

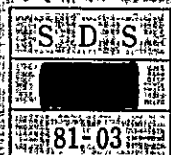
THE PEOPLE'S REPUBLIC OF BANGLADESH
TECHNICAL SPECIFICATION
OF
NATIONAL BROADCASTING HOUSE

VOLUME - I

SPECIFICATION
OF
BUILDING AND BUILDING EQUIPMENT

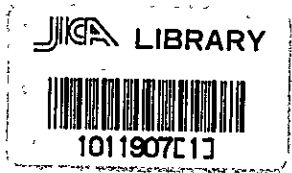
FEBRUARY, 1981

Japan International Cooperation Agency



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TECHNICAL SPECIFICATION
OF
NATIONAL BROADCASTING HOUSE

Volume - I

Specification
of
Building and Building Equipment

FEBRUARY 1981

JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団	
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G GENERAL PROVISIONS

G.1 GENERAL:

G.1.1 Scope of Common Specification:

This specification covers the works for construction of New National Broadcasting House in THE PEOPLE'S REPUBLIC OF BANGLADESH.

G.1.2 Design Documents:

Design documents mean drawings and specifications (including additional description and replies to questions raised in correspondence to additional description).

G.1.3 Supervisor:

The Supervisor shall be a consultant contracted with the Owner or an authorized representative of said consultant.

G.1.4 Deliveration in Correspondence to Doubts:

Deliveration shall be made with the Supervisor for the matters which are not explicitly covered in the design documents or if any doubt arises regarding the design documents.

G.1.5 Deliveration related to Matching, etc. at Site:

Deliveration shall be made with the Supervisor regarding matching, connection or the like at site, if decision based on design drawings is difficult or inconvenient.

G.1.6 Disposition of Results of Deliberation:

- (a) When deliberation is made with the Supervisor, design changes shall be made as required.
- (b) The matters which do not reach the stage of design change shall be treated as specified in G.6.1 (b).

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G.1.7 Proceedings at Government Agencies, etc.

Proceedings at government agencies, etc. required for execution of works shall be promptly taken.

G.1.8 Relevant Works under Separate Contracts:

Full cooperation shall be provided in accordance with the instructions to be given by the Supervisor for those who are related to relevant works under separate contracts, in order that the works of the entire projects make smooth advancement.

G.1.9 Produced Materials:

- (a) Those produced materials which require delivery under special remarks shall be delivered to the Supervisor with arrangement suitably made at the specified places and with written documents suitably drawn up.
- (b) Produced materials which do not require delivery shall be entirely brought out of the site and shall then be suitably disposed in accordance with applicable laws and regulations.

G.2 MANAGEMENT OF WORK SITE:

G.2.1 Site Representative:

Site representative means the site representative specified in the work contract agreement.

G.2.2 Safety and Health Management at Work Site:

- (a) Management of safety and health at the work site shall be made in accordance with the related laws and regulations, and the site representative shall be the person responsible for this management. If a responsible person is separately assigned, the site representative shall provide cooperation to him.
- (b) Efforts shall be made to prevent occurrence of accidents at the work site with arrangement and adjustment of goods made at all times and with inspection of dangerous points made in particular.

G.2.3 Security of Power Equipment for Work:

- (a) A person who is qualified based on laws and regulations shall be assigned as the person responsible for security of power equipment for work, and his name shall be reported to the Supervisor.
- (b) Said responsible person shall perform suitable security work under the management of the site representative.

G.2.4 Prevention of Disasters and Environmental Disruption:

Prevention of disasters and environmental disruption accompanying execution of works shall be suitably made in accordance with related laws and regulations, and the following matters should be observed in particular.

- Disasters shall not affect third parties.
- Efforts shall be made to prevent environmental disruption.
- Deliveration shall be made with the Supervisor if there is a fear of occurrence of a disaster or environmental disruption even when good care is exercised by the manager.

G.2.5 Expedient Measures:

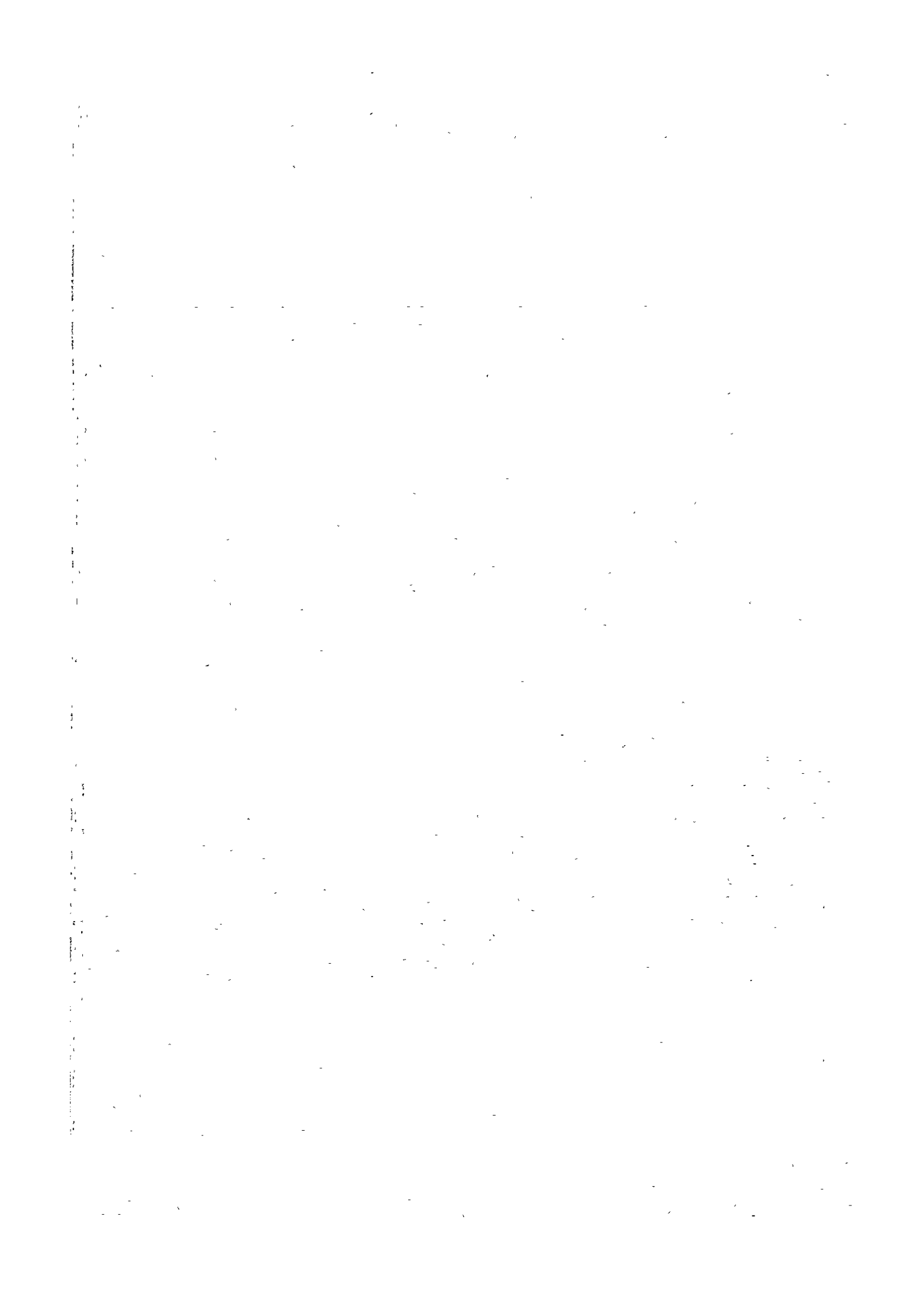
When a disaster or environmental disruption occurs, suitable measures shall be promptly taken, and the circumstances shall be immediately reported to the Supervisor.

G.2.6 Protection:

Existing portions, already worked portions, unused materials and so forth shall be protected by suitable methods, if there is a fear of occurrence of contamination or damage to them.

G.2.7 Post Arrangement:

Post arrangement and clean-up shall be made both inside and outside of buildings and so forth on completion of the works.



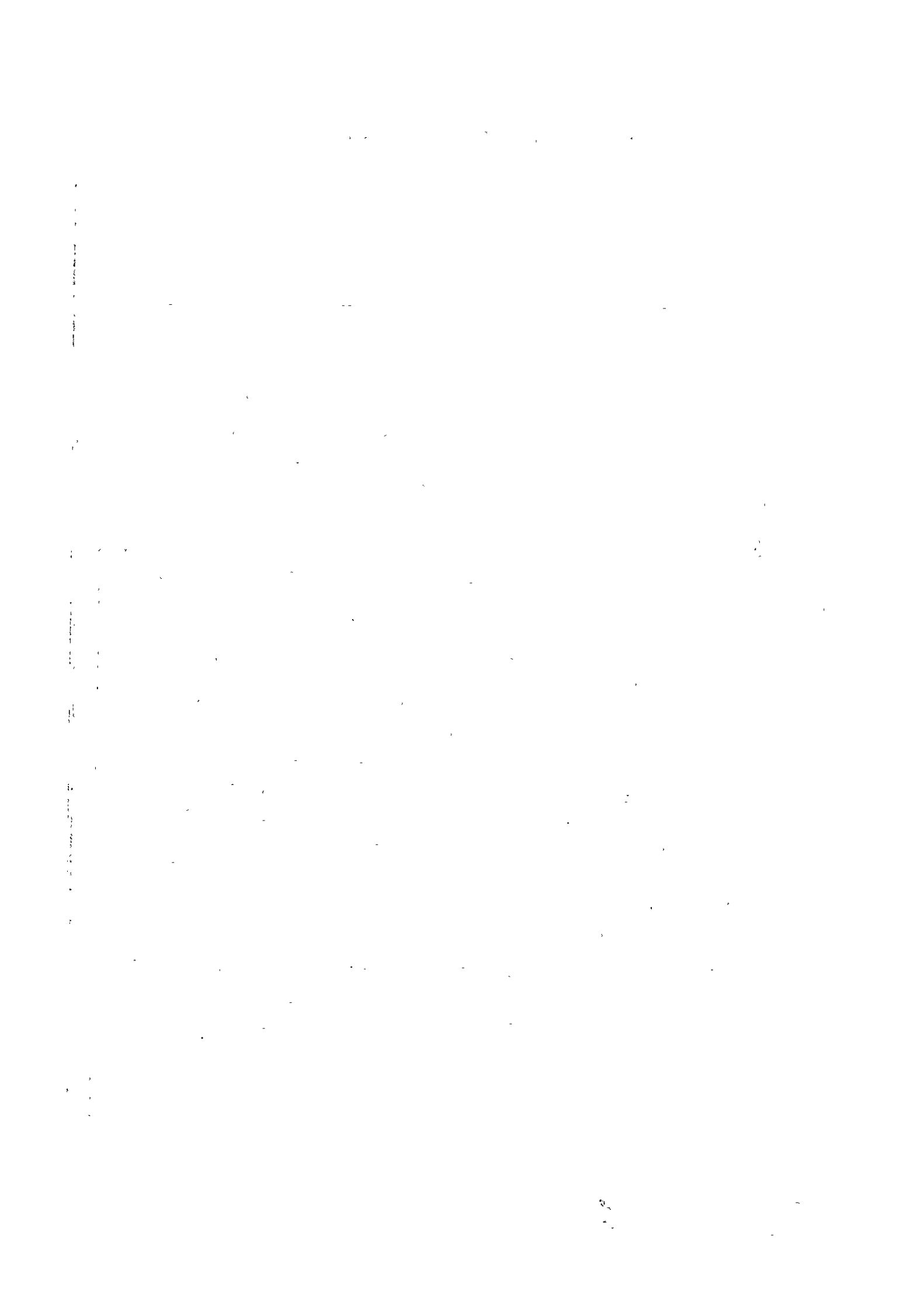
G.3 CONSTRUCTION TIME SCHEDULE, CONSTRUCTION PROGRAM, ETC.:

G.3.1 Construction Time Schedule:

- (a) A construction time schedule shall be drawn up prior to commencement of works, and shall obtain an approval from the Supervisor.
- (b) If any necessity to change the construction time schedule occurs and if such change is important, a revised construction time schedule shall be promptly drawn up and shall obtain an approval from the Supervisor.
- (c) Weekly or monthly time schedule, time schedule classified by kind of work and so forth shall be drawn up and submitted as supplement to the construction time schedule stated earlier, in accordance with the instructions to be given by the Supervisor.
- (d) If there is any relation with works under separate contract, adjustment shall be suitably made in accordance with the instructions to be given by the Supervisor.

G.3.2 Construction Program:

- (a) A construction program which summarizes the comprehensive temporary work shall be drawn up prior to commencement of work, and shall be submitted to the Supervisor.
- (b) A construction program which specifies materials, method of work and so forth in concrete shall be drawn up for each kind of work, and shall obtain an approval from the Supervisor. For the kinds of works which do not require draw-up of construction programs, however, draw-up of construction programs may be omitted with an approval obtained from the Supervisor.
- (c) If there is any relation with works under separate contract, adjustment shall be made in accordance with the instructions to be given by the Supervisor.



G.3.3 Working Drawings, Full Size Drawings, Samples, etc.:

Working drawings, full size drawings, samples, etc. shall be promptly submitted to the Supervisor for approval as required.

G.3.4 Instructions on Color, Pattern, etc.:

Colors, patterns and so forth shall be determined in accordance with the instructions to be given by the Supervisor.

G.3.5 Instructions to Subcontractors:

Documents and so forth drawn up in accordance with the provisions of G.3.1, G.3.2 and G.3.3 shall be released to the related subcontractors for causing them to be thoroughly acquainted with these documents.

G.4 MATERIALS:

G.4.1 Materials:

- (a) The materials to be used shall be new, and they shall be what were inspected and accepted by the Supervisor or what were approved in accordance with the provisions of G.4.3 (b).
- (b) If the quality of any material is not clearly specified, the material of balanced quality shall be used.
- (c) If "article conforming to JIS (Japanese Industrial Standards)" is specified in the design documents for a material, the material to be used shall be what has JIS approval mark indication or what has JIS approval certificate.
- (d) If "article conforming to JAS (Japanese Agricultural Standards)" is specified in the design documents for a material, the material to be used shall be what has JAS mark indication or what has JAS approval certificate.
- (e) The materials requiring proportioning shall be approved by the Supervisor with a proportioning chart submitted to him.

G.4.2 Reporting of Carry-in of Materials:

Each time when a material is carried in, it shall be assured that it satisfies the conditions specified in the design documents, and this carry-in shall be promptly reported to the Supervisor in writing with corroborative data attached as required. With non-important materials, however, this reporting may be omitted with an approval obtained from the Supervisor.

G.4.3 Inspection of Materials:

- (a) Inspection of materials by the Supervisor shall be made with every kind of material. However, there are cases where inspection is omitted for non-important materials.
- (b) Once a material is inspected and accepted by the Supervisor, it shall be regarded that materials of the same kind may be continually used without inspection, except for the materials which are particularly instructed by the Supervisor.

G.4.4 Test Accompanying Material Inspection:

- (a) The test accompanying material inspection shall be conducted in any of the following cases.
 - (1) Test is specified in the design documents.
 - (2) It is not possible to corroborate that a material satisfies the conditions specified in the design documents unless a test is conducted.
- (b) The test specimen shall be prepared with an approval obtained from the Supervisor.
- (c) The test shall be conducted at a suitable place such as a public test institute, other test institute and work site, and an approval shall be obtained from the Supervisor on the decision of the test place.

The test shall be witnessed by the Supervisor as a rule, except for the case where the test is conducted at a public test institute.

- (d) When the test is completed, the test record shall be promptly submitted to the Supervisor.

G.5 EXECUTION OF WORKS:

G.5.1 Execution of Works:

The construction works shall be executed in accordance with the design documents as well as the construction time schedule, construction programs, working drawings, full size drawings and so forth approved by the Supervisor.

G.5.2 Confirmation of Completion of a Process and Reporting:

When one process of construction works is completed, it shall be confirmed that the completed work conforms to the conditions specified in the design documents. Furthermore, the confirmed matters shall be reported to the Supervisor in writing at a suitable time.

G.5.3 Inspection of Work:

- (a) The inspection by the Supervisor shall be made in any of the following cases. If it is difficult to carry out inspections, however, measures to be taken shall be instructed elsewhere by the Supervisor.

(1) Inspection is specified in the design documents.

(2) Reporting was made in accordance with the provisions of G.5.2.

(3) The work reached the process specified by the Supervisor.

- (b) The portions of works executed by the method of work that is same as an accepted method of work shall be subjected to sampling inspection only by the Supervisor. But this is not the case if otherwise instructed by the Supervisor in particular.

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G.5.4 Witnessing of Execution of Works:

Witnessing of execution of works by the Supervisor shall be made in any of the following cases.

- Witnessing is specified in the design documents.
- The Supervisor instructs it in particular.

G.5.5 Test Accompanying Inspection of Execution of Works:

(a) The test shall be conducted in any of the following cases.

- (1) Test is specified in the design documents.
- (2) It is not possible to corroborate that the work satisfies the conditions specified in the design documents unless a test is conducted.

(b) The test specimen shall be prepared with an approval obtained from the Supervisor.

(c) The test shall be conducted at a suitable place such as a public test institute, other test institute and work site, and an approval shall be obtained from the Supervisor on the decision of the test place.

The test shall be witnessed by the Supervisor as a rule, except for the case where the test is conducted at a public test institute.

(d) When the test is completed, the test record shall be promptly submitted to the Supervisor.

G.6 RECORDING:

G.6.1 Recording:

(a) A document that describes general progress of the works shall be drawn up every week as a rule, and shall be submitted to the Supervisor.

(b) The matters which were instructed by the Supervisor or the matters which were deliberated with the Supervisor shall be recorded and the record shall be submitted to the Supervisor. However, it is permitted to omit recording of non-important matters.

(c) Necessary data such as photographs of works, samples, test records or the like shall be consolidated and submitted to the Supervisor if instructed by the Supervisor in the case where the Supervisor considers that it is necessary to corroborate that execution of works is suitable.

G.6.2 Completion Drawings:

On completion of the construction works (excluding intermediate completion), location maps, site plans, plans, finishing schedule and so forth of the objects of works shall be drawn up in accordance with the instructions to be given by the Supervisor, and shall be submitted to the Supervisor.

G.7 SPECIAL PROVISION

G.7.1 Units and Standards

Units of length, area, volume, mass (weight), etc. are indicated as a metric system and JIS (Japan Industrial Standard) and JASS (Japan Architectural Standard Specification) are used in these specifications and drawings.

G.7.2 Outline of the Construction

1) Title of the Construction

National Broadcasting House of Radio Bangladesh

2) Land

a) Place Name: Sher-E-Bangla, Dacca, Bangladesh

b) Area: 8,813.655 m²

3) Buildings

a) Kind of construction: New construction

b) Main structure: Ferro-concrete, Brick

c) Building area: 2,052.00 m²

d) Total floor area: 4,476.00 m²

e) Floor area by building

i. Studio house G. fl. 1,656.00 m²

1 fl. 1,080.00 m²

2 fl. 120.00 m²

P.H.fl. 3,936.00 m²

ii. Annex

G. fl. 540.00 m²

Total 540.00 m²

4) Extent of the construction

All the facilities, labor, construction equipment and materials necessary to complete the construction described in the design drawings, specifications, site explanatory notes and construction contract shall be supplied, and all works shall be executed under appropriate management.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list includes names such as Mr. J. H. Smith, Mr. W. B. Jones, and Mrs. A. M. White, among others. The addresses are given in full, including street names, cities, and states.

a) Building construction

- i. Construction of building
- ii. Electric equipment installation
- iii. Sanitary plumbing and air conditioning and ventilation

b) Exterior construction

- i. Drainage ditch and trench

1. The first part of the document is a list of names and titles, including the names of the authors and the titles of their works. This list is organized in a structured manner, likely serving as a table of contents or a reference list for the document.

G.7.3 Supervisor:

The supervisor in this construction refers to an authorized architect for supervision, or his representative or his site clerk. All the instructions, approvals and inspections made by him through his site representative shall be regarded to be made on the authority and responsibility of the authorized architect. In this case, the important matters out of those instructed and approved by the supervisor shall be promptly confirmed in writing with his seal.

G.7.4 Doubts and Slight Alterations:

- (a) If there are any differences in the contents of drawings and specifications, unless clearly stated, all shall be according to the instructions of the supervisor. In this case, slight alterations in material sizes, fitting positions of fitting methods in view of settlement, fitting, etc. on the site, or in adjustment of fitting quantity due to the above, and so on shall be performed according to the instructions of the supervisor. In this case, the contract amount shall not be adjusted.

If there is any point that is unknown or that cannot be understood in the drawings and/or specification, the Contractor shall immediately ask the staff in charge to make explanation of the subject point for correctly seizing the intention of design, without starting execution of the work with the subject point kept in unclear state. If a representative point only is clearly indicated or explained in the drawings and/or specification and explanation is omitted in other places, the work shall be carried for said other places in the manner identical to that for said representative point. If any conflicting point is found in the drawings and/or specification, it shall be immediately pointed out to the staff in charge and a reply should be obtained before executing the work of the subject point. If the work of the subject point is executed without obtaining a reply to the doubt, the Contractor is responsible to make immediate modification. Those matters

which are naturally required, even though they may not be clarified in the drawings and/or specification, shall be worked and adjusted on deliberation with the staff in charge.

- (b) Arrangement and other correct positions of various articles indicated in the design drawings shall be determined by approval of the working drawings after adjustment of matching and connection of works with other works by the staff in charge. Minor changes specified by the staff in charge and those matters which naturally require working from the standpoint of appearance and technology, even though they may not be clearly indicated in the drawings or specification, shall be worked without objection, in accordance with the instructions to be given by the staff in charge.

G.7.5 Construction:

- (a) Matching with other works:

The Contractor of this work shall maintain close communication with contractors of other works, and shall make preliminaries with them with good will to each other in order that no obstruction will occur in the progress of the work.

- (b) Water, power, etc. for work:

All of the machinery and equipment for electric power for the work and the equipment for water for work (including potable water) shall be born by the Contractor, and they shall be completely withdrawn after use.

- (c) Responsibility for disasters and recovery:

Thorough guarding shall be made during the work in preparation for damage such as theft, fire and breakage of temporary equipment and of various materials for work. If any breakage occurs to any road, if any injury to occurs to any worker or passerby or if any damage occurs to any structure in the neighborhood under the responsibility of the Contractor, the contractor shall make compensation or shall carry out repair on his expense.

1. The first part of the document is a list of names and addresses, which appears to be a directory or a list of contacts. The names are listed in a column, and the addresses are listed in a column next to them. The names are: [Illegible names]. The addresses are: [Illegible addresses].

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(d) Reporting of progress:

Progress reports indicating situation of working of workers, advancement of work, carry-in and carry-out of materials, weather and so forth as well as photos indicating processes shall be submitted in the formats specified by the staff in charge.

A work daily report shall contain the weather, contents of work, attendance of workers classified by craft and so forth and shall be submitted daily in two copies. A work monthly report shall contain a summary of contents of work, accomplishments, photos indicating processes, attendance of workers and arrival of materials for a month, and shall be submitted once a month in four copies.

(e) Photos of construction:

The photos of construction [see G.6.1 (a)] shall be taken according to the instructions of the supervisor (as shown in Table 1), and shall be attached to specified forms for submission.

Table 1

Shooting place	Shooting time	Number of Shooting times	Remarkers
Status quo of site (4 places)	Before start of construction	4 each	3 copies each in cabinet size
Under construction (4 places)	Twice a month during construction	4 each	- " -

G.7.6 Final Report, Inspection, etc.:

(a) Trial run and adjustment:

The equipment shall be thoroughly adjusted before taking-over, and the methods of adjustment in various cases shall be fully explained to the staff of the Owner in charge before taking-over. The trial run manual, report of trial run and adjustment as well as equipment instruction manuals shall be submitted prior to taking-over.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list includes names such as Mr. J. H. Smith, Mr. J. B. Jones, and Mr. W. D. Brown. The addresses are given in full, including the street name, city, and state.

(b) Inspection of work:

- (1) Each work shall be inspected when it reaches the process specified by the supervisor and this specification, and an approval certificate shall be obtained before proceeding to the next process.
- (2) If inspection after completion of work is impossible or hard, the subject work shall be executed in witness of the supervisor.
- (3) Tests such as water fill-in, water reduction, water discharge, water leakage, water spray and air delivery shall be conducted with various equipment, pipings, ducts and others and trial run of chillers, airconditioners, pumps, fans, etc. shall be made under the responsibility of the Contractor during execution of work and also on completion of work.

(c) Final inspection:

- (1) Final inspection shall be carried out in witness of the supervisor on completion of work.
- (2) Measurement and inspection of noise, vibration, air-flow, air-temperature and so forth shall be made as required with various equipment at the time of completion of work, and a report of measurement and inspection shall be submitted. Acoustic measurements shall be taken in accordance with the acoustic measuring instruction manual and other measurements and inspections shall be made in accordance with the instructions to be given by the staff in charge.

(d) Drawing of completion construction:

When the construction is completed, general drawings, sectional detail drawings, detail drawings of principal portions, completion drawings of electric equipment installation, and sanitary plumbing and thermo-humidistatic equipment installation shall be prepared, and each original drawing with copies of blueprints shall be submitted to the supervisor.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list is as follows:

- Mr. A. B. C. 123 Main St. New York, N.Y.
- Mr. D. E. F. 456 Broadway, New York, N.Y.
- Mr. G. H. I. 789 Park Ave. New York, N.Y.
- Mr. J. K. L. 1010 Fifth Ave. New York, N.Y.
- Mr. M. N. O. 1212 Third St. New York, N.Y.
- Mr. P. Q. R. 1414 Second St. New York, N.Y.
- Mr. S. T. U. 1616 First St. New York, N.Y.
- Mr. V. W. X. 1818 West St. New York, N.Y.
- Mr. Y. Z. A. 2020 East St. New York, N.Y.
- Mr. B. C. D. 2222 North St. New York, N.Y.
- Mr. E. F. G. 2424 South St. New York, N.Y.
- Mr. H. I. J. 2626 Central St. New York, N.Y.
- Mr. K. L. M. 2828 Union St. New York, N.Y.
- Mr. N. O. P. 3030 Madison St. New York, N.Y.
- Mr. Q. R. S. 3232 Washington St. New York, N.Y.
- Mr. T. U. V. 3434 Madison St. New York, N.Y.
- Mr. W. X. Y. 3636 Broadway, New York, N.Y.
- Mr. Z. A. B. 3838 Broadway, New York, N.Y.
- Mr. C. D. E. 4040 Broadway, New York, N.Y.
- Mr. F. G. H. 4242 Broadway, New York, N.Y.
- Mr. I. J. K. 4444 Broadway, New York, N.Y.
- Mr. L. M. N. 4646 Broadway, New York, N.Y.
- Mr. O. P. Q. 4848 Broadway, New York, N.Y.
- Mr. R. S. T. 5050 Broadway, New York, N.Y.
- Mr. U. V. W. 5252 Broadway, New York, N.Y.
- Mr. X. Y. Z. 5454 Broadway, New York, N.Y.
- Mr. A. B. C. 5656 Broadway, New York, N.Y.
- Mr. D. E. F. 5858 Broadway, New York, N.Y.
- Mr. G. H. I. 6060 Broadway, New York, N.Y.
- Mr. J. K. L. 6262 Broadway, New York, N.Y.
- Mr. M. N. O. 6464 Broadway, New York, N.Y.
- Mr. P. Q. R. 6666 Broadway, New York, N.Y.
- Mr. S. T. U. 6868 Broadway, New York, N.Y.
- Mr. V. W. X. 7070 Broadway, New York, N.Y.
- Mr. Y. Z. A. 7272 Broadway, New York, N.Y.
- Mr. B. C. D. 7474 Broadway, New York, N.Y.
- Mr. E. F. G. 7676 Broadway, New York, N.Y.
- Mr. H. I. J. 7878 Broadway, New York, N.Y.
- Mr. K. L. M. 8080 Broadway, New York, N.Y.
- Mr. N. O. P. 8282 Broadway, New York, N.Y.
- Mr. Q. R. S. 8484 Broadway, New York, N.Y.
- Mr. T. U. V. 8686 Broadway, New York, N.Y.
- Mr. W. X. Y. 8888 Broadway, New York, N.Y.
- Mr. Z. A. B. 9090 Broadway, New York, N.Y.
- Mr. C. D. E. 9292 Broadway, New York, N.Y.
- Mr. F. G. H. 9494 Broadway, New York, N.Y.
- Mr. I. J. K. 9696 Broadway, New York, N.Y.
- Mr. L. M. N. 9898 Broadway, New York, N.Y.
- Mr. O. P. Q. 10000 Broadway, New York, N.Y.

(e) Photos of completion construction:

When the construction is completed, completion photos shall be taken according to Table 2, and submitted according to the specified form.

Table 2

	Shooting place	Number of shooting times	Remarks
Photo A	Main interior & exterior points according to instructions	Black & white 50	4 copies each in cabinet size (in albums with negative)
Photo B	- " -	Color 20	5 copies each in cabinet size (in albums with negative)

(f) Drawing to be submitted on completion of work:

The following documents shall be submitted at the time of taking-over on completion of work.

(1) Reference Report

Outline of the building, outline of facilities, name of contractor, list of manufacturers, list of keys, list of the documents to be submitted to the owner, etc. shall be contained.

(2) Facilities operation manual

Method of handling and method of maintenance of equipment shall be clearly described with piping system diagram, duct system diagram, operation panel, etc. attached to it.

(3) Equipment operation manual

The method of operation and method of maintenance shall be clearly described for each equipment.

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- (4) Equipment test records
- Equipment shop drawings
- Equipment catalogs

The above documents shall be submitted to the supervisor in three copies. In addition, a system diagram for ducts and pipings (separately for water supply/drainage and airconditioning) shall be color coded by the 4 system. This diagram shall be put in a picture frame and shall be put up in the machine room.

1. The first part of the document is a list of names and addresses, which appears to be a directory or a list of contacts. The names are listed in a column, and the addresses are listed in a column to the right of the names. The names are: [Illegible names]

2. The second part of the document is a large block of text, which appears to be a letter or a report. The text is very faint and difficult to read, but it seems to contain several paragraphs of information. The text is: [Illegible text]

3. The third part of the document is a list of names and addresses, which appears to be a directory or a list of contacts. The names are listed in a column, and the addresses are listed in a column to the right of the names. The names are: [Illegible names]

G.7.7 Standard, Language Unit and, etc.:

(a) Standards, specifications, bye-laws:

In various places throughout this specification reference is made to the Standards, Specifications and Bye-laws issued by the Japanese Standards Association, the American Society for Testing Materials, the British Standards Institution, various Ministries and Departments of the Government of Bangladesh and other Authorities. These references shall in every case be deemed to include the latest edition of issue of such Standards, Specifications and Bye-laws, including all revisions, amendments and addenda issued up to the date of invitation to tender.

(b) Abbreviations for standards, etc.:

The following abbreviations for Standards, Specifications, Bye-laws, etc., and the names of institutions issuing same are used throughout this specification:

JIS Japanese Industrial Standards
by the Japanese Standards Association

ASTM ASTM Standards
by the American Society for Testing Materials

BS British Standards
by the British Standards Institution

(c) Nominal equivalents:

The following nominal equivalents are used throughout this specification:

INCH SIZE	METRIC SIZE (mm)
1	25.4
12	304.8

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

(d) Gauges:

Gauges for indicating sheet metal thicknesses and wire diameters are by the United States Standards Gauge (USSG).

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

(e) Language:

At least one (1) of the Contractor's competent representatives on the Site shall be fluent in the written and spoken English language. In addition the Contractor shall retain, when required by the Supervisor, the services of such personnel who are conversant with both Bengali and English languages in order to ensure the proper progress and supervision of the Works. When required by the Supervisor, any drawing and any documents written in Bengali shall be accompanied by English translation.

(f) Singular and plural:

Words in singular shall include the plural wherever the context so indicate, and the plural shall include the singular if so connoted.

(g) Unit system:

All drawings, documents and all written communications submitted by the Contractor shall be in the metric system of weight and all measures unless otherwise required by the Supervisor.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It includes a detailed description of the experimental procedures and the statistical tools employed.

3. The third part of the document presents the results of the study, showing the trends and patterns observed in the data. It includes several tables and graphs to illustrate the findings.

4. The fourth part of the document discusses the implications of the results and provides recommendations for future research. It highlights the areas that need further exploration and the potential applications of the findings.

5. The fifth part of the document concludes the study, summarizing the key points and reiterating the significance of the research. It expresses the authors' appreciation for the support and assistance provided throughout the project.

6. The sixth part of the document contains the references and citations used in the study. It lists the sources of information and the works consulted during the research process.

7. The seventh part of the document includes the appendices, which provide additional information and data related to the study. These appendices are essential for a comprehensive understanding of the research.

8. The eighth part of the document contains the index, which allows readers to quickly locate specific sections and topics within the document. It is a valuable tool for navigating the content.

9. The ninth part of the document includes the glossary, which defines the key terms and concepts used in the study. This helps to ensure clarity and consistency in the language used.

10. The tenth part of the document contains the acknowledgments, where the authors express their gratitude to the individuals and organizations that supported the research. It is a place to recognize the contributions of others.

11. The eleventh part of the document includes the list of figures and tables, which provides a clear overview of the visual elements included in the study. This helps readers to identify the specific data points and trends.

12. The twelfth part of the document contains the abstract, which provides a concise summary of the entire study. It is the first section that readers encounter and is crucial for understanding the main findings.

13. The thirteenth part of the document includes the introduction, which sets the context for the study and outlines the research objectives. It is the starting point for the reader's journey through the document.

14. The fourteenth part of the document contains the literature review, which provides a comprehensive overview of the existing research in the field. It helps to identify the gaps in knowledge and the need for the current study.

15. The fifteenth part of the document includes the methodology, which describes the research design and the procedures used to collect and analyze data. It is a critical section for understanding the validity and reliability of the study.

16. The sixteenth part of the document contains the results and discussion, which presents the findings of the study and discusses their implications. It is the core of the research and where the authors' interpretations are shared.

17. The seventeenth part of the document includes the conclusion, which summarizes the main findings and provides a final perspective on the study. It is the last section that readers encounter and is essential for understanding the overall message.

18. The eighteenth part of the document contains the references, which list the sources of information used in the study. It is a key component of academic writing and is essential for giving credit to the original authors.

19. The nineteenth part of the document includes the appendices, which provide additional information and data related to the study. These appendices are essential for a comprehensive understanding of the research.

20. The twentieth part of the document contains the index, which allows readers to quickly locate specific sections and topics within the document. It is a valuable tool for navigating the content.

SECTION 1
TEMPORARY WORKS

1.1 GENERAL:

1.1.1 Materials for Temporary Works:

Old materials which are not objectionable for use may be used for construction of temporary works.

1.2 STAKING-OUT, BATTER BOARDS, SCAFFOLDINGS, ETC.:

1.2.1 Confirmation of Site Conditions and Staking-out:

The Contractor shall confirm the site conditions, stake out the position of buildings or structures and have them inspected by the Supervisor.

1.2.2 Bench Mark:

(a) The Contractor shall provide bench marks by use of wooden or concrete stakes in such manner that the stakes are protected from movement. Provided, that fixed object may be used as bench marks.

(b) The bench marks shall be subjected to the inspection by the Supervisor.

1.2.3 Batter Board:

(a) Following the staking-out, batter boards shall be erected on the corners of the buildings or structures sufficiently away from the building line so that the work will not be obstructed.

(b) The batter boards shall have their top edge planed and nailed to batter stakes in horizontal position.

(c) The batter board shall clearly indicate the position and grade of the buildings or structures and shall be subjected to the inspection by the Supervisor.

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1.2.4 Scaffoldings, etc.:

- (a) Scaffoldings, stagings and enclosures shall be made of appropriate materials and shall have appropriate construction.
- (b) Stationary scaffoldings and stagings shall be offered for use by other contractors free of charge.

1.3 MATERIAL STORAGE, SHOPS AND OTHER TEMPORARY BUILDINGS:

1.3.1 Material Storage, etc.:

- (a) Material storages and shops shall be of appropriate construction.
- (b) Storages for cement, etc. shall be of appropriate construction to prevent rain water and moisture.
- (c) Yards for sand and gravel shall be of appropriate construction to prevent the mixing of the materials or mixing with earth.

1.3.2 Storage for Inflammables:

Storage for inflammables such as paints and oils shall be provided as far away as possible from the buildings, shops and other storages and shall have its roof, interior or exterior walls and ceiling made of fire-proof or non-inflammable materials. Doors to the storage shall be provided with locks and a sign "Inflammables" posted on them and fire extinguishes placed nearby.

1.3.3 Size and Finish of the Supervisorand:

- (a) The Supervisorand shall have a floor space of more or less 50 m².

Table 1.3.1 Finishing Schedule of the Supervisorand

Name	Finish
Floor	Carpet
Interior wall, Ceiling	Plywood or plaster board painted with synthetic resin emulsion paint.
Roof	Colored iron sheet or iron sheet with ready-mixed paint.

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1.3.4 Furnishings of the Supervisorand:

(a) The Supervisorand shall be provided, at the request of the Supervisor, with the facilities such as lighting, water supply and drainage, etc. and with the following furnishings as necessary.

- Desk, chair, book shelf, blackboard, drawing board, clock, thermometer.
- Rubber boots, rain wear, head gear, flash light.
- Extended telephone (where Contractor has parent telephone).
- Locker, extinguisher, boiler tools for cleaning cooler.

(b) The Contractor shall bear the charges for electricity, gas, water, telephone and for cleaning toilet, etc.

1.3.5 Others:

(a) No labor camps shall be provided within the site of construction.

(b) A sign board showing the name of project and owner, etc. shall be posted at appropriate location at the site of construction.

1.3.6 Construction Photographs:

Photographs to be submitted to the Engineer by the Contractor before the commencement of work to record the site conditions shall show the entire features of the site by means of continuous shooting, bird's-eye-view shooting, etc. at not less than 15 places.

At the direction of the Supervisor, topographical features and objects and the relation with the existing structures which may present causes of claims during and after the work shall also be recorded by means of photographs.

SECTION 2

EXCAVATION, GRADING, FILLING AND BACKFILLING

2.1 SCOPE OF WORK:

2.1.1 Extent: The work required under this section consists of all excavation, grading, filling, backfilling and related items necessary to complete the work indicated on drawings and described in specifications.

- (a) In general the items of work to be performed under this section shall include but is not limited to: Clearing and grubbing, removal of trees and stumps, protection of trees to remain, excavation for buildings and structures, removal of underground obstructions when indicated or specified, backfilling, filling, fill compaction as indicated on drawings or as required.
- (b) Excavated material that is suitable may be used for fills and backfills indicated or required. All unsuitable material and all surplus excavated material not required for site grading or backfill, shall be removed to the dump directed by the Supervisor.
- (c) Provide and place any additional fill material from off the site as may be necessary to produce the grades or rough subgrades required. Fill obtained from off site shall be of kind and quality as specified for fills herein, and the source approved by the Supervisor.
- (d) The Contractor shall accept the site as he finds it and remove all trash and rubbish from area to be occupied by new buildings, roads, surfaced areas, and other areas required to complete the work prior to starting excavation.
- (e) Where adjacent lawn or surface areas within the site and/or adjacent lots are disturbed as a results of building operations or storage of materials under this Contract, they shall be cleaned of all debris and restored to original grades and condition.

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

- (a) Excavation and backfilling for utility lines.
- (b) Final shaping of subgrade under outside paved areas.
- (c) Placing topsoil and performing finished grading.

2.2 BENCH MARKS AND MONUMENTS:

2.2.1 After determination of the standard level of buildings, the Contractor shall establish the bench mark at places and/or existing structures free from removal and destruction and obtain the confirmation of the Supervisor. Maintain carefully all bench mark, monuments and other reference points; if disturbed or destroyed, replace as directed by the Supervisor.

2.3 LOCATIONS AND ELEVATIONS:

2.3.1 The Contractor's surveyor shall locate by stake and/or mark, the locations and/or elevations for the following:

- (a) All building corners and structure corners.
- (b) Under-slab elevations for slab on fill.
- (c) Lines and grade and/or fill elevations for pavings and sidewalks.
- (d) All other items required to execute the work under this section.

2.4 EXCAVATION FOR BUILDINGS AND STRUCTURES:

2.4.1 Planning: The contractor shall submit excavation planning drawings for approval of the Supervisor. The drawings shall indicate the dimensions, procedures and methods of excavation.

2.4.2 Dimensions: Excavate to elevations and dimensions indicated; allow additional space as required for construction operations and inspecting foundations.

2.4.3 Obstructions: Completely remove all existing walls, slabs, curbs, paving, floors, steps, footings, piers and other construction from under new foundations.

2.4.4 Suitable Bearings for Foundations: If suitable bearing is not encountered at the depth indicated on drawings for foundations, the Contractor shall immediately notify the Supervisor; he shall not proceed further until instructions are given and necessary measurements made for purpose of establishing additional volume of excavation.

1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order, and the addresses are given in full. The list includes the names of the members of the committee, the names of the members of the sub-committee, and the names of the members of the advisory committee. The addresses are given in full, including the street name, the city, the state, and the zip code.

2.4.5 Shoring: Shore, sheet pile and brace excavations as required to maintain them secure; remove shoring as the backfilling progresses, but only when banks are safe against caving or collapse.

2.4.6 Drainage: The Contractor shall control the grading around buildings so that ground is pitched to prevent water from running into the excavated areas or damaging the structures. Maintain all pits and trenches where footings are to be placed, free of water at all times. Provide all pumping required to keep excavated spaces clear of water during construction. Should any springs or running water be encountered in the excavation, the Supervisor shall be notified and the Contractor shall provide free discharge of it by trenches and drain to an appropriate point of disposal as directed.

2.4.7 Footing Trenches: Where soil conditions will permit, footing trenches may be excavated to the exact dimensions of the concrete, and side forms omitted. Place footings and foundations upon undisturbed and firm bottoms; fill with concrete any excess cut under footings and foundations. Fill excess cut under slabs with gravel and thoroughly compact.

2.5 FILL UNDER FLOOR SLABS ON GRADE:

2.5.1 Where fill is required to raise the subgrade for concrete floor or terrace slabs to the elevations indicated on drawings, such fills shall be of earth or bank-run gravel, placed and compacted as specified. Either earth or bank-run gravel shall be used for fills not exceeding 30 cm deep; only bank-run gravel or other approved material shall be used for fills greater than 30 cm. The type and quality of material for fills shall be approved by the Supervisor. The placing and compaction of fill under slabs after foundation walls are in place shall be coordinated with the backfilling against the outside of the walls, or walls shall be adequately braced to prevent damage.

2.5.2 Before depositing fill, remove all loam, vegetation and other unsuitable material from areas to receive fill. Do not deposit fill until the subgrade has been checked and approved by the Supervisor. In no case shall fill be placed on a subgrade that is muddy. Deposit fill material in horizontal layers not exceeding 30 cm in depth before compacting.

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Spread fill evenly and compact each layer by uniformly rolling, pneumatic tamping or by other approved equipment to 90 percent maximum density at optimum moisture content over the entire area.

If necessary, soil shall be moistened, or allowed to dry to the correct moisture content before compaction. The finished compacted areas shall be brought to a reasonable true and even plane at the required elevations and shall be approved by the Supervisor prior to further construction operations thereon.

2.6 BACKFILLING FOR BUILDINGS AND STRUCTURES:

2.6.1 Backfill against foundation walls only after the slab has been poured to support the top of the wall and approval of the Supervisor has been obtained. Place and compact backfill so as to minimize settlement and avoid damage to the walls and to waterproofing and other work in place.

2.6.2 Before placing fill, remove all debris subject to termite attack, rot or corrosion, and all other deleterious materials from areas to be backfilled. Deposit backfill in layers not more than 30 cm thick. All fill material shall be reasonably free from roots, plaster, bats and unsuitable material. Stones larger than 10 cm, maximum dimension shall not be permitted in the upper 15 cm of fill. Place the fill material in successful horizontal layers, in loose depth as specified, for the full width of the cross section.

Thoroughly compact each layer by rolling or pneumatic tamping after a light sprinkling with water. The finished subgrade shall be brought to elevations indicated and sloped to drain water away from the building walls. Fill to required elevations any areas where settlement occurs.

SECTION 3
REINFORCED CONCRETE WORK

3.1 SCOPE OF WORK:

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

3.2 SHOP DRAWINGS:

- 3.2.1 General: Submit shop drawings for reinforcing steel and formwork to the Supervisor for approval. Obtain approval of drawings prior to fabricating any material or proceeding with the work.

(a) Reinforcing Steel Drawings: Shop drawings for reinforcing steel shall indicate bending diagrams; assembly diagrams, splicing and laps of rods; shapes, dimension and details of bar reinforcing and accessories. Scaled dimensions from structural drawings shall not be used in determining the lengths of reinforcing rods.

(b) Formwork Drawings: Shop drawings of formwork for all reinforcing concrete constructions shall be submitted for approval. Shop drawings shall be complete in all respects and shall show the general arrangement, sizes and grades of lumber, panels, alignments, etc. They shall indicate schedules of placement, construction and control joints with their methods of forming; locations of inserts, tees, sleeves, and other items. The Contractor shall also submit for approval drawings or description of the method of shoring and reshoring and other horizontal concrete members.

3.3 SAMPLES:

- 3.3.1 Upon signing the Contract and from time to time as required the Contractor shall provide and deliver to the testing laboratory

indicated by the Supervisor, at his own expense, samples of the cement aggregates and reinforcements he proposes to use.

- (a) After the initial test of concrete and before the commencement of work, samples of sand and aggregate intended to be used are to be submitted to the Supervisor for approval. The quantities to be submitted are to be as follows:

Sand - 6 kg, gravel (coarse aggregate): 9 kg

which should be representative of consignment. Where a sample is rejected as unsuitable, all material from that consignment must be immediately removed from site. Periodical tests will be taken by the Supervisor to see that the quality of material is maintained and conforms to the standard of the approved samples held.

- (b) Submit samples in duplicate of all classes of reinforcement with manufacturer's test certificates.
- (c) All sampling shall be done by or under the supervision of the Supervisor.

3.4 MATERIALS:

3.4.1 Portland Cement: All cement used in the works is to be portland cement of an approved brand and is to comply with BS 12, ASTM C 150 or JIS R 5210 or equivalent equal.

The bags shall contain 50 kg net $\pm 1\%$ and barrels or containers shall contain multiples thereof.

The cement shall be delivered to the site by the Contractor in the original sealed and branded bags or containers of the manufacturer in batches not exceeding 100 tons and shall be stored in a proper manner off the ground and in fully closed room with roofing to prevent deterioration. Each batch shall be stacked separately and used in the order of delivery. No cement shall be used which has been manufactured more than six (6) months prior to its proposed use on the site.

3.4.2 Aggregates: The aggregates for use in the production of concrete shall be naturally-occurring materials, crushed or uncrushed, and shall be of quality, grading and shape as specified hereinafter. It is to be clean, hard, durable and free from dust, earth, slag or any other deleterious matter.

(a) Coarse aggregate:

- (1) Brick chip shall be the first grade brick material.
- (2) Crushed stone shall be 20 mm or smaller in nominal size.
- (3) The maximum size of the coarse aggregate shall be not larger than one-fifth of narrowest dimensions between the sides of forms of the member for which the concrete is to be used, nor larger than three-fourths of the maximum clear spacing between reinforcing bars.

(b) Fine aggregate:

Fine aggregate shall be 2.5 mm or smaller in nominal size.

- (c) The grading of the aggregate shall be such as to permit the production of sound dense concrete of the strength specified. The final grading approved by the Supervisor shall not varied without his permission.

Following tables indicate standard grading of aggregate;

(1) Coarse aggregate

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

(2) Fine aggregate

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

- (d) The choice and preparation of sites for stockpiling of

aggregates, the number and sizes of stockpiles and the method adopted to prevent segregation of component sizes shall be agreed with the Engineer.

Coarse aggregate shall be stockpiled in separate gradings. When aggregates of different gradings are stockpiled close together, the stockpiles shall be separated by bulkheads. Stockpiles are to be on concrete or other hard surface sufficiently sloped so that water is not retained in the base of the stockpiles. All aggregates are to be handled from the stockpile in such a manner as to secure a typical grading of the material, care being taken to avoid crushing the aggregates and contamination with extraneous matter.

3.4.3 Water: To be clean, free from dirt, vegetable matter, mineral salts or other impurities.

3.4.4 Steel Reinforcement: The steel reinforcement to concrete shall be clean and free from all defects, loose rust, scale or coating that will reduce bond.

(a) Reinforcing

Reinforcing bars to be used shall be M/S bars specified below.

M/S bars allowable unit stress 1,265 kg/cm²
(JIS G 3112)

Where so specified on drawings, mild steel bars of local make shall be used.

(b) Manufacturer's test certificates for all classes of reinforcement shall be supplied. Specimens sufficient for three tensile tests and three cold-bend tests per ten tons of bars or fraction thereof and for each different size of bar shall be sampled under the supervision of the Supervisor. Testing shall be in accordance with BS 785 or other approved standard and batches shall be rejected if the average results for each batch are not in accordance with the specifications.

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(c) Unless otherwise approved by the Supervisor, all reinforcing bars shall be obtained from one manufacturer.

3.4.5 Accessories: Accessories for concrete work shall be of the types approved by the Supervisor and include all spacers, chairs, bolsters, ties, and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place. Metal accessories shall be galvanized where legs will be exposed in finished concrete surfaces.

3.4.6 Asbestos Cement Pipes and P.V.C. Pipes: Asbestos cement pipes to be installed in foundation for water circulation shall conform to JIS A 5301 or shall be of material approved by the Supervisor. P V.C. pipes to be installed for air and water circulation, and drain shall conform to JIS K.6741 or shall be of material approved by the Supervisor. They shall be fixed to the forms prior to depositing of concrete. Dimensions and locations shall be as shown on drawings.

3.4.7 Expansion Joint Fillers: Expansion joint fillers shall be asphalt impregnated fiberboard as "Maruesu Board" manufactured by Nisshin Kōgyō Co., Ltd. or equal. Joint sealer shall be asphalt conforming to JIS A 6011, Type 4 or materials approved by the Supervisor. Expansion joint fillers may be of wood boards of a species appropriate for the purpose and approved by the Supervisor.

3.4.8 Protect all reinforcement and other materials until used.

3.5 FORMWORK:

3.5.1 Forms shall be of wood, well constructed and of sufficient strength to safely sustain construction loads and shall conform to the shape, lines and dimensions of the concrete as shown on the drawings. Forms shall be set to line and grade and so constructed and secured as to produce true lines, and shall be substantial and sufficiently tight to prevent leakage of mortar, special care shall be used to prevent bulging.

Forms for all concrete work shall be constructed with special care

- to secure a smooth workmanlike finish on all surfaces for concrete work which is to remain exposed.
- Do not coat forms with material that will stain or cause injury to exposed concrete surfaces or to plaster applied direct to concrete.
- 3.5.2 Provide access openings for cleaning and inspecting forms and reinforcing. Before placing concrete, the forms shall be thoroughly cleaned of all shavings, wood blocks and other undesirable matter, and shall be wet down before concrete is deposited.
- 3.5.3 Forms for exposed concrete beams, girders and columns shall provide for a 2.5 cm radius or flat bevel on external corners. Form materials for fair face finish surfaces shall be of wrought timber/board, mortised and tenoned, or other approved materials to make the uniformly smooth concrete surfaces. Where indicated, provide the forms with wrought wood ribs of shape, and in sizes and spaces as shown on drawings to produce the decorative grooved surface finish. Form ties used for exposed concrete surfaces shall be of type approved by the Engineer. Construct forms for beams, girders and lintels so that sides may be removed without disturbing bottom of form or its support.
- 3.5.4 Where soil conditions will permit excavation to accurate sizes without bracing, side forms for footings may be omitted and the sides of excavation shall be lined with waterproof paper, or 0.15mm thick polyethylene film.
- 3.5.5 Proper shoring shall be provided under the forms for concrete work to support all construction loads, and reshoring shall be provided for all floor slabs after stripping. Supports for forms shall consist of wood or steel posts of a size and spacing as required to support the weight of the forms, concrete, reinforcement and construction live load. Each post shall be well braced. Reshoring shall be installed simultaneously with stripping. The Contractor shall be responsible for the adequacy of the number and location of reshores. As the support of the ground floor form work will, in general, rest on compressible material, particular

1. The first part of the document is a list of names and titles, including the names of the authors and the titles of their works. This list is organized in a structured manner, likely serving as a table of contents or a reference list for the document.

The main body of the document consists of several paragraphs of text, which appear to be a detailed report or a series of articles. The text is arranged in a standard left-to-right, top-to-bottom format. The content is dense and covers a wide range of topics, though the specific details are difficult to discern due to the low resolution of the scan. The text is organized into distinct sections, with some paragraphs starting with clear indicators of new sections or sub-sections.

care must be exercised to prevent settlement of those support. Forms shall not be removed until a through examination indicates that the floors have developed ample strength to carry the load put upon them, as approved by the Supervisor.

- (1) The formwork shall be left in position before easing and removal for the following minimum period:

	Position	Period (days)
		Mean air temperature More than 15°C
Forms	Foundation, Sides of Beams/Girders Columns, Walls	3
	Soffits of Beams and Slabs	6
Supports	Under Slabs	17
	Under Beams/Girders	28

- (2) Formwork shall be left in place and not disturbed for a longer period than above stated if so required by the condition of the concrete, by severe weather conditions or by the lack of adequate protection, as determined by the Supervisor, however, the Contractor shall be responsible for any injury to the work and any damages caused by or arising from the removal or striking of moulds, centering and supports.

3.6 INSERTS AND FASTENING DEVICES FOR OTHER WORK:

- 3.6.1 Provide for installation of inserts, conduit, pipe sleeves, drains, hangers, metal ties, shelf angle supports, anchors, bolts, angle guards, stair nosings, dowels, thimbles, anchor slots, metal re-lets, nailing strips, blocking, grounds and other fastening devices required for attachment of other works. Properly locate in cooperation with other trades and secure in position before concrete is poured. Where openings are left in concrete for the passage of ducts, the openings shall be made slightly larger than the duct size as directed by the Supervisor. Do not install sleeves in any concrete girder, beam, joist or column except after approval of the Supervisor.

3.7 PREPARING AND PLACING REINFORCEMENT:

3.7.1 Reinforcement shall conform accurately in size and position to the requirements of the drawings.

Place reinforcement accurately in position shown, securely fasten and support to prevent displacement before or during pouring.

3.7.2 Reinforcement shall be supported on wire chairs or other approved supports. At intersections, the rods shall tightly bound together by use of annealed iron binding wire.

3.7.3 Before being placed, all reinforcement shall be cleaned loose of rust, scale or coating of any kind which will reduce the bond between the steel and concrete.

3.7.4 Before pouring concrete, the reinforcement shall be inspected by the Supervisor for approval.

3.7.5 Concrete Covers to Reinforcement: Minimum concrete covers to reinforcement shall be as shown on drawings.

3.8 STRUCTURAL CONCRETE:

3.8.1 Concrete shall be a mixture of cement, fine aggregates, coarse aggregates and water, and as specified hereinafter.

3.8.2 Mix proportions of concrete shall be planned on the basis of the table of concrete strength (Table 3.8.3) and be approved by the Supervisor.

For inspections, tests and other matters necessary for the control of concrete strength the Supervisor instructions shall be followed.

3.8.3 Concrete strength:

Table 3.8.3

Marking	Type of concrete	Aggregate	28-day minimum compressive strength of test piece kg/cm ²
FC180	STRUCTURAL CONCRETE	Brick chip	180

3.9 BATCHING AND MIXING OF CONCRETE:

3.9.1 All materials for concrete shall be accurately measured. Cement shall be batched by weight and the water by weight or volume. Each size of aggregate shall be measured in by means of gauge boxes/containers of sizes approved by the Supervisor.

3.9.2 Concrete shall be mixed in a batch mixer of a type approved by the Supervisor and in good condition having a drum rotating about a horizontal or inclined axis. Continuous mixers shall not be used. Each mixer is to be fitted with a water measuring device having an accuracy within one percent (1%) of the quantity of water required for the batch. The water measuring device shall be such that its accuracy is not affected by variations in the water supply pressure.

The batch shall be so charged into the mixer that some water (about 10%) enters the drum in advance of the cement and aggregates. Water shall then be added gradually while the drum is in motion such that all required water shall be in the drum by the end of the first quarter of the mixing time. The concrete shall be mixed until a mixture of uniform color and consistency is obtained. Where double-drum, high performance mixers of a type approved by the Supervisor are used, a minimum mixing time of 70 sec. may be allowed.

The amount of concrete mixed in any one batch is not to exceed the

rated capacity of the mixer. The whole of the batch is to be removed before materials for a fresh batch enter the drum.

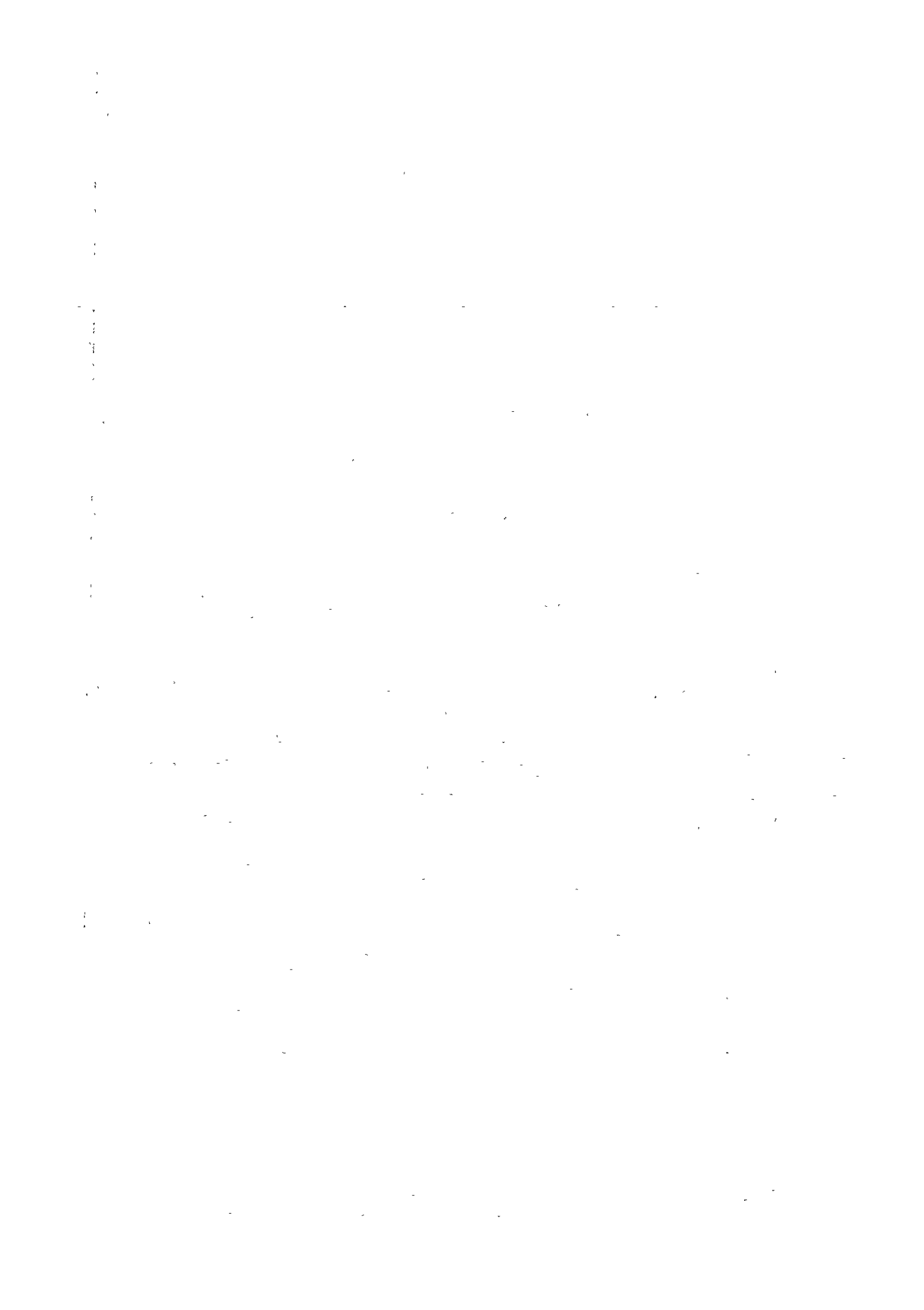
- 3.9.3 On cessation of work, including all stoppages exceeding 20 minutes, the mixers and all handling plant shall be washed with clean mixing water. If old concrete deposits remain in the mixer drum, it shall be rotated with clean aggregate and water prior to production of new concrete.

Concrete mixed as above is not to be modified by the addition of water or in any other manner to facilitate handling or for any other reason.

3.10 DEPOSITING CONCRETE:

- 3.10.1 Preparation: Before placing concrete, all debris and water shall be removed from the places to be occupied by the concrete. Wood forms shall be thoroughly wetted or oiled, and the reinforcement cleaned of oil or other coatings. Formwork and the placement of reinforcement, pipes, sleeves, conduit, hangers, anchors and other inserts shall be inspected and approved by the Engineer.

- 3.10.2 Placing: Concrete shall be rapidly handled from mixer to forms and deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing. In concrete placing, special care shall be taken not to disturb or displace the reinforcements, pipes, wooden bricks and other items to be embedded. Concrete work for high columns shall not be rushed out to the top within a short space of time. In normal cases, concrete for the beams shall be placed simultaneously up to overall depth of beam from the bottom to the slab top. Concrete shall be spadded and worked by hand and vibrated to assure close contact with all surfaces of forms and reinforcement and leveled off at proper grade to receive finish. No concrete that has partially hardened or been contaminated by foreign material shall be deposited in the work, nor shall retempered concrete be used. All concrete shall be placed upon clean, damp surfaces, free from water, and never upon soft mud or dry porous earth. Concrete in bearing walls and



columns shall be placed and allowed to settle two (2) hours before placing concrete superimposed thereon.

3.10.3 Vibration: Concrete shall be placed with the aid of mechanical vibrating equipment. Vibration shall be applied directly to the concrete unless otherwise approved by the Supervisor. The intensity of vibration shall be sufficient to cause flow or settlement of the concrete into place.

Vibration shall be applied at the point of deposit and in the area of freshly placed concrete. It shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures but shall not be long enough to cause segregation of the mix. To secure even and dense surfaces, free from aggregate pockets or honeycomb, vibration shall be supplemented by hand spading in the corners and angles of forms and along form surfaces while the concrete is plastic under the vibratory action. Caution must be exercised when using vibrators and hand spades to prevent any injury to the inside face of the forms or any movement of the reinforcement.

3.11 CONSTRUCTION JOINTS:

3.11.1 Construction joints shall be formed as indicated on drawings, or as approved or directed by the Engineer. Dowels and keys shall be used where indicated or required.

3.11.2 The rate and method of placing concrete and the arrangement of construction joint bulkheads shall be such that the concrete between construction joints shall be placed in a continuous operation.

3.11.3 Joints in reinforced slabs, joists, beams and girders shall be perpendicular to the axis or surface of the member jointed and at the center of the span. If an intersecting member occurs at the point, the joint shall be located at a point of minimum shear.

3.11.4 Unless otherwise indicated by the Supervisor, construction joints in walls, columns, or piers shall be at the top of floor. Whenever it is necessary to stop a day's work, or for any reason, such stops

shall be located at center of slabs and of beams or as directed by the Supervisor.

3.11.5 A temporary wood bulkhead shall be erected so that the jointing will follow a vertical plane at right angles with the direction of the main reinforcement. To this bulkhead fasten a wood strip 5 cm thick and of width equal to one-third the depth of the concrete slab to form a tongue and grooved joint.

3.11.6 Before concreting is resumed, the surfaces of previously placed concrete shall be roughened, cleaned, wetted and slushed with grout immediately before additional concrete is placed. Grout shall be 1-part portland cement and 2-parts sand.

3.12 WEATHER CONDITIONS:

3.12.1 When the shade temperature is about 37°C and rising, special precautions shall be observed during concreting to the satisfaction of the Supervisor regarding the cooling of aggregates, the maintenance of the correct water-cement ratio, and the proper supervision of the work. Concreting shall not be permitted when the shade temperature is above 43°C.

3.12.2 Records shall be kept by the Contractor to show the date of placements, the mix used and the air temperature at time of concreting for the various portions of the work. These records shall be available to the Supervisor when requested.

3.13 PROTECTION AND CURING:

3.13.1 Freshly placed concrete shall be protected from rain, dust storms, chemical attack, and the harmful effects of heat, wind, flowing water, vibrations and shocks. This protection shall continue until the concrete is sufficiently set such that it is no longer damaged by these factors. The Supervisor shall determine when the protection is no longer required, but in any case this shall not be less than 24 hours after the time of placing.

3.13.2 Concrete shall be cured for at least seven (7) days and as required by the Supervisor. Concrete and cement finishes shall be

sprayed during the curing period as frequently as drying conditions may require. Cover the surfaces of the concrete and the cement finishes with cotton mats, canvases or other approved membranes within 24 hours after placing or finishing and maintain in good condition until the installation of permanent floor covering unless otherwise directed. Covering shall be of a type that will not stain or discolor finished concrete surfaces.

Timber formwork covering the concrete shall be moistened with water at frequent intervals to keep it from drying during the curing period. Metal formwork exposed to the sun must be shaded from its direct rays, painted white or otherwise protected during the curing period.

3.14 PATCHING FORMED SURFACES OF EXPOSED CONCRETE:

3.14.1 After the forms have been removed, all concrete surfaces shall be inspected and any pour joints, voids, stone pockets or other defective areas permitted by the Supervisor to be patched, and all tie holes, shall be patched before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than 25 mm with the edges perpendicular to the surface. The area to be patched and a space at least 15 cm wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. Do not fill or patch construction joints or surfaces to receive metallic waterproofing, unless specifically authorized by the Supervisor.

3.14.2 A grout of equal parts of portland cement and sand with sufficient water to produce a brushing consistency shall then be well brushed into the surface, followed immediately by the patching mortar. The patch shall be made of the same material and of the same proportions as used for the concrete except that the coarse aggregate shall be omitted. The amount of mixing water shall be as little as consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for a period of one hour during which time it

shall be mixed with a trowel to prevent setting.

- 3.14.3 The mortar shall be thoroughly compacted into place and screeded off so as to leave the patch slightly higher than the surrounding surface. It shall then be left undisturbed for a period of one to two hours to permit initial shrinkage before being finally finished. The patch shall be finished in such manner as to match the adjoining surface. Tie holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar after first being thoroughly wetted. For holes passing entirely through the wall, a plunger-type grease gun or other device shall be used to force the mortar through the wall.
- 3.14.4 Unexposed formed surfaces of concrete shall be patched as directed by the Supervisor.

3.15 FLOOR SLABS ON EARTH:

- 3.15.1 Concrete floor slabs on earth shall be placed over a well compacted subgrade. Fill under floor slabs shall be 15 cm thick after compaction, consisting of bank run gravel containing not more than 5% clay.

The bed shall be rolled until compacted to required thickness and leveled off to the correct elevation before placing leveling concrete to the thickness indicated on drawings.

- 3.15.2 Over concrete mats lay 0.15 mm thick polyethylene film, or lap joints 15 cm. Stretch and weight edges and laps to maintain their positions until concrete is placed. Do not displace the film. Immediately place concrete of required thickness and strike off at proper levels to receive finishes specified.

- 3.15.3 Except where otherwise specified or indicated, set continuous expansion joint strips where edge of slab abuts vertical surface; seal joint tightly around strips and spaces around pipes penetrating floors. Use coaltar pitch for sealing joints.

3.16 CEMENT FLOOR AND SLAB FINISHES:

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3.16.1. General: Cement finished for floors and other slabs shall be of type specified for the various locations. Where the specific type of finish is not indicated or specified, provide a standard integral monolithic finish for slabs where a separate topping is not required, and provide a standard topping finish for slabs where a delayed separate topping finish is required.

3.16.2. Float Finish: Surfaces of slabs to receive membrane waterproofing shall have a floated finish. Screed surface of base slab and remove surface water and laitance. Floating shall be minimum necessary to produce a smooth even texture surface. Perform floating by hand using a wood float or by power driven float of the metal disc type. Slabs shall be accurately sloped to drains as required.

3.16.3. Separate Topping Finish: Separate delayed topping finish of 30 mm thickness shall be applied to the hardened base slab for all locations where a separate cement topping finish is required.

(a) Treatment of Base Slabs: Where a delayed separate cement topping is applied to the hardened and cured slab, strike the base slab below the finished floor elevation as noted on drawings. Before slab hardens, remove all dirt, laitance and excess water from surface and roughen slab with wire broom or lightly rake to provide bond for the topping. Where waterproofing is required between the base slab and topping, the base slab shall have a floated finish. Just prior to placing topping, remove loose particles of sand and dirt with stiff broom or wire brush. If required, roughen slab by an approved method to provide a mechanical bond. Remove oil or grease spots by washing with 10% solution of muriatic acid or strong washing sode. After cleaning, hose down slab with pressure hose and keep wet for at least six (6) hours. Allow slab to dry until surface water has disappeared. On the wet slab surface, apply a thin neat cement grout, broomed into slab surface a short distance ahead of topping mixture. Spread topping mixture as hereinafter specified to proper thickness.

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- (b) Mixes: Standard topping mix shall consist of 1-part portland cement and 3-parts sand. Not more than 15.14 liters of mixing water shall be used for each bag of cement.
- (c) Mixing: Except as otherwise specified, mixing shall be done in a mechanical batch type mixer and mixing shall continue for at least 1-1/2 minutes after all ingredients are in the mixer. The concrete shall be of the driest consistency possible to work with a sawing motion of the strike-off board, or straightedge. The mix may be slightly varied as directed by the Supervisor, but in no case shall the volume of the coarse material be less than 1-1/2 times the volume of the fine; in no case shall the specified amount of mixing water be exceeded.
- (d) Finish: Compact topping and float to true surface with wood or power driven disc floats. After concrete has hardened sufficiently to prevent excess fine material from working to the surface, it shall be steel troweled to a smooth even finish free from defects and blemishes. No dry cement or mixture of dry cement and sand shall be sprinkled directly on the surface of topping to absorb moisture or to stiffen the mix. After the concrete has further hardened, floors that will be left exposed or uncovered shall have additional trowelling to produce a dense hard finish, free of trowel marks. The finished floor surface shall be sufficiently even to the satisfaction of the Supervisor.

3.16.4 Integral Monolithic Finish: Integral monolithic finish shall be provided for floors indicated on drawings. Apply an integral monolithic finish of mix and workmanship as specified herein to the base slab after it has dried firm, but not yet set.

- (a) Produce standard integral finish by striking surfaces of 30 mm thick concrete added on structural slabs at proper level. Roll or tamp the concrete to force aggregate away from surface and then screed. After screeding and while the concrete is still plastic, float the surface with wood, cork, or metal

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floats or with a power finishing machine. During this operation the surface shall be brought to a true grade by cutting down high spots and filling low spots. Care shall be taken not to overwork the plastic concrete. When the concrete has hardened so that water and fine material will not be worked to the surface, finish with a steel trowel to a smooth and even surface within the tolerances specified and suitable to receive the floor covering specified. Exterior steps and platforms shall be given a float or brushed finish as directed. Do not sprinkle dry cement or a mixture of dry cement and sand directly on the surface to absorb moisture or to stiffen the mix.

(b) The finished surface for integral finished floors shall be sufficiently even to the satisfaction of the Supervisor.

3.17 CEMENTED CHIP BOARD:

- 3.17.1 Cemented chip board cast onto the soffits of concrete floor slabs shall be 25 mm in thickness, and the product as approved by the Supervisor.
- 3.17.2 Cemented chip board shall be fixed onto the horizontal surfaces of form for slabs, butt jointed, horizontally, rectangular or parallel to lines of girders/beams.
- 3.17.3 Forms to receive cemented chip board shall be so constructed that the concrete floor slab should have correct elevations and thickness as shown on drawings.
- 3.17.4 Anchors as indicated on drawings shall be fixed at more than four points in each wood concrete slab to prevent peeling off due to defective placing of concrete.

3.18 INSULATION MATERIAL (Extruded Polysthylene Foam)

- 3.18.1 Insulation material shall be extruded polysthylene foam of 100 mm thick under slabs and approved by a supervisor.

- 3.18.2 Insulation materials shall be set completely horizontally on the forms of slab concrete and be set in parallel and at right angle with beams before pouring concrete.

- 3.18.3 Forms for concrete slab and insulation material shall be set and be adjusted so that finishing levels and thickness shall comply with the drawings.

- 3.18.4 C-shape steel channel shall be fixed under insulation material under roof slabs, complying with the drawings.

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SECTION 4
STEEL WORK

4.1 GENERAL:

4.1.1 Scope of Work:

This section applies to the works for which rolled steel shapes are used as principal structural members.

4.1.2 In-house test:

- (a) Rolled steel shapes which have passed the in-house test by the manufacturers shall be used. The test results shall be submitted to the Supervisor for his approval. Provided however, rolled steel shapes not for heavy duty use may be exempt from the in-house test and the test results only may be submitted to the Supervisor with his prior consent.
- (b) Criteria for the in-house tests by the manufacturers shall be approved by the Supervisor.

4.2 MATERIALS:

4.2.1 Rolled Steel Shapes:

Rolled steel shapes shall conform to the requirements of the following standards and the quality and designation of standard products shall be as shown on the drawings.

JIS G3101 (Rolled steel shapes for ordinary structures)

JIS G3444 (Carbon steel pipes for ordinary structures)

JIS G3466 (Square steel pipes for ordinary structures)

where so specified on drawings, mild steel bars of local make may be used.

4.2.2 High-tension bolts:

- (a) High-tension bolts shall be classified into "High-tension bolts specified by JIS" and "Special High-tension bolts".
- (b) High-tension bolts specified by JIS

- (1) A set of bolt, nut and flat washer shall be the product satisfying the requirements of JIS B1186 (A set of hexa-

gonal bolt, nut and flat washer of high-tension bearing).

- (2) The kind of the bolt set shall be type 2 (F10T) and the kind by tightening torque shall be such as to be suitable for the work.

(c) Special high-tension bolts

- (1) Special high-tension bolts shall be high-tension bolts capable of being tightened easily which are not specified by JIS.
- (2) The kind of the special high-tension bolts and that of the bolt set shall be as specifically instructed.
- (3) The bolt set shall pass the in-house test by the manufacturers according to their in-house standards, which shall be equivalent to JIS B1186.

4.2.3 Welding Materials:

Welding materials shall comply with the requirements of Table 4.2.1 and shall be of good quality suitable for welding purpose selected according to the welding conditions.

Table 4.2.1 Welding Materials.

Nomenclature	Standards
Covered electrode	Standard products conforming to JIS Z3211 (Covered electrode for soft steel) Standard products conforming to JIS Z3212 (Covered electrode for high-strength steel)
Carbon dioxide arc welding wire	Standard products conforming to JIS Z3312 (Carbon dioxide arc welding wire)
Submerged arc welding wire	Standard products conforming to JIS Z3311 (Submerged arc welding wire)

4.2.4 Ordinary Bolts:

- (a) Material for bolts, nuts and washers shall be standard product conforming to JIS G3101 Type 2 (SS41).
- (b) Bolts and nuts shall be standard product of class 3 medium.

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of the following standards.

JIS B1180 (Hexagonal bolts)

JIS B1181 (Hexagonal nuts)

JIS B0205 (Ordinary metric pitch threads)

- (c) Washers shall be standard product of polished finish conforming to JIS B1256 (Flat washers).

4.2.5 Anchor Bolts:

- (a) Quality of anchor bolts shall conform to the requirements of paragraph 5.2.1.
- (b) Threads on the bolts shall be class 3 ordinary metric pitch threads specified by JIS B0205.

4.2.6 Material Tests:

- (a) In principle, JIS standard products shall not be subjected to material tests. Rolled steel shapes of JIS standard shall be approved by the Supervisor by means of standard quality certificate submitted to him.
- (b) Rolled steel shapes other than JIS standard products shall be subjected to tests specified below. Test shall be made on the rolled steel shapes of different sectional area. Provided, however, test may be omitted for any steel shape weighing less than 2 tons a piece.
 - (1) Method of test shall be such as to be suitable for the material designated according to JIS.
 - (2) Frequency of tests shall be such that one test shall be made for steel shapes weighing 20 tons or less a piece and one test for each 20 tons or fractions exceeding the first 20 tons for each different sectional area.
 - (3) Kinds of tests and number of test pieces to be prepared per test shall be as shown in Table 5.2.2.

Table 4.2.2 Kind of test and number of test piece required

Kind of steel shapes \ Kind of test	Tensile test	Bending test	Elongation test
Rolled steel shapes other than below	1	1	-
Steel pipe	1	1	1
Square steel pipe	1	-	-

(c) Special high-tension bolts shall be tested according to JIS B1186. Provided, however, test may be omitted in the following cases.

- (1) When the production control method and the results of control tests of the product are submitted to and approved by the Supervisor.
- (2) When the product is used for light-duty work and the approval of the Supervisor is obtained as to omission of the tests.

(d) Principal welding materials other than the standard products of JIS shall be approved by the Supervisor by submitting to him data certifying that the materials are of good quality suitable for welding. Provided, however, minor welding materials may be exempt from submitting the data with the consent of the Supervisor.

4.3 FUBRICATION, GENERAL:

4.3.1 Shop Drawings:

- (a) Shop drawings of the part to be fabricated shall be prepared based on the drawings and submitted to the Supervisor for his approval.
- (b) Full-size drawings (including templates and rulers) shall be prepared for test by the Supervisor.
- (c) Gauges, pitches and clearance of high-tension bolts and rivets

shall be as shown in the drawings

4.3.2 Confirmation of the basic tape measure for correctness:

In large scale steel construction, basic tape measure used for shop fabrication of rolled steel shapes shall be checked against the basic tape measure for field use to confirm that error, if any, does not cause any trouble in steel construction.

4.3.3 Marking-off:

- (a) Marking off shall be carried out accurately by use of shop drawings, full-size drawing, templates and rulers.
- (b) High-strength steel shapes and the outside of steel shape to be bent shall not be injured by chisels and punches. Provided, however, marking by chisels and punches may be permitted at the part to be fused by welding or to be cut off.

4.3.4 Cutting and Bending:

- (a) Unless designated, the cutting face of steel shapes shall be perpendicular to the axis.
- (b) Gas cutting shall, in principle, be automatic gas cutting. If manual gas cutting is carried out by unavoidable reasons, cutting shall be done accurately true to shape and size and trimmed with a grinder.
- (c) Shearing shall be permitted for steel plate of not more than 9mm thick.
- (d) Injurious irregularities, burrs and notches on cut surface shall be trimmed or removed.
- (e) Bending shall be performed under normal temperature or by heating. Bending by heating shall be performed in red-heated condition and quick cooling shall not be permitted.

4.3.5 Correction of Strain:

Strain in the unfabricated steel shapes or in the assembled component shall be corrected during fabricating process in such manner as shall not damage the material.

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4.3.6 Fixing of temporary Members:

If it is necessary to fix a temporary members on rolled steel shapes or if it is necessary to drill holes on rolled steel shapes for temporary works, such operation shall be approved by the Supervisor.

4.4 HIGH-TENSION BOLTING:

4.4.1 Confirmation of Torque Coefficient

High-tension bolts specified by JIS and special high-tension bolts brought to the project site shall be subjected to torque coefficient tests. Provided, however, if the bolts are used for light duty work, torque coefficient test may be omitted with the consent of the Supervisor.

4.4.2 Bolt Length:

(a) The length of high-tension bolts shall be that of the shank which shall be the sum of tightening length and the values shown in Table 4.4.1. Variety of length shall be kept to a minimum.

Table 4.4.1 Values to be added to tightening length

Designation	Values to be added to tightening length
M16	Not less than 30
M20	" " " 35
M22	" " " 40
M24	" " " 45

- (b) The length of special high-tension bolts shall be such as to be suitable for tightening length and the variety of the length shall be kept to a minimum.

4.4.3 Standard Bolt Tension:

Standard bolt tension shall be as shown in Table 4.4.2.

Table 4.4.2 Standard Bolt Tension (t)

Designation Type of Bolt	M16	M20	M22	M24
Type 2 (FlOT)	11.7	18.2	22.6	26.2

4.4.4 Bolt Holes:

- (a) The diameter of bolt holes shall be the sum of the bolt diameter and the value shown in Table 5.4.3

Table 4.4.3 Value to be added to Bolt Diameter (mm)

Bolt diameter	Value to be added to bolt diameter
Less than 20	1.0
Exceeding 20	1.5

- (b) Bolt holes shall be drilled at the shop.

4.4.5 Handling of Bolts:

- (a) Bolts shall be stored with care and kept free from damage, rust, sticking of foreign matter and spoils.
- (b) Bolts shall be delivered to the project site with their package unbroken and unpacked immediately before use.
- (c) Bolts used for test and adjustment of equipment shall not be re-used.

4.4.6 Treatment of Friction Surface:

- (a) Friction surface shall be cleaned of mill scales by means of sand blast or grinding and shall have rust developed uniformly

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is crucial for ensuring the integrity of the financial statements and for providing a clear audit trail. The text notes that any discrepancies or errors in the records can lead to significant complications during an audit and may result in the disallowance of certain expenses.

2. The second part of the document addresses the issue of proper documentation. It states that all receipts, invoices, and other supporting documents must be retained for a minimum of three years. This requirement is intended to ensure that the necessary evidence is available to substantiate the amounts reported in the financial statements. The document also mentions that digital copies of these documents should be stored securely and accessed regularly.

3. The third part of the document focuses on the importance of timely reporting. It highlights that all financial information should be reported to the appropriate authorities in a timely and accurate manner. This includes providing regular updates on the company's financial performance and any changes in the ownership structure. The text stresses that failure to report accurately or on time can lead to penalties and legal consequences.

4. The fourth part of the document discusses the role of the auditor. It explains that the auditor's primary responsibility is to provide an independent and objective opinion on the financial statements. The auditor must adhere to strict professional standards and maintain confidentiality throughout the audit process. The document also notes that the auditor's findings and recommendations should be clearly communicated to the management and the board of directors.

5. The fifth part of the document covers the importance of transparency and communication. It states that the company should maintain open lines of communication with its stakeholders, including investors, creditors, and regulatory bodies. This involves providing clear and concise information about the company's financial health and any potential risks. The text emphasizes that transparency is essential for building trust and ensuring the long-term success of the organization.

6. The sixth part of the document discusses the importance of internal controls. It explains that a strong system of internal controls is necessary to prevent and detect errors and fraud. This includes implementing proper segregation of duties, regular reconciliations, and a robust risk management framework. The document also mentions that the internal control system should be regularly reviewed and updated to reflect changes in the business environment.

7. The seventh part of the document focuses on the importance of ethical behavior. It states that all employees and management should adhere to a high standard of ethical conduct. This includes being honest, fair, and transparent in all business transactions. The text emphasizes that ethical behavior is not only a moral imperative but also a key factor in the success of the organization.

8. The eighth part of the document discusses the importance of staying up-to-date on regulatory changes. It notes that the regulatory environment is constantly evolving, and it is essential for the company to stay informed about any new laws, regulations, or standards that may apply. This involves regular communication with legal and compliance departments and staying abreast of industry news and developments.

9. The ninth part of the document covers the importance of maintaining accurate and complete records. It states that all records should be maintained in a clear, organized, and accessible manner. This includes keeping accurate records of all financial transactions, as well as other important documents such as contracts, agreements, and correspondence. The text emphasizes that accurate records are essential for ensuring the integrity of the financial statements and for providing a clear audit trail.

10. The tenth part of the document discusses the importance of regular audits. It explains that regular audits are necessary to ensure the accuracy and reliability of the financial statements. This includes both internal audits and external audits by independent auditors. The document also notes that the results of the audits should be used to identify areas for improvement and to implement corrective actions.

on the entire surface.

The friction surface shall also be kept free from burrs, warps and depressions caused by grinding.

- (b) Filler plates shall be treated in the same manner as the friction surfaces. Development of rust shall be confirmed on the filled plates welded to structural members.
- (c) Burrs and warps on the contact face of bolt heads and washers shall be finished smooth by grinding.

4.4.7 Assembling:

- (a) Friction surfaces shall be protected with care. Scales, oil, paints and dusts which may cause reduction of friction shall be removed before assembling.
- (b) Clearance exceeding 1mm caused by the difference in the thickness of members to be joined shall be filled with filler plates.
- (c) If the surface of the member to be joined has a slope larger than $1/20$ against the bolt head or nut, a tapered washer shall be used.
- (d) Bolt holes which do not match after assembling shall be matched with a reamer. Burrs left by reamer operation shall be carefully removed. For matching the bolt holes; use of drift pins that may cause burrs or deformation of the member shall not be allowed.

4.4.8 Tightening and Test Equipment:

- (a) Tightening and test equipment shall be of the type suitable for the bolts and shall be inspected and maintained in good condition at all times.
- (b) Equipment liable to changes in torque such as torque control impact wrenches shall be adjusted of their tightening force in the morning and in the afternoon before the start of the work. Adjustment shall continue until the torque error becomes $\pm 7\%$ of the required torque. Record of adjustment shall be submitted to the Supervisor for his approval.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support informed decision-making.

3. The third part of the document focuses on the role of technology in modern data management. It discusses how advanced software solutions can streamline data collection, storage, and analysis, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data security and privacy. It stresses the importance of implementing robust security measures to protect sensitive information from unauthorized access and breaches.

5. The fifth part of the document explores the ethical implications of data collection and analysis. It discusses the need for transparency in data practices and the importance of obtaining informed consent from individuals whose data is being collected.

6. The sixth part of the document provides a detailed overview of the data analysis process. It describes various statistical and analytical techniques used to extract meaningful insights from large datasets.

7. The seventh part of the document discusses the importance of data visualization in communicating complex information. It highlights how visual representations such as charts and graphs can make data more accessible and understandable for stakeholders.

8. The eighth part of the document focuses on the integration of data with other organizational systems. It discusses how data can be shared and used across different departments to improve collaboration and overall organizational performance.

9. The ninth part of the document addresses the future of data management. It discusses emerging trends such as artificial intelligence and machine learning, and how these technologies will continue to shape the way data is collected and analyzed.

10. The tenth part of the document provides a summary of the key points discussed throughout the document. It reiterates the importance of data in driving organizational success and the need for a data-driven culture.

4.4.9 Tightening:

(a) General

- (1) Before the members are joined together, they shall be bolted together temporarily so that the members come to a close contact. This temporary bolting shall be performed with care when special high-strength bolts are used. The number of temporary bolts shall be not less than 1/3 of the permanent bolts or not less than two.
- (2) Prior to tightening, bolts shall be confirmed of their length, quality and nominal size for their fitness to the work.
- (3) Tightening of bolts shall be commenced outward from the center.

(b) High-tension bolts specified by JIS

- (1) Bolts shall be fit into the hole and tightened first by hand. Then preliminary and final tightening by equipment shall follow.
- (2) Preliminary tightening shall be performed with 70% of the standard bolt tension. Final tightening shall be performed with 100% of the standard bolt tension.
- (3) Bolts which have been tightened preliminarily shall be marked together with nuts, washer and members.

(c) Special high-tension bolts

- (1) Tightening shall be performed by use of equipment suitable for the bolts in a manner recommended by bolt manufacturers.
- (2) When a large number of bolts are to be tightened, preliminary tightening stipulated in (b) above shall be performed.

4.4.10 Tightening Test:

- (a) Tightening test for high-tension bolts specified by JIS

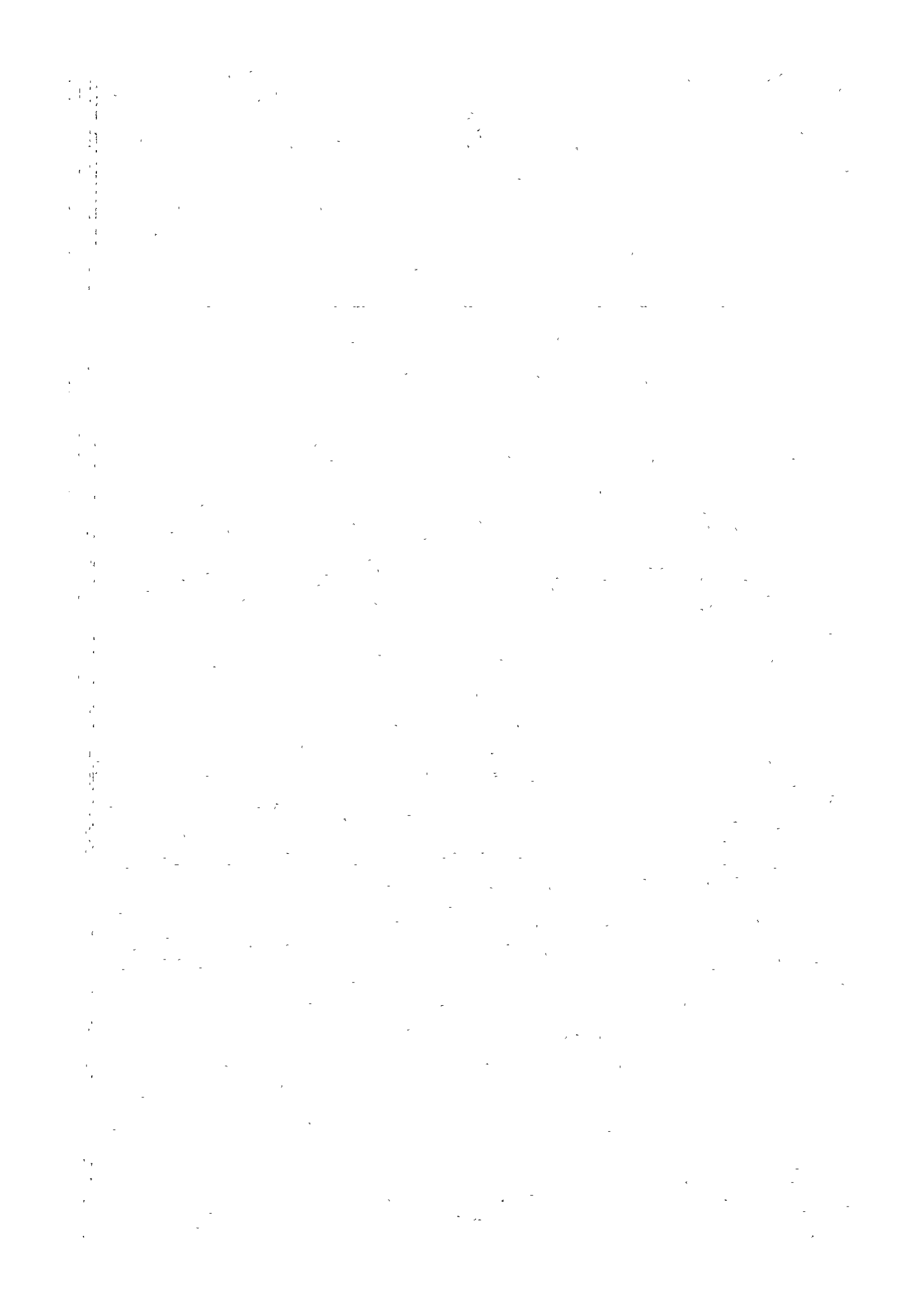
- (1) Test shall be conducted after final tightening.
- (2) By the change in the position of the matching mark made at the time of preliminary tightening, completion of final tightening or loosening of bolts shall be confirmed.
- (3) Tightening test shall be performed with a torque wrench by tightening the nut and the torque shall be measured when the nut starts to turn.
- (4) Number of bolts to be tested shall be not less than 10% of the entire number of the bolts or not less than one. If the test shows a satisfactory result, number of the bolts to be tested thereafter may be reduced with the consent of the Supervisor.
- (5) Torque shall be regarded as passing the test if it satisfies formula 4.4.1

$$0.9 T_o \leq T \leq 1.1 T_o \dots\dots\dots (4.4.1)$$

$$T_o = \frac{k \times d_1 \times N_o}{1,000} \dots\dots\dots (4.4.2)$$

Where; T : Torque at time of test (kg-m)
 T_o : Standard torque (kg-m)
 K : Torque coefficient
 d₁ : Outside diameter of threads on bolt (mm)
 N_o : Standard bolt tension in Table 4.4.2 (kg)

- (6) If a bolt of unsatisfactory torque is found, the entire group of the bolts shall be re-tightened. Overtightened bolts shall be replaced.
 - (7) Bolts loosened while other bolts are tightened shall be re-tightened.
- (b) Tightening test for special high-strength bolts
- (1) Test shall be conducted after final tightening.
 - (2) Completion of final tightening shall be confirmed by partial breakage or deformation of the bolts.



(3) After final tightening, bolts shall be confirmed of their shape and size for their appropriateness. Grip bolts shall be confirmed by measuring gauge.

(c) Test records shall be submitted to the Supervisor for tightening test.

4.5 WELDING WORK:

4.5.1 Scope of work:

This paragraph applies to manual arc welding (hereafter called manual welding), semi-automatic gas shield arc welding (hereafter called semi-automatic welding) and automatic submerged arc welding (hereafter called automatic welding).

4.5.2 Welding Control and Facilities:

(a) Before manual welding and semi-automatic welding arc carried out, document showing past records of welding works, welding work control organization, equipment and facilities and in-house standards for workmanship and test shall be submitted to the Supervisor for his approval as to performance and control ability of the welding shop.

(b) Before automatic welding is carried out, documents mentioned in (a) above shall be submitted to the Supervisor and a test suitable for the welding work to be performed, where necessary, shall be performed for his approval.

4.5.3 Welding Specialist:

(a) A welding specialist charged with guidance and supervision of the welding work shall be stationed on the job. Provided, however, if the welding work is of simple nature, the welding specialist need not be present with the consent of the Supervisor.

(b) The welding specialist shall be a qualified person for the work certified by the Japan Welding Association, whose qualification certificate shall be submitted to and approved by the Supervisor.

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4.5.4 Welder:

- (a) A welder shall be a person who possesses the following skills suitable for the work, whose workmanship certificate and other required data shall be submitted to and approved by the Supervisor.
 - (1) For manual welding, the requirements of JIS Z3801 (Method of test and its judging standards for welding test).
 - (2) For semi-automatic welding, the requirements of JIS Z3841 (Method of test and its judging standards for semi-automatic welding test).
 - (3) For automatic welding, the basic class of (1) above and records of works certifying the workmanship and welding skill.
- (b) If any doubt arises as to the workmanship and skill of the welder, a test suitable for the work shall be given to find his qualification.

4.5.5 Preparation of Parent Metal:

- (a) Depending on the experience of the shop, shape of beveling may be changed slightly with the consent of the Supervisor.
- (b) Beveling shall be performed either by automatic gas cutting or by machine. Inaccurate beveling or irregular beveling shall be corrected.
- (c) Welding rods and electrodes shall be handled with care and shall be kept free from peeling of coat, damage, deterioration, moisture and remarkable rust. Welding rod shall be carefully protected against moisture.
Welding rods exposed to moisture shall not be used.

4.5.6 Clamping of Parent Metals:

- (a) Clamping of parent metals shall be done by use of suitable clamps. Special care shall be exercised in maintaining the roof width and contact part. Defective contact shall be corrected.

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- (b) Sequence of clamping shall be such as to minimize the deformation and restraints caused by welding and inverse straining method shall be adopted as much as possible.
- (c) If high-strength bolts are concurrently used, high-strength bolting shall precede the welding operation.
- (d) Tack welding shall be performed as follows.
 - (1) Tack welding shall be avoided from such places as may cause difficulties in welding operation or may weaken strength of weld, for example ends of joint, corners, starting and finishing point of permanent welding.
 - (2) Minimum number of tack welding shall form a part of permanent weld, and defective welding shall be grounded off completely.
 - (3) Tack welding shall avoid short bead and the minimum length shall be as shown in Table 4.5.1.

Table 4.5.1 Minimum length of tack welding (mm)

Plate thickness	Minimum length of welding	
	Manual and Semi-Automatic Welding	Automatic welding
Less than 3.2	Not less than 30	Not less than 40
Exceeding 3.2 but less than 25	Not less than 40	Not less than 50
Exceeding 25	Not less than 50	Not less than 70

4.5.7 Cleaning of Parent Metals:

Parent metals to be welded shall be cleaned of objectionable matter such as water, oil, slug and paint. Provided however, scale mills and paint which is not objectionable to welding and not removed with a tough wire brush need not be removed.

4.5.8 Welding Operation:

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(a) General

- (1) Welding equipment and its accessories shall be of such construction and performance as to be suitable for the welding condition and shall be capable of safe and satisfactory welding.
- (2) Parts to be welded shall be free from harmful defects and shall be as smooth as possible.
- (3) The effective length of welds shall be from the starting point of uninterrupted welds including craters.
- (4) The sequence of welding shall be such as to minimize the deformation and restraints caused by welding operation.
- (5) Welding position shall be flat whenever feasible by adjusting the position of the parent metal.
- (6) Pre-heating shall be performed, where required, taking into consideration the quality and thickness of the parent metals and temperature.
- (7) Treatment of end tabs
 - (i) In case of butt welding, partial fusion and fillet welding, end tabs of sufficient length shall be used at the weld ends. Provided however, if the weld is not subjected to heavy duty and defects can be avoided by projection welding, end tabs need not be used with the consent of the Supervisor.
 - (ii) Concealed end tabs shall be cut off, leaving a length of 3 to 5 mm.
 - (iii) Exposed end tabs shall be removed and the cutting surface finished in such manner as shall not damage the sectional surface.
- (8) Removal of slug shall be carried out carefully at each pass and after completion of welding.
- (9) Remarkable spatters and the spatters on which paint is applied shall be removed.

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(b) Buttt welding

- (1) When backing metal is not used, welding shall be performed from the front side and after the back chipping has been completed, root running shall be performed. If sufficient weld penetration is insured by automatic welding, back chipping may be omitted with the consent of the Supervisor.
- (2) A minimum excess metal shall be left at the welded part. The height of the excess metal shall be made as small as possible to form a gentle slope and shall be not more than 3 mm in manual welding and 4 mm in semi-automatic and automatic welding.
- (3) T joints shall be provided with fillets not less than $1/4$ the thickness of the metal to be butted and not more than 10 mm in throat.
- (4) When there is a slight offset at the buff of the parent metals because of the difference in plate thickness or width, excess metal shall be left for smooth transition of the surfaces. When the offset exceeds 4 mm in manual and semi-automatic welding or when the offset exceeds 3 mm in automatic welding, the thicker parent metal shall be planed off with a slope of not more than $1/5$ to match the offset. Provided however, in case of I-bevel the offset shall be a maximum of 3 mm for semi-automatic welding.

(c) Partial penetration welding

- (1) Unless shown in the design drawings, partial penetration welding shall not be permitted.
- (2) A minimum excess metal shall be left on the welded portion. The height of the excess metal shall be as mentioned in (b)(2) above.
- (3) First pass of welding shall be performed with care to insure the required penetration.

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