.

- 2) Synthetic Resin Emulsion Paint (A-EMP)

For finishing, A-EMP specified by the Engineer shall be applied on Japanese linden plywoods planked after filling. Under coat shall be applied on the boards prior to laying them.

Both under and top coats shall be applied not to stop up the holes.

- 3) Clear Lacquer (C.L.)

Top coat on lauan plywoods shall be C.L.

Under coat and filling shall be applied on the boards

prior to planking them.

After planking, finish coat shall be applied thoroughly based on the specifications in the paragraph "2-12".

4) Cloth Hanging Work

Cloth shown in drawings shall be hessian cloth.

The color of it shall be as designated by the Engineer.

The cloths shall be hanged on lauan plywoods at places shown in the relevant drawings and due care shall be taken that they will be finished smooth.

(8) Carpet

Carpet to be used for this work shall be made in Nepal. The contractor shall submit samples showing quality and color, etc., to the Engineer for approval.

The thickness of carpet shall be about 8mm, and that of jute felt for under lining 7mm.

For sheeting accessories, the dimensions of a gripper shall be fit for the thickness of jute felt and brass or stainless nails shall be used.

The felt shall be sheeted with butt joints using nails or paste at necessary spots. An adhesive material will be permitted to be used at the edge of felt.

The carpet shall be sheeted evenly by gripper method without gap. The grippers at edges shall be fixed by nails or adhesive materials.

The carpet shall be sheeted using an expander with 20 kg of tension per 300mm of width. Joints of the carpet shall be made by hand-sewing using firm cotton or flax yarn.

(9) 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.

(10) 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 exercised not to lay film tensed.

2-14-3 Studio fittings installation work

(1) General

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

1) Aluminum doors

a) Types and performance

Two types: C and D

Reference: Transmission losses of the respective types of doors at 500Hz shall be as given in Table 2-14-2.

Table 2-14-2 Transmission Losses

Type	Transmission Loss Directly with the Aluminum Door	Total Transmission Loss
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.

c) Locations and method of mounting

Aluminum doors shall be used in sound studios and control rooms. The method of mounting and the locations of the respective types shall in principle be as given in Table 2-14-3.

Table 2-14-3 Methods of Door Mounting

Door Type	Installation Location	Mounting Method
Type C	Between studios (music, production, talk, announce) and sound lock. Between music studio and storage (1)	The door frame shall be mounted on floating structure
Type D	Between master control room and sound lock. Between sub-control room and sound lock. Between sound lock and corridor. Between corridor and storage (1)	The door shall be mounted on concrete structure
	Between music studio and musical instrument room.	The door shall be mounted on floating structure

2) Observation window

a) Types and performance

Types B specified in Table 2-14-4 shall be used.

Reference: The transmission losses of the respective types at 500 Hz shall be as given in Table 12-14-4.

Table 2-14-4 Transmission Losses

Type	Thickness of the Glass Plates Combined	No. of Floating Construction	Transmission Loss
Type B	3 plates, 10mm, 5mm and 8mm	6	Over 50dB

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.

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 2-14-5.

Table 2-14-5 Methods of Mounting

Type	Installation Location	Mounting Method
Type B	Between studios (music production, talk) and sub-control rooms. Between announce studio and master control room.	The window shall be mounted on the floating construction on the studio side.

(2) Materials steel

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

2) Steel materials

Shape steel and bar steel shall meet the requirements of JIS G 3101 (Rolled steel materials for general structures) and steel sheet shall meet the requirements of JIS G 3131 (Hot-rolled mild steel plates, sheets and strip) or JIS G 3141 (Cold-rolled carbon steel sheets and strip).

3) Aluminum materials

Aluminum press-out materials shall meet the requirements of JIS H 4100 (Aluminum and aluminum press-out materials, A 6063 S-T5 or A6063 SS-T5) and aluminum sheets shall meet the requirements of JIS H 4000 (Aluminum and aluminum alloy sheet and wires, A1100P-H 14).

4) Airtightening materials

The airtightening material to be furnished around door frames shall consist of vinyl chloride high polymer molded type material and foamed polyurethane rubber filler as indicated in the basic drawings.

H type rubber for mounting the panel boards of doors and observation window panes shall be of a molded material made of neoprene, and have JIS hardness of 65°

The airtightening materials to be furnished at a door lower rail and around a door shall both be of the same molded type with pressed-attached portions being sufficiently soft and flexible.

Packing materials to be used around a frame and a casing, etc., for vibration proof and insulation shall all be sponge rubbers covered with neoprene film. Both shape and size of the airtightening materials said above shall be as shown in the basic drawings.

5) Honey comb core

The paper honey comb core containing resin shall be used for the work cell size: 12mm, resin content: 10%, compressive strength: more than 3 kg/cm².

6) Glass wool filler

Shall meet the requirements of JIS A 6306 (1976) (sound absorbing glass wool felt No.2, 24K).

7) Polyurethane foam

Hard polyurethane foam (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 0.03g/cm³.

8) 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. Bolts shall be of galvanized steel and hexagonal head bolts.

(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

Dimensional accuracy of aluminum press-out materials shall keep the minimum value specified in JIS H 4100 S (Dimensional tolerance of press-out materials) and thickness of main parts shall be more than 2.5mm.

Dimensional tolerance of other members shall also follow above.

For height, width and diagonal length of fittings, dimensional tolerance shall be as given in Table 2-14-6.

Twist and bend of door and frame shall not exceed 1mm.

Table 2-14-6 Dimensional Tolerance

Fittings	Height	Width	Diagonal Length
Aluminum door	Below 1mm	Below 1mm	Below 1.5mm
Observation window	Below 2mm	Below 2mm	Below 3mm

b) Fabrication

Spare 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, steel doubling plates with sufficient thickness shall be used not to cause screws loose.

c) Panel fixing

For fixing of the panel with honey comb core, synthetic resin adhesive agent shall be applied. Under proper pressure, the panel shall be fixed firmly by both sides fixing method, using enough quantity of the agent to form fillet fully between core and aluminum sheet. And the panel shall be cured during proper period. For fixing of the panel board, synthetic resin adhesive agent shall be applied. Under proper pressure, the panel board shall be fixed firmly by both sides fixing method. After that, it shall be cured during proper period.

d) Surface treatment

Aluminum surface shall be treated as specified in JIS H 8601 (Sulphuric acid anodic oxidation coatings on aluminum and aluminum alloys) after removing an oxide film by sufficient removal of oiliness.

The oxide film shall meet the requirements of JIS H 8601 (over 9.L2)

Coating shall be made with synthetic resin clear lacquer of more than 7 microns thick. After that, the materials shall be dried by low or high temperature heating.

Stainless steel to be used for door sills shall be finished by hair line finish.

e) 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 door-check 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) Inspection by the Engineer

After the shop inspection, all products shall be inspected in the presence of the Engineer. The way of inspection shall be as indicated by the Engineer. For all types of products, every one set at least shall be inspected under temporary mounting condition.

The shop inspection table shall be also checked by the Engineer. Defects and items indicated by the Engineer shall be corrected promptly, and the results of correction thus made shall be reported to the Engineer for approval. If necessary, sound insulation test shall be conducted.

5) Mounting

a) General

Mounting work shall be done on the responsibility of the fittings manufacturer.

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 air-tightening 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 or concrete contained pebble 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

The pane shall be fitted when there is no fear of breaking the pane. Prior to fitting, the inside of the frame and the pane shall be cleaned sufficiently. H type rubber shall be used so that wedge rubbers for outer panes face a control room and a studio and that for inner pane faces a studio.

Care shall be taken not to put in H type rubber tensed.

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 and installation, 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 and installation 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 C and D doors shall be furnished 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 C and D doors, roller type 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) Door check

All doors shall be furnished with door checks.

2-14-4 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 neoprene 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.

2-14-5 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.

2-14-6 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.

2-15 EXTERIOR CONSTRUCTION WORK

The exterior construction works, such as preliminary leveling of site, and fences, gate house, staff-quarters, road, etc., shown in the site plan are separated from the works covered by Japanese side.

2-16 TOWER WORK

2-16-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of the fabrication and erection of all steel pole foundations, anchors, etc., and related items of work necessary to complete the work indicated in drawings and described in specifications.

(2) Items to be approved by the Engineer

The contractor shall in advance submit instruction manuals for fabrication, work plan, construction schedule, etc., to the Engineer for approval. The contractor shall also submit the historical record or, scale, of shop facilities of shop or shops, etc., of the manufacturer or manufacturers to the Engineer for approval.

2-16-2 Materials and Parts

(1) Specifications of materials

Unless specifically noted, materials shall be those that meet the requirement of JIS standards given in Table 2-16-1. The types of materials to be selected shall be as shown in design drawings.

Table 2-16-1 Standards of Quality of Materials

Material	Standards
Section steel, steel plate and steel bar	SS41 and SS55, prescribed in JIS G 3101 (Rolled Steel for General Structure) SM41A and SM50B, prescribed in JIS G 3106 (Rolled Steel for Welded Structure)
Steel pipe	STK41, prescribed in JIS G 3444 (Carbon Steel Tubes for General Structural Purposes) SGP, Black pipe, prescribed in JIS G 3452 (Carbon Steel Pipes for Ordinary Piping)
Light gauge steel	SSC41, prescribed in JIS G 3350 (Light Gauge for General Structure)
Expanded metal	XG, prescribed in JIS G 3351 (Expanded Metal)
Malleable steel	SF45 and SF50, prescribed in JIS G 3201 (Carbon Steel Forgings)
Cast steel	SC46, prescribed in JIS G 5101 (Carbon Steel Castings)
Locked coil rope	JSS10-1978 (Spiral-rope for structure)
Welding materials	JIS Z 3211 (Covered Electrodes for Mild Steel) JIS Z 3212 (Covered Electrodes for High Tensile Strength Steel) JIS Z 3311 (Steel Wires and Fluxes for Submerged Arc Welding) <u>Note:</u> The type of welding rod to be used shall be approved by the Engineer in advance.

* JSSC: Society of Steel Construction of Japan

(2) Shapes and dimensions of materials

All materials shall have proper shapes, good quality, have no harmful flaws, cracks or extreme rust, have smooth surfaces, and meet the requirements given in Table 2-16-2.

Table 2-16-2 Standards of Dimensions

Material	Standards
Steel bar	JIS G 3191 (Dimension, Weight and Permissible Variations of Hot Rolled Steel Bars and Bar in Coil)
Section steel	JIS G 3192 (Dimension, Weight and Permissible Variations of Hot Rolled Steel Sections)
Steel plate and steel strip	JIS G 3193 (Dimension, Weight and Permissible Variations of Hot Rolled Plates, Sheets and Strip)
Flat steel	JIS G 3194 (Dimension, Weight and Permissible Variation of Hot Rolled Steel Flats)

Materials not specified in Table 2-16-1 shall conform to relevant JIS standards.

(3) Material test

- 1) For steel materials, test pieces shall be sampled for every 10 tons and its fractions for each shape and dimension. Those steel materials that are to be used but not to construct main structure may be dispensed with this test with the Engineer's approval.
- 2) Specimens shall be sampled in the presence of the Engineer. Test shall be conducted by a test organization approved by the Engineer and the results of test

shall be submitted to the Engineer for judgement.

When test can be performed at the shop, specimens may be tested at the shop with the approval of and in the presence of the Engineer.

- 3) Specimens shall be manufactured as per JIS G 0303 (Test specifications of steel materials), JIS Z 2201 (Metal material tension test pieces), and JIS Z 2204 (Metal material Bending test piece).
- 4) Test items and test methods shall be as given in Table 2-16-3.

Table 2-16-3 Items and Methods for Testing Materials

Material	Items and Methods for Tests
Steel plate and Section steel	Tension test (JIS Z 2241) ° Bending test (JIS Z 2248)
Steel pipe	do. ° Bending or flattening test (JIS Z 3444)
Gas pipe	do. ° do.
Malleable steel	do. ° Bending test (JIS Z 2248)
Cast steel	do. ° do.
Locked coil rope	JSS 11-1978
Welding rod	JIS Z 3211

- 5) Those standardized products which are furnished with certificates for compliance to the relevant standards and of which quality can be warranted sufficiently may dispense with material test with Engineer's approval.

(4) Component parts (bolts, nuts, and washers)

1) Materials

Unless otherwise specified, the quality of materials shall be as given in Table 2-16-4.

Table 2-16-4 Standards of Quality of Materials

Material	Standard
Bolt and nut	SS41B-D, prescribed in JIS G 3123 (Cold Finished Carbon Steel Bars)
Spring washer	SWRH72B, prescribed in JIS G 3506 (High Carbon Steel Wire Rods)
Plain washer	SS41, prescribed in JIS G 3101 (Rolled Steel for General Structure)

2) Shape, dimensions, specifications and mechanical properties

a) Shape, dimensions, and specifications of bolts, nuts, and washers shall be as given in Table 2-16-5 unless otherwise stated. Bolts shall be average finished products with regular, hexagon, forged heads. Nuts shall be hexagon forged nuts with a height equal to the bolt diameter.

Table 2-16-5 Standards of Dimensions of Bolts, Nuts and Washers

Material	Standards
Bolt	JIS B 1180 (Hexagon Head Bolts) The grade of finish: average. The precision of screw: grade 2
Nut	JIS B 1181 (Hexagon Nuts). The grade of finish: average The precision of screw: grade 2
Screw	JIS B 0205 (Metric Coarse Screw Threads). The precision shall be equivalent to grade 2, prescribed in JIS B 0209 (Limits of Sizes and Tolerances for Metric Coarse Screw Threads) and the screw shall be able to be driven easily by fingers.
Spring washer	No.2, prescribed in JIS B 1251 (Spring Lock Washers)
Plain washer	Cold finished, round washer, prescribed in JIS B 1256 (Plain Washers). Dimensions shall be those shown on the drawings.

- b) In principle, threading on bolts shall be made mainly before plating and slightly after plating. Threading of nuts shall be performed after plating.
 - c) Bolts and nuts shall have interchangeability among those with identical diameters.
 - d) Unless otherwise specified, the bolt length is equal to the bolting length (the entire thickness of the material to be coupled) plus the applicable value given in Table 2-16-6.
- As less kinds of bolt length as practicable shall be employed.

Table 2-16-6 Bolt Length

Nominal Diameter of Bolt	Length to Be added to Bolting Length (mm)
M16	26 ~ 30
M20	33 ~ 42
M22	35 ~ 44
M24	37 ~ 46

e) The effective thread length shall be equal to the bolt length subtracted by the bolting length and the washer thickness, as standard.

f) Sockets, turnbuckles, pins, pinplates, etc., shall be as indicated in design drawings.

3) The abbreviation or symbol of the manufacturer of the bolt shall be embossed or carved on the top of the bolt head.

(5) Split pins

Unless otherwise, split pins shall meet the requirements of JIS B 1351 (split pins) and shall be galvanized.

1) Unless otherwise, split pins shall be Class 1 or Class 2 specified in JIS H 3521 (brass wires).

2) Shape and dimensions

Shall meet the requirements of relevant JIS standards. Suitable sizes shall be selected for corresponding bolt diameters, unless specifically noted.

3) Testing

Appearance inspection and bending test as per the relevant JIS standard shall be performed.

2-16-3 Work

(1) Manufacture drawings

Manufacture drawings shall be prepared in consideration

of connections between sections and others on the basis of design drawings and submitted to the Engineer for approval.

(2) Full-size drawings

- 1) Prepare full-size drawings from manufacture drawings and, when necessary, make templates and/or scales and submit them to the Engineer for inspection. However, when the Engineer approves that it is not necessary to provide full-size drawings, they need not necessarily be prepared.
- 2) For scale tape to be used for the preparation of full-size drawings and fabrication, JIS Class 1 tape shall be used and, when necessary, by applying a proper tension specified. Scale tape for full-size drawings and scale tape for use in the field shall be checked for discrepancy.

(3) Identification of steel materials

When steel materials with different qualities are used together, colour identification or other proper means of identification shall be employed for easy identification of different steel materials.

(4) Marking-off

- 1) Marking-off shall be made accurately and elaborately. Necessary items shall be laid out as required from design drawings, manufacture drawings, or full-size template or scales.
- 2) When marking off of high-strength steel, no chisel shall be used in principle.
- 3) When marking off upon bending, the external surface to be bent shall not be notched by a punch or chisel.

(5) Cutting

- 1) For cutting materials, ensure to keep accurate

perpendicularity, included angle, and straight forwardness as required and the roughness of the section obtained by cutting shall meet the requirements of surface roughness 50S of JIS B 0601.

- 2) For gas cutting, use an automatic gas cutter. In an avoidable case, a hand gas cutter may be employed with Engineer's approval. When the cutting edge is not normal, finish it smooth by a grinder.
 - 3) Steel plates of less than 6mm thick and angle steel may be cut by a cutter.
 - 4) Members (materials) to be welded shall be cut by an automatic gas cutter or a saw, into dimensions determined in consideration of shrink and deformation to be caused by welding.
- (6) Punching
- 1) Holes shall be so bored that their centers coincide when members are combined. Where particularly high accuracy is required, holes shall be made after temporary assembling.
 - 2) Holes shall be bored by a drill or by a combination of a sub punch and a reamer. When the thickness of the material piece is less than 6mm, holes may be bored by a punch to finishing dimensions.
 - 3) The hole diameter shall be slightly larger than the bolt diameter: It shall be 1.0mm larger in the case of holes of less than 16mm and 1.5mm larger in the case of holes of 20 ~ 24mm in diameter, at standard. Anchor bolt holes shall be as shown in design drawings.
 - 4) Burr and strain around bolt holes shall be removed.
- (7) Correction of strain
- 1) Strain on materials shall be corrected.

- 2) Strain caused upon cutting shall be corrected.
- 3) Strain produced upon welding, heating or others shall be corrected to meet the purpose.
- 4) Correction of strain by heating shall be performed at such temperature that shall not damage the material.
- 5) Steel materials caused pronounced distortion shall not be used.

(8) Processing by bending

Steel materials requiring processing by bending shall be bent at room temperature in principle. However, materials to be bent with small curvatures may be processed heated.

(9) Processing by planing

- 1) Surfaces which receive pressure, such as post joint, shall be plane-finished to have a metal touch.
- 2) When specifically indicated in drawings, metal fittings, parts, etc., shall be plane-finished as specified.

(10) Finish

- 1) Metal fittings, parts, etc., shall be finished as required for their purposes.
- 2) Welded portions having irregular shapes shall be finished adequately.

(11) Partial assembly

- 1) When necessary materials are arranged, partially assemble them as required and effect hole alignment or temporary fastening for welding.
- 2) When it is complicated or difficult to combine material by partial assembly before welding, assemble them by using jigs for assembly and fixing. Sufficient adjustment shall be effected in assembly dimensions, angles, and twist prior to the commencement of welding.

(12) Temporary assembly

- 1) When the arrangement of component materials is complete, temporarily assemble the whole construction. Check and adjust overall dimensions, bending, twist, straight-forwardness, etc.
- 2) During temporary assembly, check the connection of all component materials and hole alignment on materials to be connected and correct when necessary.
- 3) Galvanized materials shall in principle be assembled temporarily after galvanization and removing strain.

(13) Cast steel

- 1) Casting shall be performed at shop so as to produce complete products through thorough examination of cast form, method, etc.
- 2) Cast steel shall be free from casting fin, flaws, and other defects. Light defects may be corrected by welding with Engineer's approval. After correction proper heat treatment shall be effected.
- 3) For cast steel, finish forging materials and removal of strain shall in principle be effected by heat treatment and other methods. For those cast steel for which high accuracy is not required, finish forging and removal of strain may be dispensed with by obtaining the Engineer's approval.
- 4) Finish of cast steel shall in principle be performed after heat treatment.

(14) Forged steel

- 1) Forging shall be effected so as to achieve complete products through thorough examination of the method of forging and others.
- 2) The forging ratio of forged steel shall in principle meet the requirements of JIS.

- 3) Forged steel shall in principle be heat treated.
- 4) The dimensions, shapes, etc., of forged steel shall be as indicated in design drawings.

(15) Guy-wire fittings

- 1) Guy-wire fittings shall in principle have rounded corners.
- 2) Split pins to be used for guy-wire fittings shall be made of brass.

(16) Base fittings

- 1) Supporting portions of base fittings shall be such that achieve their purposes sufficiently.
- 2) Accessories and attachments shall be such that achieve their purposes sufficiently.

(17) Mounting of bowl-type lead-in insulators

Insulators above are specified in the relevant drawings. Upon mounting of the insulators, complete waterproof treatment around the base plate shall be made and a corona ring and metal portions of the plate shall be earthed perfectly.

Due care shall be taken for handling of the insulators.

2-16-4 Welding

(1) General

- 1) Welding shall be performed completely and as required.
- 2) Welding of major portions of structures shall be made by manual arc welding. When employing automatic welding or other means of welding, the contractor shall receive the approval of the Engineer.
- 3) Welding work shall be planned so that flat welding shall be achieved as much as practicable and that strain and contraction stress to be caused by welding shall be minimized.

(2) Welders

1) Welders for manual welding shall have qualifications specified separately among JIS Z 3801 (test method and judgement criteria for welding technique qualifications), have experience of being engaged in welding of structures for more than 6 months, and have passed additional tests specified separately for respective items of welding.

However, additional tests shall not be performed unless particularly specified.

2) Welders to be engaged in welding shall in advance submit their photographs, a copy of certificate for their qualifications, and personnel history to the Engineer for approval, and shall identify themselves as authorized welders by armbands or a like.

3) When there is a doubt in working attitude or workmanship of welding of a welder who has already approved by the Engineer, the welder may be retested or disqualified.

4) When so directed by the Engineer, the welder shall enter by painting his name or symbol on portions welded by him.

(3) Welding rods (electrodes)

1) Welding rods shall meet the requirements of JIS Z 3211 (coated electrodes for mild steel) and JIS Z 3212 (coated electrodes for high strength steel) and shall be suitable for the types, dimensions, and welding conditions of base metals.

2) Welding rods shall be handled elaborately. Welding rods with removed, spoiled, or deteriorated coating shall not be used.

- 3) Welding rods shall be stored not to absorb moisture. When there is a fear of absorbing moisture use them after drying them up sufficiently with a drying furnace.
- (4) Assembly of material (member) pieces
 - 1) Assembly of material pieces shall be made accurately by using proper jigs and others. For filled welding, material pieces shall be jointed as firmly as practicable. In butt welding, the shape of groove shall strictly meet design drawings and assembly shall be made not to cause discrepancy in groove angle, interval, and member pieces. When errors caused in assembly can not be corrected, instructions from the Engineer shall be received.
 - 2) In assembly, counter-strain or proper constraint method shall be adopted in order to minimize constraint for deformation to be presumed on the basis of the structure, welding type and welding procedure and produce structure with accurate form after completion of welding.
 - 3) Proper temporary fastening or temporary welding shall be effected in order to maintain members securely and not to give excessive constraint. Temporary welding shall be limited to minimum. When temporary welding becomes part of the final welding, the welding shall be performed without any fault.
- (5) Welding machine and tools
 - 1) Welding machine to be used shall have a construction and functions suitable for the materials, dimensions, and joint shapes of materials to be welded and shall allow stable welding performance. When current can not be adjusted easily near the welding position, the welding machine shall be furnished with a remote control equipment.

2) Jigs to be used for welding shall have ample performance and meet the requirements of the relevant JIS standards.

(6) Cleaning of base metals

Prior to welding, clean the surface of the base metal to be welded by elaborately removing slug, water, rubbish, oil, paint, and other foreign matter on the surface.

(7) Welding operation

1) Welding shall be performed with proper current and voltage depending on the type and thickness of the welding rod and working attitude. In the case of using a DC welder, the performance characteristics of the welder should also be considered depending on to the type of the welding rod and other conditions.

2) The methods and procedure of welding shall be so selected as to minimize strain and residual stress. The welding rod shall be held to keep a proper arc length and angle, maintain sufficient penetration through adequate weaving, and prevent the mixture of blowholes and slag, undercut, unevenness in leg length, overlap, and other defects. The width of weaving shall be less than 3 times as large as the diameter of the welding rod.

3) Welded surfaces shall be as much smooth and correctly waved. Welding shall in no case undersize the design dimensions. A slight oversizing of design dimensions may be allowed. Excessive overwelding or pronounced irregularities on surfaces shall not be allowed.

4) When the steel material to be welded is large in carbon equivalent and in plate thickness, the workability of welding shall be improved by selecting adequate welding rod and adding pre-heating and post-heating.

5) Butt welding

- a) Unless specifically noted, butt welding shall be made with minimum reinforcement. The thickness of reinforcement shall not exceed 3mm.
 - b) When welding is to be made from both sides, perform first back chipping and then back run. Back chipping shall be effected until the first layer on the surface shall be removed or a good welded metal portion shall appear. The thickness and width of back chipping shall be as much uniform as practicable.
 - c) When welding is not made on both sides, particularly confirm by applying a backing strip that the root portion is as required. When it is necessary to remove the backing strip, take due care not to damage the base metal and deposit material upon removing the backing strip. The welded portion shall form a slightly convex surface and provide a complete section.
 - d) When there is a difference in surface level between plates or materials to be welded by butt welding excluding butt welding of T type joints, weld metal shall be deposited so that a smooth run of deposit shall be formed from the low surface to the high surface. When the difference in level exceeds 3mm, the higher material shall be on a level at the groove portion with the lower material and, in addition, the surface shall be so formed as to provide a moderate slope of less than 1:5 in inclination.
- 6) In isosceles fillet welding, no remarkable difference shall be left between the two sides. When non-isosceles condition is indicated specifically, due care shall be taken to maintain the required dimensions and as much smooth surface of weld as possible. The length of intermittent weld shall be more than 2 times

as large as the effective dimension of the fillet.
The thickness of reinforcement in fillet weld shall be $0.1S + 1\text{mm}$ or less (S is the specified leg length).

- 7) When the welder is directed to make an important butt weld and fillet weld, deposit an end tab of the same shape as the joint at the both edges and, after completing welding on the weld line extended by more than 25mm at the respective edges, remove the reinforcing plate and finish the welded portion, unless it is approved to prevent the occurrence of defects at the edges of weld by using return or boxing weld on fillet weld joints.
- 8) When shutting off arc, sufficiently embed the end of weld with a sound deposited metal.
- 9) When replacing the electrode or welding next layer in multi-layer welding, completely remove slag and other obstacles which may prevent welding operation on the surface.
- 10) After completion of welding, insure to remove slag without fail.
- 11) When boring temporary bolt holes on members to be welded for assembly, the approval of the Engineer shall be obtained.

(8) Weather

When the surface of the base metal is wet because of rain, snow, etc., or when a high wind blows, welding shall not be performed, unless welders and welds are sufficiently protected and proper measures are taken for the base metal.

(9) Temperature

Welding shall not be performed at temperatures below 0°C . However, if the temperature is in a 0°C to -15°C range and the temperature of the base metal located within 100mm

from the welding start portion is maintained above 36°C by heating, welding may be performed.

(10) Disaster prevention

The welding facilities shall be free from hazard, such as electric leakage and electric shock, shall be provided with ample protective means against fall of weld metal and others and fire by arc, and shall prevent harm being given by arc light.

(11) Correction of faulty weld

- 1) Blow holes and porous portions, inclusion of slag, overlap, or ill-merged portions on welded joints, shall be chipped off by a chipping grinder or gas gauging not to damage other welded metal or base metals and then re-welded. When a weld metal involves a crack, re-weld over the whole welded metal. When the base metal involves a crack due to welding, consult with the Engineer to take a proper measure.
- 2) For undercut or insufficiency in the size of weld, add weld metal to obtain the required dimensions. The electrode to be used for correction of defects shall be one with a small diameter.

(12) Correction of members or materials

- 1) Strain caused by welding heat shall be corrected by a mechanical or heating method without damaging the property of the material, under instructions from the Engineer.
- 2) When a member or material is warped in shape or dimensions, correct elaborately it with approval of the Engineer. Materials with excessive warp shall be abandoned.

2-16-5 Rustproofing

(1) Galvanization (Shop plating)

1) Galvanization

Members and materials except portions to be embedded in concrete shall be hot-dip galvanized, unless otherwise specified.

2) The standard process and standards of galvanization are given in Table 2-16-7.

Table 2-16-7 Standard Process and Standards of Zinc Coating

Hot-dipped zinc coating	JIS H 0401 (Methods of Test for Zinc Coating (Hot-Dipped) on Iron or Steel) JIS H 8641 (Zinc Coating (Hot-Dipped) on Iron or Steel) JIS H 9124 (Standard Process of Zinc Coating (Hot-Dipped) on Iron or Steel)
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3) The standards of weight and uniformity of zinc in galvanization shall be as given in Table 2-16-8.

Table 2-16-8 Standards of Zinc Weight

Classification	Zinc Weight (g/sq.m)	Test by Sulfate of Copper
Section steel, steel plate, etc.	More than 550	More than 6 times
Bolt, etc.	More than 450	More than 5 times

4) Galvanized members and materials shall be corrected in strain and inspected in appearance for defects in quality. Defective members and materials shall be rejected.

5) Zinc weight and uniformity test shall be performed as per JIS H 0401 and the results of test shall be filed and submitted to the Engineer.

(2) Painting (to be worked in the field)

1) Types of painting

The types of painting to be accomplished in the construction field shall be as given in Table 2-16-9.

Table 2-16-9 Classification of Painting

Classification	Shop Treatment for Rustproof	Preparation of Surfaces for Painting	First Coat	Second Coat	Finish Coat
A	Zinc coating	Dust, dirt and oil shall be wiped off with benzine. Rust shall be removed.	Rubber chloride paint 1 coat (180g/sq.m)	The same as the left. (170g/sq.m)	The same as the left. (150g/sq.m)

Note: Values in brackets () are coat weights given for reference's sake.

2) Materials

- a) Materials of painting shall meet the requirements of JIS.
- b) Painting materials shall in principles be procured from a paint maker selected with Engineer's approval.
- c) Auxiliary materials other than paints shall be those specified by the maker of the paint to be used.
- d) Every paint shall have full description of data on the paint and shall be carried in to the construction in the sealed condition. Upon carrying in a paint or paints, confirm the name of the maker, date of manufacture, the type, colour, and quantity of the paint or paints. When painting work is complete, check the remaining volumes of respective types of paints to confirm the amount used.

3) Painting methods and procedures

- a) The contractor shall consult sufficiently with the subcontractor or subcontractors on the painting methods and procedures to be employed, prior to commencing painting. In each stage, inspection shall be performed for the entire surfaces.
- b) In preparing bed surfaces for painting and in adjusting the preceding layer, completely remove harmful attachments on the surfaces to be painted as specified for respective types of paints.
- c) Painting shall be made by a method suitable for the paint to be applied.
- d) The amount of paint to be used shall be determined from the painting area and painting material to be used as specified for respective types of paints and shall meet the specified amount.
- e) Exercise care for the thickness of coating particularly on projections and corners where paint may not be easily applicable because of construction. The thickness of coating shall meet the required value on all portions.
- f) Painting shall be effected uniformly in consideration of property of the paint in use, performance of the painting tools, condition of the surface to be painted, and weather, not to cause standing, patches, runs, brush marks, wrinkles, and other defects.
- g) The ratio of dilution, drying time intervals between coats, maturing time, and working life shall meet the specified values.
- h) Paint shall be stirred sufficiently. In particular, rustproofing paint shall be stirred sufficiently.
- i) When abnormality is encountered on the coat because of abrupt change of weather, re-clean the surface and re-paint as required. Portions where coating is

not uniform or the amount of paint is not sufficient shall be re-painted.

4) Prohibition of painting

When the weather becomes any of the following items, painting shall not be performed.

- a) When the temperature is below 5°C.
- b) Two hours before sunrise or after sunset.
- c) When the relative humidity exceeds 85%.
- d) In case of rain or snow or in case it is feared that it will rain or snow after starting or finishing painting work.
- e) When a high or dusty wind blows.
- f) When it is feared that bubbles may be caused on painted surfaces because of high temperature of steel materials exposed to the scorching heat of the sun.
- g) When the weather condition is expected to become worse during the drying process to be followed after painting.

5) Curing and safety control

- a) During painting operation, take sufficient care not to apply soil or damage to the surface to be painted, surfaces already painted, surroundings of the surface to be painted, and other objects. In particular, proper curing or protection shall be effected for the surroundings and other objects as required.
- b) Use and control of paints and thinners shall be made in compliance with relevant laws and regulations to prevent disasters from occurring.
- c) Painting operations at high positions shall be made by skilled painters who shall have ample safety education and provide proper dressing, equipment, and scaffolding for safety.

6) Painting colours

Painting of aviation obstruction markings

- a) For guy-wire type pole (Antenna), red (Munsell 5R 4/13) or yellowish red (Munsell 2.5YR 6/13) and white (Munsell N9 or more) shall be used alternately to form stripes with the top and bottom stripes being coloured in red or yellowish red.
- b) Guy-wires and selfsupporting towers shall be coloured in white (Munsel N9 or more).

2-16-6 Work for Steel Pole and Foundation

All reinforced concrete work excluding the following items shall be executed as specified in Paragraph 2-3 of this specification.

- 1) Standard design strength $F_c = 180 \text{ kg/cm}^2$
(Reinforced concrete structure)
- 2) Slump: 13 cm ~ 18 cm
- 3) For exposed concrete above the ground, fair-faced concrete with smooth and minute surfaces free from bubbles and blurs shall be employed. When found necessary through Engineer's inspection, correction shall be made under instructions from the Engineer. A triangular wood strip of 3cm shall be applied to internal and external corners.

4) Concrete test

As per Paragraph 2-3 "REINFORCED CONCRETE WORK", unless specifically directed by the Engineer.

5) Method

- a) Leg interval shall be measured accurately according to the drawings. For embedding anchor bolts, bolts interval, neck length and length margin shall be kept accurately as indicated in drawings. Fix anchor

bolts into concrete by using gauge plates on the basis of work drawings. Due care shall be taken not to move the bolts during the work.

- b) The concrete surface to be contacted by the bottom of the base plate shall be, immediately after being placed, finished with a trowel flush and level so that respective leg bases shall be on a level with each other.

2-16-7 Laying Anchor Blocks and Anchor Frames

(1) Survey

Prior to commencing the work, accurately measure the positions of the main pole foundation and guy-wire anchor blocks and their positional relationship (in horizontal and vertical directions) on the basis of design drawings and fix their positions. Relocate the centers of the foundation and anchor blocks to places other than on batter board, and cure until these centers shall not move before completion of the work.

(2) Plain concrete work

As per Paragraph 2-3 "REINFORCED CONCRETE WORK", except the following items.

- 1) Standard design strength: $F_c = 150 \text{ kg/cm}^2$
- 2) Concrete mixing
 - a) Slump: 8 ~ 13 cm
 - b) Maximum coarse aggregate diameter: less than 40mm
 - c) Minimum unit weight of cement: 250 kg/m^3

(3) Laying anchor frame

The position to lay the anchor frame at shall be determined accurately by drawings and shall not be relocated upon work.

- (4) Precise re-surveying of the positions of the main pole foundation and guy-wire anchor blocks

After placing concrete for the main pole foundation and guy-wire anchor blocks, accurate survey shall be made again in order to estimate the initial guy-wire tension and guy-wire lengths. The results of this survey shall be reported to the Engineer.

2-16-8 Guy-Wire Composition Work

(1) Stranded steel wire (End socketing)

- 1) Composition of guy-wire is specified in the relevant drawings.
 - a) The type of stranded steel wire shall be a galvanized spiral rope (strand tensile strength, 150 kg/mm^2), otherwise specified.
 - b) Insertion of an insulator
When an insulator is inserted between sockets, due care shall be taken to keep accurate distance between sockets in process of combination of them.
 - c) Metal fittings for guy-wire shall be assembled keeping even touch between insulator and fitting, and bolts shall be tightened completely without loose.

2) Dimensions of guy-wires

In order to accurately measure the dimensions of guy-wires, measure guy-wire dimensions by adding a tension of about 10% of the guy-wire rupture stress upon applying pretension to the guy-wires in the guy-wire shop, and enter markings.

3) Cutting of guy-wires

- a) The initial tension and lengths of guy-wire shall be determined by calculation on the basis of the survey drawings of anchor block distances and shall be approved by the Engineer.

- b) The length of a guy-wire to be cut shall be equal to the distance between the specified sockets measured with the above-mentioned tension being applied plus the length necessary for socketing.
- c) Stranded steel wire cut end shall be bound firmly by winding a galvanized steel wire over a length 3 to 4 times as large as the stranded wire diameter so as to prevent return of strand.
- d) Stranded steel wire shall be cut by a saw or cutter. When stranded steel wire is cut by gas cutter as required by the circumstances, cut the wire at a position more than 5cm from the end by a saw or cutter.

(2) Socketing work

- a) Socketing shall be performed at the shop.
- b) Socket fittings

For socket fittings, Type 1 distillation zinc specified in JIS H 2107 shall be used. Authorized test data issued by relevant bureau or government office shall be submitted.

c) Socketing procedure

- i) Effect sufficiently firm seizing of the guy-wire over a length 3 to 6 times as large as the stranded wire diameter excluding the guy-wire edge section to enter into the socket so as to prevent return of strand. Ensure that the seized portion shall enter into the socket by about 20mm.
- ii) After passing a guy-wire, unravel the strand wire into a tea whisk form, and eliminate twist and overlap. Stranded of each wire may be kept as it is.
- iii) By impregnating the tea whisk portion of the strand wire into scouring oil (light oil heated up to about 50°C), wash out oil and impurities attached on the wire.
- iv) Wash the tea whisk portion with hot water and,

after drying, pull the tea whisk portion into the socket, and determine the fixing point. The seized portion of about 20mm shall remain within the socket and the tip of the wire shall not come out of the socket.

- v) Heat the socket to a 150 to 200°C. In particular, heat the bottom and opening of the socket sufficiently. Gas burner, torch lamp or the like shall be used for this heating, without affecting materials.
- vi) Coincide the axis of the socket with that of the guy-wire, fix the socket on a vice or work bench so that the center line shall become plumb, fill the opening of the socket with clay, asbestos, etc., so that metal poured shall not leak out.

The fixation shall be so made that the guy-wire under the socket opening shall become plumb in a length equal to 30 to 40 times as large as the wire diameter.

Leakage of the poured metal may cause haneycomb and thus shall not be caused. Take due care so that the guy-wire shall not contact with the inside of the socket. Only the upper end should desirably contact with the socket.

- vii) Promptly pour melt metal into the socket at a stretch. The pouring temperature shall be 480°C. After pouring, dent will appear on the upper surface, and then pour additionally.
- viii) Leave the socket fixed as it is for about 30 to 40 minutes, then take it out and after painting apply caulking to the hollow in the opening to prevent rainwater from staying there.

2-16-9 Steel Pole Erection and Guy-Wire Laying

- 1) Erection shall be made as indicated in working and assembly drawings.
Erection shall be executed according to the erection numbers of members.
- 2) Clamping bolts shall be used definitely identified in shop drawings to be prepared separately. Clamping nuts shall in principle be located outside in the case of vertical members and on the upper side in the case of horizontal members.
- 3) When the erection is complete, inspect the plumbing of the whole structure for normality prior to final tightening of bolts, then finally tighten the bolts with bolting torques given in Table 2-16-10 by using torque wrench and set detents securely to screws and nuts at more than 3 places by using a roundhead punch.

Table 2-16-10 Bolting Torque

Bolt Diameter	M16	M20	M22
Torque (kg - cm)	570~610	1000~1100	1650~1800

- 4) Take proper measures to prevent objects from being dropped from heights as much as possible and prevent disasters and hazard from occurring by accidental drop.
- 5) Members shall not be damaged or spoiled by any means during transportation and work. In case any damage or loss is given, measures shall be taken under instructions from the Engineer.
- 6) Take due care in replacing erector or temporary stay on the basis of the erection plan. When necessary, use temporary reinforcements.

- 7) Temporary reinforcement shall, when necessary, be employed for wind pressure and other loads during erection.
- 8) Split pins to be used on guy-wire fittings and pin bolts shall be bent sufficiently and wound around pins.
- 9) Guy-wire with guy-wire fittings assembled completely and finished by painting as required shall be laid on a stage, cleaned and fitted to the tower structure.
- 10) Each guy-wire shall be given the required initial tension. Initial tension shall be measured accurately by using a proper instrument.
- 11) The threaded portions of the guy-wire turnbuckles shall be greased sufficiently after specified painting.
- 12) All lock nuts shall be tightened completely.

2-16-10 Accompanied Items of Work

(1) Feeder lead-in

Laying of feeder tube from tower mast to the prescribed position in the station building, including manufacture of necessary mounting fixtures. The structure and dimension of fixtures are to conform to the design drawing and the anti-corrosive shall be zinc coating.

(2) Aviation obstruction light work

- 1) Aviation obstruction lights shall be furnished at the required positions as per design drawings.
- 2) Pippings and wirings are included in this work.
- 3) As for the spare parts, One OM 7, Two OM 3A shall be allocated to each transmitting station.

(3) Radial earth

Laying of radial earth to the prescribed position in accordance with the design drawing.

(4) Austin transformer

Supply and installation work of the transformer is included as per design drawing.

(5) Fence

The location, dimension, members to be used, etc., are shown in the drawing.

2-16-11 Inspection

(1) Inspection of full-size drawings

When full-size drawings are prepared, inspect major dimensions, member arrangements, assembled condition, etc., by referring to the manufacture drawings for comparison.

(2) Inspection of component parts

1) Bolts, nuts and washers

Inspect bolts, nuts, and washers for appearance, shape, dimensions, threading accuracy, and mechanical properties by referring to the relevant JIS standards.

2) Guy-wire fittings

a) When major parts have been arranged, inspect them for appearance, shape, dimensions, finish, and mechanical properties.

b) Inspect guy-wire dimensions.

c) Inspect guy-wires for composition, sockets for assembly condition, assembly bolts for tightening condition and split pins for normality.

3) Cast steel and forged steel

When major parts have been arranged, inspect cast and forged steel for appearance, shape, dimensions, finish, mechanical properties. When directed by the Engineer, perform inspection by using a supersonic wave detector and/or X-ray photograph equipment.

(3) Inspection of finished products

1) Inspection of temporary assembly

After completion of parts, assemble them temporarily into a structure with attachments as required,

sufficiently correct strain caused by galvanization, and inspect the temporarily assembled structure in a cleaned condition for appearance, major dimensions, shape, accuracy, finish, member arrangement, etc.

2) Inspection of galvanization

- a) Perform zinc weight test and copper sulfate test for galvanized test specimens as well as for major members.
- b) Inspect members for galvanizing condition.

3) Inspection of painting

- a) Inspect paints for their composition and performance. However, maker's test data will be used for this inspection, unless specifically directed by the Engineer.
- b) For those portions of which bed adjustment has been completed, inspect to determine whether bed adjustment is complete or not.
- c) In each painting process, inspect the amount of paint and finish.

4) Inspect of erection

- a) Inspect, appearance of members, assembly procedures and methods in each stage of the work.
- b) When bolting is complete, inspect bolting torque, punched portions, and washer conditions.
- c) Inspect damage and loss on the base and tightening condition of anchor bolts.
- d) Inspect distances between the steel pole and anchor blocks and directions, angles, and dimensions of anchor blocks.
- e) While adjusting force applied to obtain the specified initial stress of guy-wires, inspect to determine whether the force is applied in good balance.

- f) Inspect finished condition of anchor block concrete.
- g) Inspect lock nut tightening of turnbuckles, greasing on split pins and threaded portions (after painting) and protective measures.
- h) Inspect the mounting position of aviation obstruction light and mounting dimensions and finish of the feeder lead-in rack.

5) Other inspection

Inspect the material and the installation of aviation obstruction light, insulator, radial earth and austin transformer etc., which are included in this work.

2-17 ELECTRICAL WORK

2-17-1 Scope of Work

(1) Extent

The work specified under this paragraph consists of the following items of work.

- 1) Main line installation
- 2) Power
- 3) Earthing
- 4) Lighting fixture and receptacle mounting
- 5) Conduit piping for telephone system
- 6) Conduit piping for interphone system
- 7) Conduit piping and wiring for clock system
- 8) Fire alarm system installation
- 9) Conduit piping for broadcasting equipment
- 10) Conduit piping for monitor system

(2) Work not included

The following items of related work are not included herein.

- 1) Fabrication, installation, and related wiring of power receiving and distribution apparatus

- 2) Fabrication, installation and related wiring of emergency engine generator facilities
- 3) Fabrication, installation and related wiring of battery facilities
- 4) Extension of earthing wire in floor duct and connection of earthing wire with equipment
- 5) Apply and installation of airconditioners and motors
- 6) Mounting of aviation obstruction light on steel towers and related wiring
- 7) Connection of lightning rod and lightning wire to steel tower
- 8) Wiring of feeders to steel tower and supply and installation of outdoor ladder
- 9) Wiring for telephone system and mounting and connection of low-power terminals
- 10) Supply, installation and related wiring of interphone facilities
- 11) Supply, installation and related wiring of common radio antenna facilities
- 12) Fabrication and installation of master and slave clocks
- 13) Fabrication and installation of battery facilities for clocks
- 14) Fabrication and installation of broadcasting equipment and wiring between equipment
- 15) Fabrication and installation of connectors and plates for microphones and loud speakers, etc.
- 16) Wiring for ON AIR lamp (for control circuit use)

(3) Work to be accomplished by Nepal side

- 1) Power lead-in work and outdoor conduit piping
- 2) Telephone lead-in work and outdoor conduit piping

2-17-2 General

1) Main line installation

Piping and wiring from terminals on the secondary side of the power distribution board (work not included) in the power room to each distribution board for lighting fixtures, distribution board for broadcasting equipment, and power control panel and supply and installation of cable racks for high and low powers shall be carried out by the contractor. For each penetrating portion on walls and floors, opening portion shall be filled with a sound absorbing or heat insulating material after passing wires.

2) Power installation

Fabrication and installation of the power control panel to be installed in the equipment room, piping and wiring from terminals on the secondary side of the panel to the respective loads such as a motor, and piping and wiring between the power control panel and manual control panel shall be accomplished by the contractor. The starting of the motor shall be made either automatically or manually and the operating condition is monitored in the equipment room.

3) Earthing

Earthing for high power, low power, broadcasting equipment, and lightning shall be accomplished.

4) Lighting fixture and plug socket mounting

Fabrication and installation of respective distribution boards for lighting fixtures, piping and wiring from

terminals on the secondary side of the board to lighting and wiring fixtures, and supply and installation of lighting and wiring fixtures shall be carried out by the contractor.

5) Conduit piping for telephone system

Supply and installation of terminal board for low power, piping to respective receptacles, and installation of metal nozzle plates shall be accomplished by the contractor. Telephone exchange and associated equipment, telephone sets, related wiring and terminals shall not be included.

6) Conduit piping for monitor system

Piping to respective receptacles and installation of metal blind plates shall be accomplished. Supply and installation of equipment and wiring are not included.

7) Conduit piping for interphone system

Piping to respective receptacles and installation of metal nozzle plate shall be accomplished by the contractor. Supply and installation of equipment and wiring are not included.

8) Conduit piping and wiring for clock system

Piping and wiring to respective receptacles and installation of metal plates furnished with 2P and 3P receptacles. The manufacture and installation of master and slave clocks shall not be included.

9) Fire alarm system installation

Supply and installation of receivers and sensors and related piping and wiring shall be accomplished by the contractor.

10) Conduit piping for broadcasting equipment

Piping for broadcasting equipment of the respective studios, subcontrol rooms, and master control installation of wiring ducts, and fabrication and installation of boxes for microphone etc. and shall be accomplished by the contractor.

Broadcasting equipment, connectors, plates, and wiring shall not be included.

2-17-3 Spares

Spares specified in Paragraph 2-17-15 shall be supplied at the time of transfer of the facilities.

2-17-4 Inspection and test

Wiring insulation resistance and earthing resistance measurements, operation test of respective equipment, illumination measurement, and all other measurements and tests shall be accomplished and their records shall be taken prior to the completion test.

2-17-5 Piping and Wiring Materials

(1) Conduits

- 1) For metal pipes, thin-wall steel conduits specified in JIS C 8305 shall be used in principle.
- 2) Hard PVC conduits shall meet the requirements of JIS C 8430.
- 3) Flexible conduits shall be such that meet the requirements of JIS C 8309 or equivalent.

(2) Accessories to conduits

- 1) Coupling shall meet the requirements of JIS C 8330 and union couplings and unthreaded couplings shall meet the requirements of JIS C 8357.
- 2) Normal bends shall meet the requirements of JIS C 8331.

- 3) Bushings shall meet the requirements of JIS C and insulation bushings shall meet the requirements of JIS C 8347.
 - 4) Lock nuts shall meet the requirements of JIS C 8333.
 - 5) Saddles shall meet the requirements of JIS C 8334 and insulation saddles shall be such that shall meet the requirements of the same JIS standard or equivalent.
 - 6) Universals shall meet the requirements of JIS C 8335.
- (3) Boxes
- 1) Outlet boxes shall meet the requirements of JIS C 8336 and switch boxes the requirements of JIS C 8337. Box covers shall meet the requirement JIS C 8339. For switches and receptacles, applicable BS boxes shall be used.
 - 2) Concrete boxes shall meet the requirements of JIS C 8338.
 - 3) Round exposed type boxes shall meet the requirements of JIS C 8340.
 - 4) Accessories for hard PVC conduits shall meet the requirements of JIS C 8432 through JIS C 8435.
 - 5) The specified pull boxes and wiring ducts shall be made of steel sheets of more than 1.6mm thick coated with rustproofing paint over both inside and outside surfaces with the outside surface being coated in the specified colour. In construction, the pull boxes and wiring ducts shall be reinforced with angles, have construction suitable for wiring and inspection, and provide an inside surface free from burr on connecting portions and containing no projected screws. For rising ducts, wiring bands shall be provided at specified positions.

6) Joint frames shall be made of steel sheets and meet the requirements for boxes which joint frames shall be applied.

(4) Wires and cables

Wires to be used in this work shall meet the requirements of the relevant JIS standards, unless otherwise stated.

600V thermoplastic-covered wires (1V) shall meet the requirements of JIS C 3307 and 600V thermoplastic-covered cables shall meet the requirements of JIS C 3342 (VVF), 3605 (CV), and 3401 (CVV).

(5) Cords

Cords for apparatus shall meet the requirements JIS C 3306.

2-17-6 Boards/Panels

(1) Distribution boards

- 1) The construction and dimensions of each distribution board shall be as indicated in design drawings.
- 2) Built-in equipment shall be as particularly specified and MCB (Magnetic Circuit Breaker) shall be used in principle for main and branch switches.
- 3) The neutral conductor of one circuit shall be separated from that of another and insulation resistance measurement shall be facilitated. Box earthing terminals shall also be provided.
- 4) Prior to manufacture, the contractor shall submit manufacture drawings, connection diagrams, and detailed drawings to the Engineer for approval.
- 5) Painting colours and finish shall be as directed by the Engineer, unless otherwise specified.

(2) Terminal boards

- 1) The construction and dimensions of each terminal board shall be as indicated in design drawings.
- 2) Box earthing terminals shall be incorporated without fail.
- 3) Prior to manufacture, the contractor shall submit manufacture drawings, connection diagrams, and detailed drawings to the Engineer for approval.
- 4) Painting and finish shall be as those of distribution boards.

(3) Power control panels

- 1) Selfsupporting power control panel shall be an enclosed frame type made of steel plate and shall be, unless otherwise stated, of front door type. The dimensions of a selfsupporting power control panel shall be as indicated in design drawings.
- 2) Meters, operational pushbuttons, selection switches, etc., shall be provided on the front door and magnetic circuit breaker magnetic contactor, and relays shall be incorporated within. Box earthing terminals shall be provided without fail.
- 3) Each power control panel shall have a construction and equipment arrangement to assure ease of inspection and repair of the built-in equipment. Terminals for exterior wiring shall be provided at locations convenient for exterior wiring.
- 4) Common terminal symbols shall be employed, which shall be described on all terminal boards and wire ends.
- 5) For switching boxes, either exposed wall mount type or wall flush mount type shall be employed. On the front door an operation pilot lamp, control pushbuttons,

etc., shall be provided. Inside the switching box a hand switch (MCB without trip) shall be provided.

- 6) Painting and finish shall be as those of distribution boards.
- 7) Prior to manufacture, the contractor shall submit manufacture drawings, connection diagrams, and detailed drawings to the Engineer for approval.

(4) Power stabilizer boxes

- 1) The construction and dimensions of each power stabilizer box shall be as indicated in design drawings.
- 2) Inside each power stabilizer box shall have stabilizer fittings and terminals with neat wiring arrangement.
- 3) Prior to manufacture, the contractor shall submit manufacture drawings, connection diagrams, and detailed drawings to the Engineer for approval.
- 4) Painting and finish shall be as those of distribution boards.

2-17-7 Wiring Fixture and Plates

(1) Compact switches

The types and capacities of switches shall be as indicated in design drawings and shall meet the requirements of relevant BS specifications.

(2) Receptacles

The types and capacities of receptacles shall be as indicated in design drawings and shall meet the requirements of relevant BS specifications.

(3) Plates

Unless otherwise stated, plates shall be made of metal and have thicknesses of more than 0.6mm.

2-17-8 Lighting Fixtures

(1) Fluorescent lamps

- 1) The construction and types of fluorescent lamps shall be as indicated in design drawings.
- 2) Fluorescent lamps shall meet the requirements of JIS C 7601, 7602, and 8106.
- 3) Unless otherwise specified, fluorescent lamps shall be of high power factor type. Straight fluorescent lamps of 40W shall be of instantaneously turn-on type. Fluorescent lamps incorporating double lamps shall be of flickerless type. Fluorescent lamps of less than 20W shall be of glow type.
- 4) Appliances using acrylic covers shall be such that will not cause noise due to expansion of the cover by heat.
- 5) All fluorescent lamp appliances shall be earthed.
- 6) Prior to manufacturing, the contractor shall submit manufacturer drawings to the Engineer for approval.

(2) Incandescent lamps

- 1) The construction and types of incandescent lamp shall be as indicated in design drawings.
- 2) Incandescent lamps shall meet the requirements of JIS C 7501.
- 3) Prior to manufacture of incandescent lamps the contractor shall submit manufacture drawings to the Engineer for approval.

2-17-9 Piping and Duct Work

(1) Conduit piping

- 1) Unless otherwise specified, conduits shall be thin-wall steel conduit with diameters indicated in design drawings.

- 2) The curvature of a conduit shall be more than 6 times as large as the conduit diameter and the bending angle shall not be less than 90°. The number of curves between boxes shall not exceed 3.
 - 3) Conduits less than 25mm shall not use normal bend.
 - 4) Ends of conduits shall be finished to be smoothed not to damage the covering of wires.
- (2) Pull box and joint box
- 1) When the length of conduit exceed 30m, or when the conduit is required to be bent at more than 3 positions, pull box or joint box shall be used even if not indicated in drawings.
 - 2) When the plate of the pull box or joint box is to be mounted on a wall, it shall be finished to keep harmony with the surrounding.
- (3) Position box
- 1) Outlet box or switch box shall be provided at locations where lighting fixture, receptacle, switch, etc., are mounted, and at other designated locations.
 - 2) Each position box for lighting fixture shall be provided with bolts and others for mounting lighting fixtures.
 - 3) In principle, more than 5 conduits shall not be connected to a position box.
 - 4) Box to be used for outlet on the floor shall be furnished with a cover mounting a level-height adjustor.
- (4) Connection between conduits and connection between conduit and box
- 1) Connection between conduits shall be made completely by means of a threaded or unthreaded coupling not to cause a gap on the joint.

- 2) For connection of a conduit with the box or duct the conduit shall be fitted perpendicularly to the box or duct, fixed securely to the inside and outside surfaces of the box or duct by using lock nuts, and fit fushing in place. Conduit shall not be projected more than necessary into the box.
 - 3) Joints between conduits and joints between conduit and box shall have earthing bonding. Conduits to come on both sides of the box shall have a linkage to one another, using a bond wire located outside.
 - 4) For bonding, sufficiently polish the portions to be jointed, wind soft copper wire of more than 2mm in diameter on the joint, and then solder or clip by copper sheets of more than 0.5mm thick, or use an equivalent method for complete bonding.
 - 5) When the knock-out of the box does not meet the outside diameter of the conduit to be used, insure to use a reducer.
- (5) Conduit laying
- 1) When it is necessary to embed a conduit or pass it through a structure, it should be embedded in or passed through such a portion of the structure that gives no hindrance to the strength of the structure.
 - 2) When embedding a conduit into reinforced concrete or the like, pass the conduit above or between reinforcing bars, bind the conduit to the reinforcing bars, and fix the box firmly to the concrete form.
 - 3) Conduit shall not be laid by breaking a building structure. When it is necessary to lay a conduit in a groove, gain the approval of the Engineer and the depth from the finished surface to the conduit shall be more than 30mm.

- 4) When passing a conduit through a wall covered with a metal net (such as metal lath and wire lath) or along a metal net, the conduit and the box or the like to be mounted on the metal net shall be completely isolated from the metal net.
 - 5) Exposed piping and concealed piping shall be laid in good order by using proper hangers or the like. The intervals of hangers or saddles to be provided shall be less than 2m.
 - 6) When a conduit is fixed with saddles to concrete surface, curl plugs or anchor bolts shall be employed.
- (6) Treatment of pipe ends.
- 1) When conduits are to be embedded, pipe ends of conduits shall be covered with a blind cap not to allow water or rubbish to enter.
 - 2) Cut of a conduit in box or others shall be furnished with lock nut and bushing without fail.
- (7) Painting and others
- 1) Connecting portions of conduits, threaded portions, and exfoliated galvanized portions caused while piping shall be coated with a rustproofing paint such as zinc chromate primer.
 - 2) Boxes and others to be used for concrete work shall be cleaned after removing forms.
 - 3) Exposed portions of conduits shall be given more than 2 coats of paint of the specified colour.
- (8) Duct work
- All floor ducts shall be accomplished in the construction work.

(9) Cable rack work

- 1) Hanger bolts for cable racks shall be fixed to the building structure. The intervals of hanger bolts to be provided shall be less than 2.0m. Connection of racks shall be earth bonded with a copper band or the like.
- 2) When necessary, a support or supports anchored in wall shall be employed.

(10) Vibration proofing and soundproofing

- 1) For vibration proofing of conduit piping, conduits in the studio shall be fixed to the interior framework not to contact the building structure. Supporting hardware to be used for airconditioning ducts and sanitary pipes shall not be used in combined use with electrical conduits. Conduits to vibration proofed pumps and airconditioners shall not directly be fixed to the pumps or airconditioners. When it is necessary owing to circumstances to directly connect a conduit to a pump or airconditioner, use a flexible conduit at a proper portion to prevent transmission of vibration.

2) Sound insulation of pipes

When a conduit or duct is laid into a studio or sub-control room, a sound absorbing or heat insulating material shall be applied over the opening portion of the room after passing wires, so as to prevent leakage of sound. The same treatment shall be applied for auxiliary piping and piping for broad-casting equipment to be provided on partition walls of respective rooms.

3) Sound insulation of through holes

When conduit or conduits is to pass through the building structure near a studio or subcontrol room, fill

the through holes sufficiently with mortar and then extend the conduit or conduits to accomplish the piping work. When a conduit or conduits is to pass through the interior sound insulating layer of a studio, bore a hole elaborately and apply caulking material to the surrounding of the hole after wiring completely for sound insulation.

- 4) Sound insulation on surrounding of lighting fixtures and others

When a hole is bored on the studio soundproofing layer, for fitting a lighting fixture or the like, fill the surrounding of the lighting fixture or the like with caulking material after fitting the fixture.

- 5) Sound insulation pipe shall be used for a conduit pipe to each studios.

2-17-10 Wiring

(1) Passing wires through conduits

- 1) For passing wires through a conduit, clean the inside of the conduit prior to passing wires so as to not to soil the ceiling or wall.
- 2) For passing a wire or wires through a conduit, use a wire of sufficient length so that the fixture can be pulled while being connected to the wire or wires.
- 3) In the case of an auxiliary piping or only piping without passing wires (when wire passing work is not included), ensure to pass an orderwire (vinyl covered steel wire of 1.2mm) through the pipe. When it is found difficult to pass a wire or wires through a conduit because of poor installation of a conduit line, even after completion of the work, the contractor shall be responsible for making proper correction.
- 4) Connection of wires shall not be made in any conduit.

- 5) Wires in pull box and ducts specified by the Engineer shall have identification tags having a description of the type of power, destination of the wires, etc.
- (2) Wiring in ducts
 - 1) Wiring shall be performed in good order while binding wires properly for respective circuits. Connection of wires shall not be made in ducts.
- (3) Wiring on cable racks
 - 1) Wiring shall be performed in good order. Wires shall be bound and fastened to racks. Wirings shall have identification tags with the description of the types of power, destination of the wires, etc.
 - 2) No other wiring than the earthing wire and cables shall be laid on cable racks.
 - 3) Wires shall not be connected on cable racks.
- (4) Connection of wires
 - 1) After polishing wires to be connected sufficiently, connect them by solder or by pressure. Connections shall be given more than 4 rolls of adhesive vinyl tape.
 - 2) Connection of wires with terminals shall be made by using pressure connection type terminals or copper tube type terminals.
- (5) Colour identification of wires

When using vinyl covered wires, vinyl cover colours shall be such as specified by the Engineer for different phases for wire identification.
- (6) Gauge size of branch wires
 - 1) Gauge size of branch wires shall be as indicated in drawings.
 - 2) Connection of wires and cables shall be made in boxes or panels and cable terminals shall be processed with terminating material.

2-17-11 Installation of Equipment and Fixtures

(1) Installation of equipment

- 1) For installation of equipment, the method of installation, the location of installation, etc., shall be as indicated in drawings. The contractor shall prepare manufacture drawings, assembly drawings, installation layout drawings, mounting drawings, and other detailed work drawings, consult with the Engineer and related construction contractor, and other contractors, and implement equipment installation with the Engineer's approval.
- 2) On installation of equipment, sufficiently check equipment for being level and plumb and connect conduit or duct with the equipment as required.
- 3) Selfsupporting equipment such as power control panel shall be mounted on channel bases to be fixed securely to the floor with anchor bolts.

(2) Fitting of lighting fixture

- 1) Since design drawings indicate rough positional relationship between lighting fixtures, concrete ceiling plans shall be prepared with due consideration for fixtures layout upon actually fitting lighting fixtures and shall obtain the Engineer's approval for the ceiling plans. Inserts and bolts, etc., for mounting shall also be embedded.
- 2) Hanging of lighting fixtures shall in principle be made from the building structure: at 2 points in the case of a fluorescent lamp and at one position in the case of an incandescent lamp.
- 3) In fitting lighting fixtures, due care shall be taken for heat radiation and ventilation so that the temperature inside each lighting fixture shall not rise and that the functions and service life of bulbs shall not degrade.

4) When waterproofing or moistureproofing is required, use rubber packing and putty to assure complete waterproofing and moistureproofing.

(3) Fitting of wiring fixtures

1) Receptacles, switches, etc., shall be positioned as followed, unless specifically noted.

<u>Item</u>	<u>Distance to center of fixture</u>
Switch	1300mm from floor surface
Receptacle	300mm from floor surface
Outlet for lowpower	300mm from floor surface

2) Height of box for slave clock shall be as indicated in drawings.

3) When connecting wires to wiring fixtures, sufficiently tighten screws or the like not to cause poor contact.

2-17-12 Earthing

(1) Earthing

Earthing shall be made as indicated in design drawings. When the specified earthing resistance is not obtained, take proper measures under instructions from the Engineer until the specified earthing resistance is obtained.

(2) Method

1) Driving earthing rods into the ground and laying earthing copper plates shall all be made in the presence of the Engineer. When, by measuring earthing resistance, the specified earthing resistance is to be achievable, back fill as required.

2) When earthing work is complete, stick a tag having the description of the measured resistance, date of measurement, type of the rod, etc., to the inside of the earthing relay box.

3) Earthing of not only control panels and distribution board but also motors, lighting fixtures, and other electric appliances shall be accomplished securely. Connection of earthing wires shall be made completely both electrically and mechanically.

(3) Earthing resistance

- 1) All earthing resistances except those for broadcasting equipment shall be less than 10 ohms.
- 2) Earthing resistances for broadcasting equipment shall desirably be less than 5 ohms.

2-17-13 Fire Alarm System Installation

The construction and circuit design of the fire alarm system to be employed shall be as indicated in design drawings.

2-17-14 Outdoor Installation

(1) General

Design drawings indicate outlines of the work to be carried out. Care shall be exercised not to hinder the existing installations buried by examining the conditions of the circumstances and the presence/absence of installations buried upon commencing the work in the field.

(2) Underground piping

- 1) In principle, hard PVC conduits or thick-wall steel conduits coated with polyethylene lining on both inside and outside surfaces shall be used.
- 2) The depth of underground piping shall be more than 1200mm under the ground surface under roads and others involving traffic of automobiles, etc., and more than 600mm under other places. Mark blocks made of concrete shall be provided at locations under which conduits are buried. Above bending portions of conduits buried, mark blocks shall be provided, and

above the straight portion mark blocks shall also be provided at intervals of less than 10m. At the top of each mark block an arrow indicated the direction of the conduits buried shall be provided.

- 3) The construction and dimensions of hand holes shall be as indicated in design drawings. A cast iron water-proofed hand hole cover shall be provided on the upper part.
 - 4) For back fill river sand or mountain sand shall be used in principle.
- (3) Cable laying and splicing
- 1) Cable splicing shall be made in the presence of the Engineer.
 - 2) For connecting cores of cables, use pressure connection or solder connection. Insulators and armors shall be sharpened like pencils and insulation shall be effected by insulation tape. Due care shall be taken not to allow moisture enter inside.
 - 3) Cable splicing shall in principle not be made in hand holes.
 - 4) Cable ends shall use termination material. Care shall be exercised not to allow water enter into the cable during the work as well as after completion of the work.

2-17-15 Spares

Spares to be provided at the Kathmandu Studio Center and transmitting stations shall be as given hereunder.

(1) Spares to be provided at Studio Center

Item	Type	Unit	Quantity
Fluorescent lighting lamp	FL 40W	No.	100
	FL 20W	No.	50
	FL 10W	No.	10
Incandescent lighting lamp	100W	No.	5
	60W	No.	5
	40W DC-24V	No.	10
Ballast for fluorescent lighting	FL 40W x 2	No.	20
	FL 40W x 1	No.	10
	FL 20W x 1	No.	10
	FL 20W x 2	No.	10
	FL 10W x 1	No.	2
Glow-starter for lighting fixture		No.	50
Socket for fluorescent lighting fixture	T18	No.	50
Socket for incandescent lighting fixture	E26	No.	10
Socket for incandescent lighting	DC-24V	No.	10
Diffuser of fluorescent lighting fixture		No.	5
Plug socket	2P, 15A with earth	No.	20
Switch	1P, 15A	No.	20
	3-way	No.	5
	Phototube	No.	1
Floatless switch	61F-G1	No.	1
	61F-G2	No.	1
Relay		No.	10

(Continued)

Item	Type	Unit	Quantity
Transformer	400/200V, 0.2kVA	No.	1
	400/200V, 1.5kVA	No.	1
	400/200V, 2kVA	No.	1
Ampere-meter	30/5	No.	2
	10/5	No.	3
Magnet switch	5.5kW	No.	2
	1.5kW	No.	5
Pushbutton for power board		No.	15
Pilot lamp for power board		No.	200
Changeover switch		No.	5
Fuse for control circuit		No.	50
M.C.B	4P 50AF/50AT	No.	3
	3P 50/15	No.	5
	3P 50/10	No.	5
	2P 50/5	No.	5
	2P 50/50	No.	2
	2P 50/20	No.	10
Fire alarm bell		No.	1
Fire alarm lamp		No.	20
Fire alarm pushbutton		No.	1
Fire alarm detector	Differential type	No.	5
Low tension outlet		No.	2
E.L.B	3P 225AF/225AT	No.	1
	3P 225/150	No.	1

(2) Spares to be provided at respective transmitting stations

Item	Type	Unit	Quantity	
			Kathmandu	Pokhara
Fluorescent lighting lamp	FL 40W	No.	40	40
Incandescent lighting lamp	100W	No.	1	0
	60W	No.	1	1
	40W DC-24V	No.	3	3
Ballast for fluorescent lighting	FL 40W x 2	No.	10	10
	FL 40W x 1	No.	5	5
	20W x 2	No.	3	3
	20W x 1	No.	3	3
Socket for fluorescent	T18	No.	10	10
Socket for incandescent lighting fixture	E26	No.	5	5
Socket for incandescent lighting fixture	DC-24V	No.	5	5
Plug socket	2P,15A with earth	No.	5	5
Switch	1P, 15A	No.	10	10
	3-way	No.	2	2
	Phototube	No.	1	1
M C B	4P 50AF/30AT	No.	2	2
	3P 50/15	No.	3	3
	3P 50/10	No.	2	2
	2P 50/50	No.	1	1
	2P 50/20	No.	5	5
Magnet switch	4.0kW	No.	5	5
	1.5kW	No.	3	3
Pushbutton for power board		No.	15	15
Pilot lamp for power board		No.	100	100

(Continued)

Item	Type	Unit	Quantity	
			Kathmandu	Pokhara
Fire alarm detector	Constant temperature differential type	No.	2	2
		No.	5	5
Relay		No.	5	5
E.L.B.	3P 100AF/ 100AT	No.	2	2
	3P 50/50	No.	1	1
Floatless switch	61F-G1	No.	1	1
	61F-G2	No.	1	1

