Guideline

Construction Supervision
for
Emergency School Reconstruction Project
(ESRP NE-P11)

< First Edition >

July 2016

Prepared by

TPIS-ERP (JICA Consultant)

on behalf of

Japan International Cooperation Agency (JICA)

Preface

In any civil construction works, close and continuous monitoring and supervision thereof are utmost important tasks for all engineers and sub-engineers assigned to the project for assuming such duties and responsibilities in order to assure required quality and to complete the project within the time period specified in the contract, among many other objectives to be accomplished.

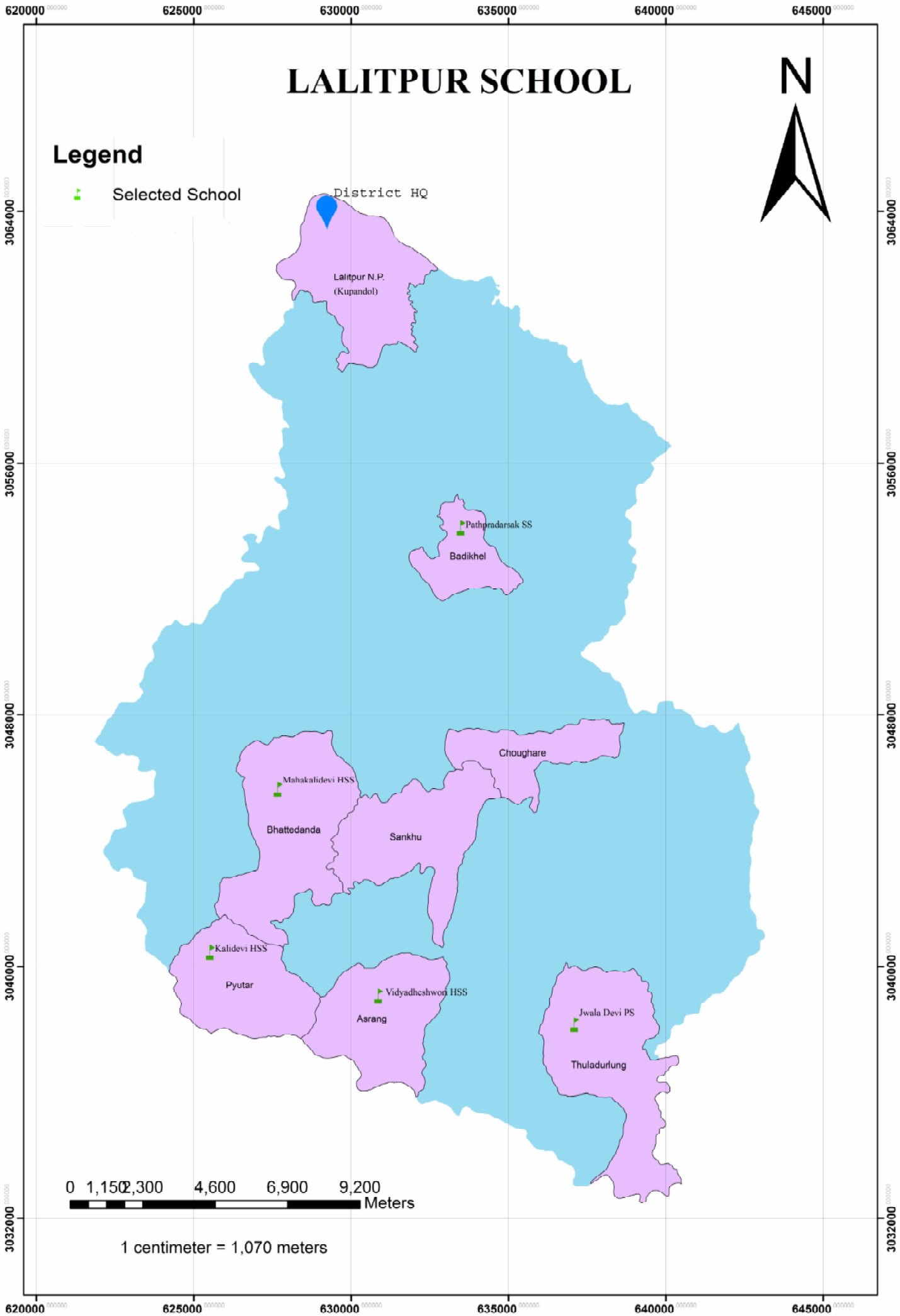
In addition, those engineers and sub-engineers are often have to take other duties and responsibilities not only physical supervision of the construction works but also other aspects and/or issues relevant to health and safety control, environment control, document control including reporting, and cost control including reviewing and recommending contractor's progress payment, and so on as well as coordination with and among all stakeholders of the project.

This 1st Edition of Guideline has been prepared by Transitional Project Implementations Support for Emergency Reconstruction Projects (TPIS-ERP) giving considerations of the above and the fact that the 1st Batch of Emergency School Reconstruction Project will be implemented as one of Japanese ODA Loan Projects funded by Japan International Cooperation Agency (JICA), through discussions and collaboration with Asian Development Bank (ADB) which is also involved with similar school reconstruction projects and in provision of similar supervision guidelines for their projects.

Therefore, this Guideline shall be used as an add-on documents to *"Construction Monitoring and Supervision Guideline, Volume II Supervision Guideline for Technical People prepared by National Society for Earthquake Technology-Nepal (NSET), June 2016 (Draft)"* for National Reconstruction Authority (NRA) through the Technical Assistance by Asian Development Bank (ADB) which includes easy to understand pictorial descriptions of required construction supervision of the civil construction works, in terms of implementing essential quality assurance procedures.

July 2016, Kathmandu, Nepal

TPIS-ERP, JICA


LALITPUR SCHOOL
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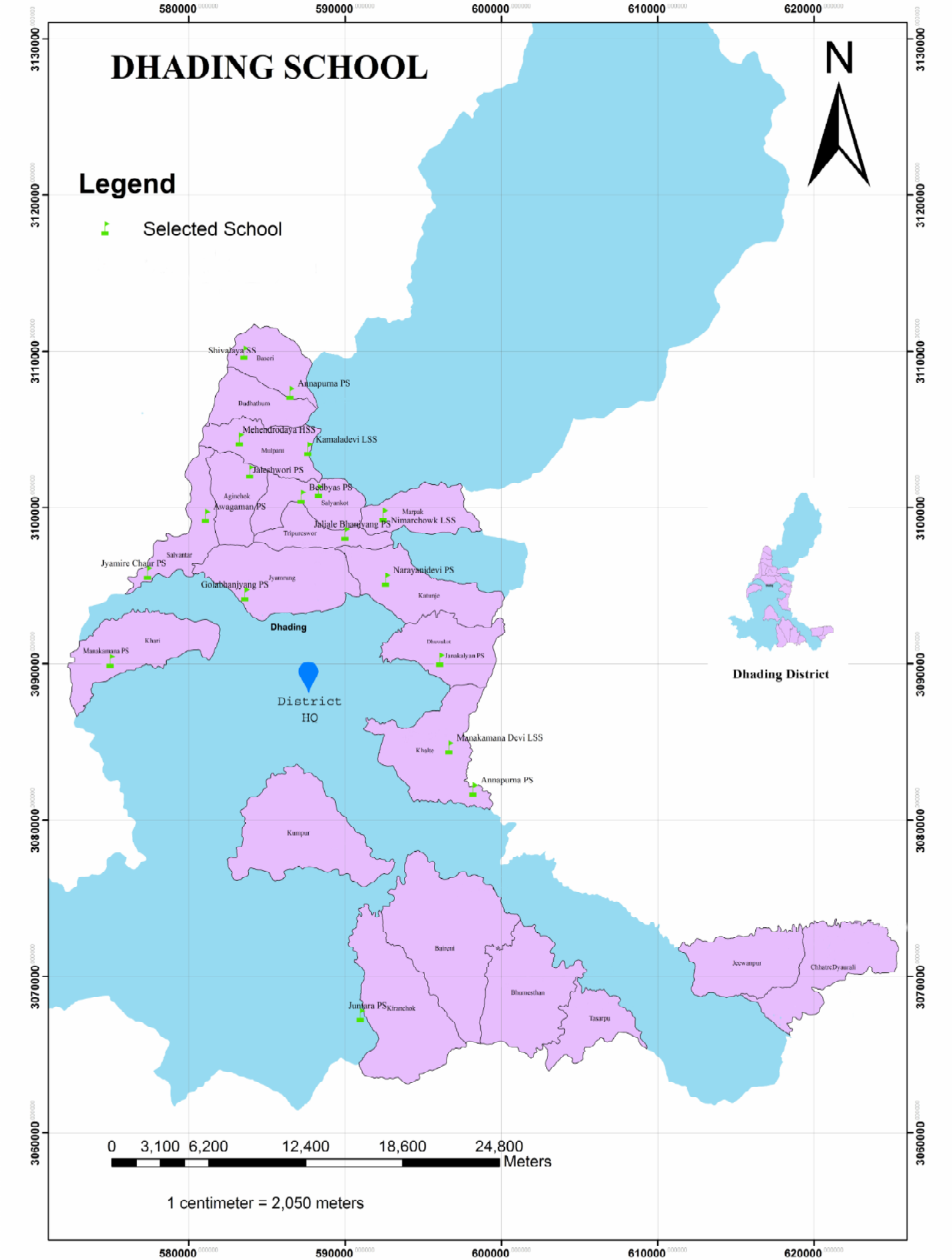
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Marpak
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Jaljale Bhanjyang PS
Tripurasowr
Salyantar
Jyamire Chaur PS
Jyamrung
Golabhanjyang PS
Narayanidevi PS
Katunje
Dhading
Khari
Manakamana PS
Dhuwakot
Janakalyan PS
District HQ
Manakamana Devi LSS
Khalte
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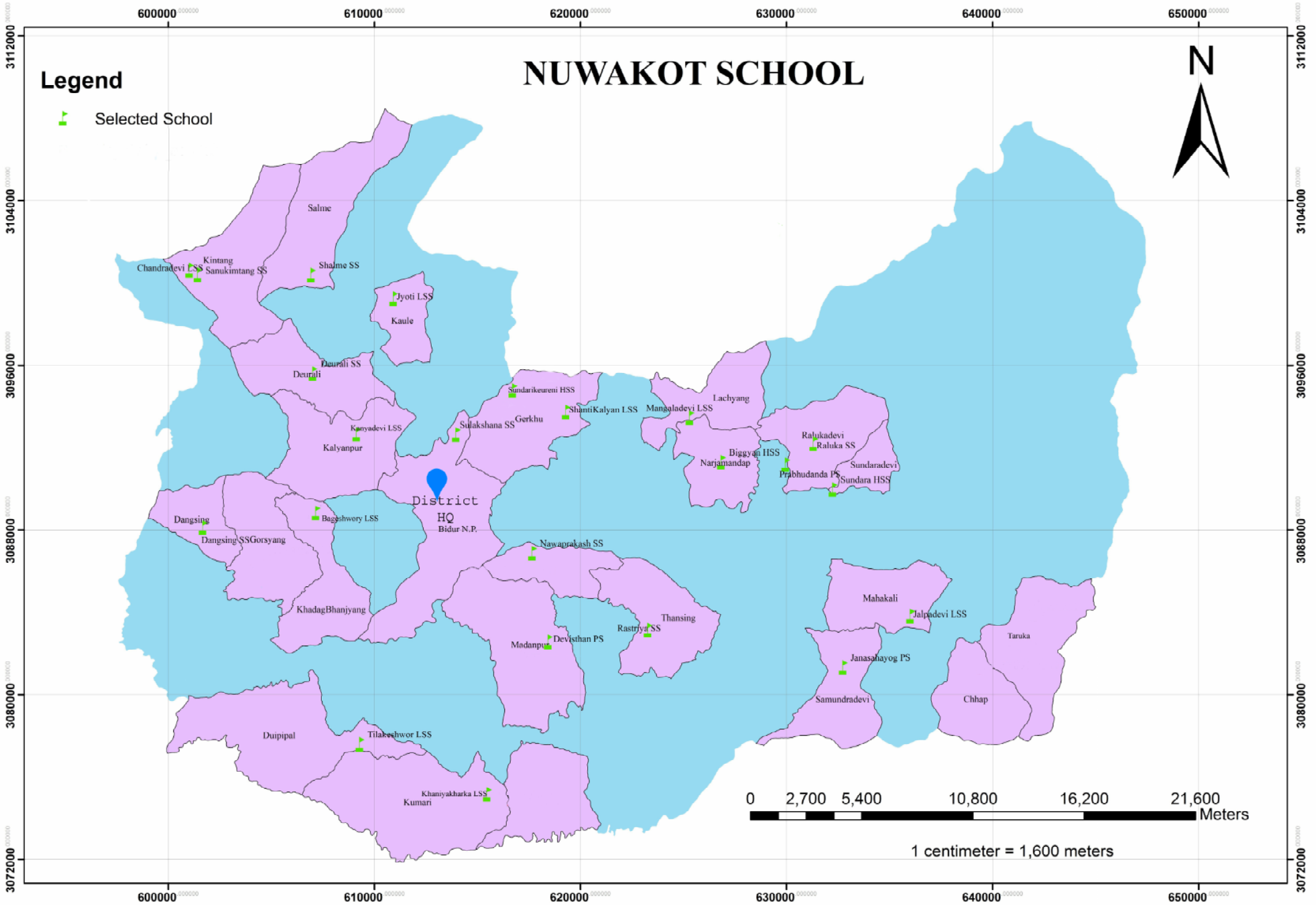
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ShantiKalyan LSS
Gerkhu
Sulakshana SS
Kanyadevi LSS
Kalyanpur
Lachyang
Mangaladevi LSS
Ralukadevi
Raluka SS
Biggyan HSS
Narjamandap
Prabhudanda PS
Sundaradevi
Sundara HSS
District
HQ
Bidur N.P.
Dangsing
Dangsing SS
Gorsyang
Bageshwory LSS
Nawaprakash SS
KhadagBhanjyang
Thansing
Rastriya SS
Madanpur
Devisthan PS
Mahakali
Jalpadevi LSS
Taruka
Janasahayog PS
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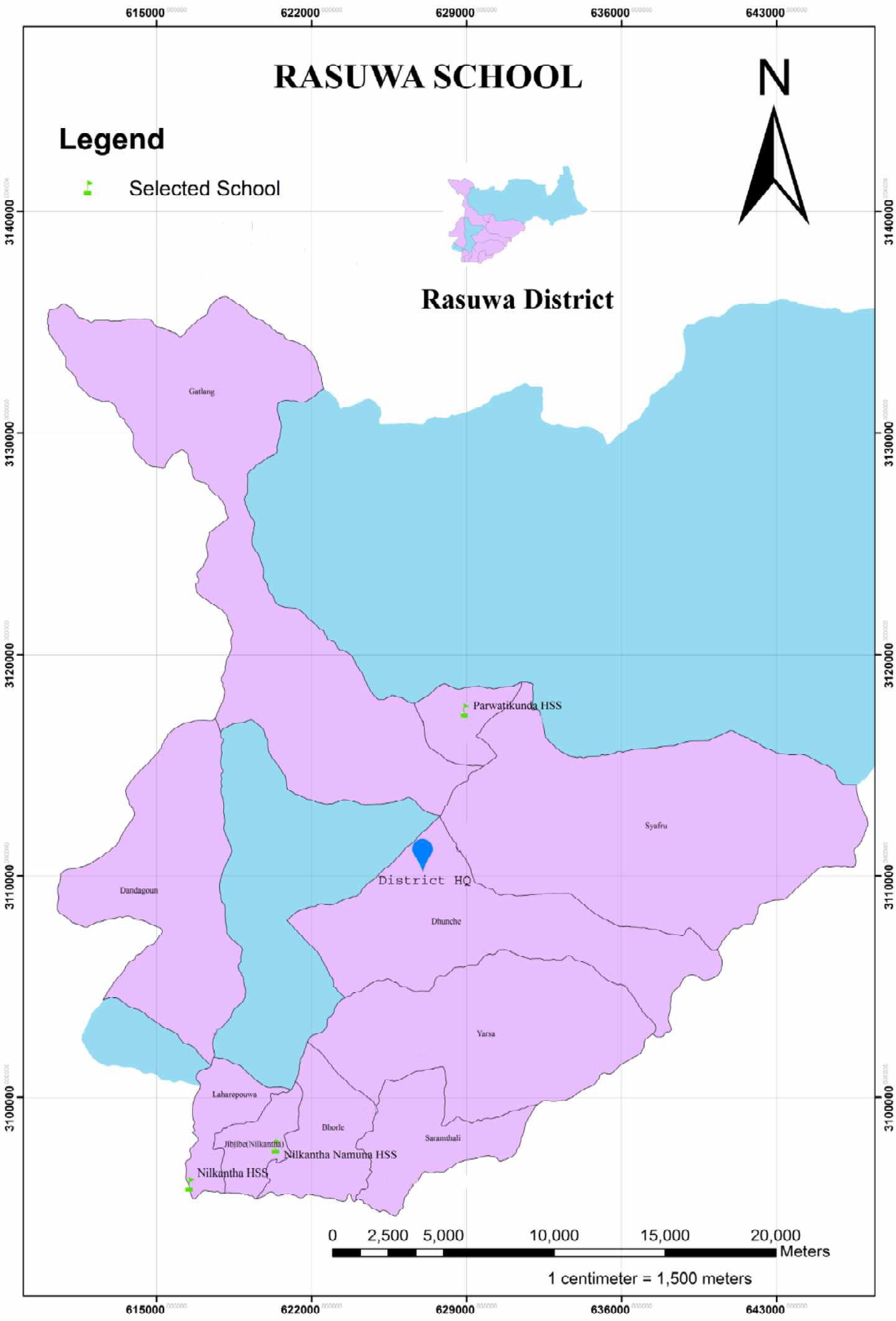
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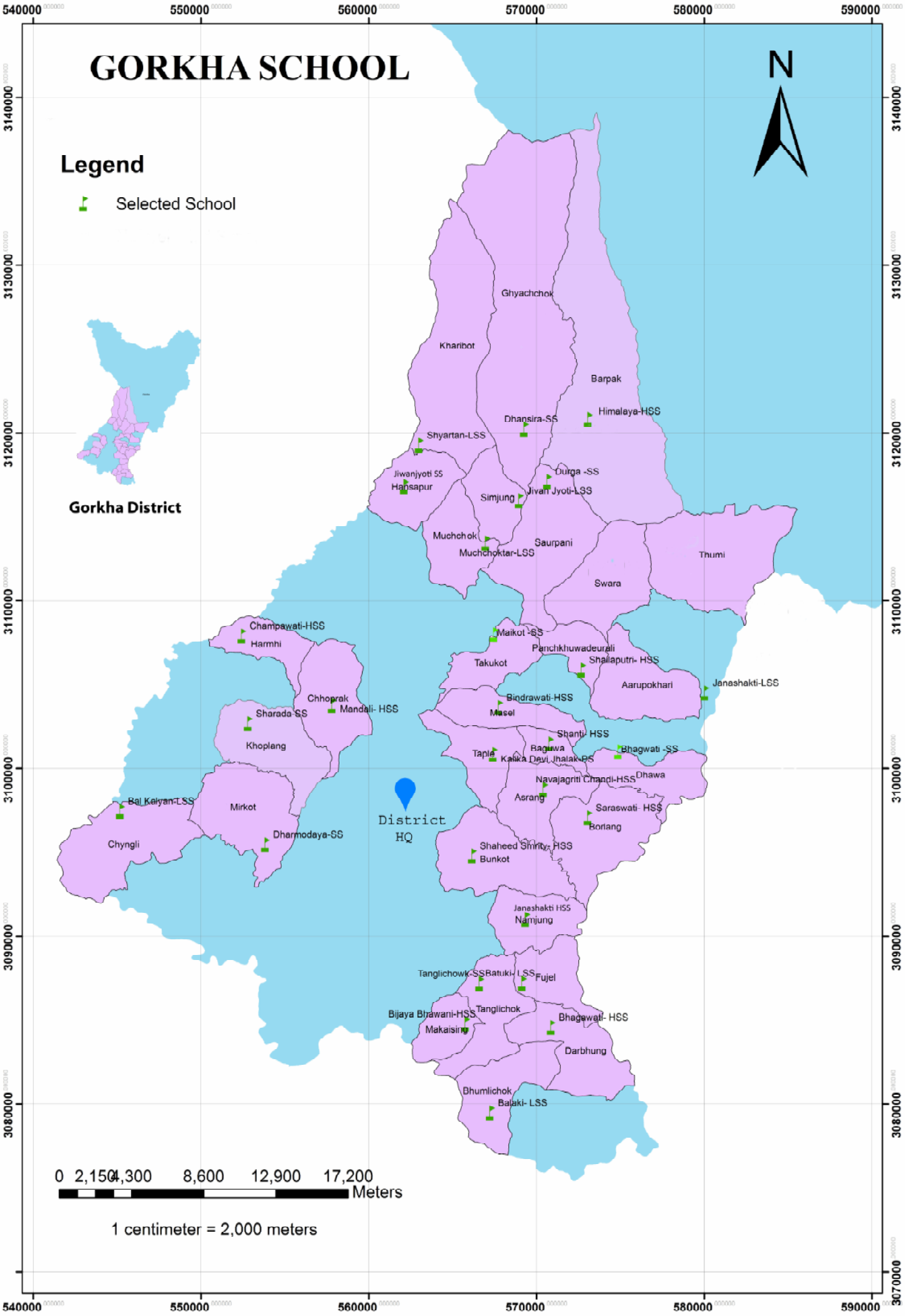
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Durga -SS
Jivan Jyoti-LSS
Simjung
Muchchok
Muchchoktar-LSS
Saurpani
Thumi
Swara
Champawati-HSS
Harmhi
Maikot -SS
Panchkhuwadeurali
Takukot
Shailaputri- HSS
Aarupokhari
Janashakti-LSS
Chhoprak
Mandali- HSS
Bindrawati-HSS
Masel
Sharada SS
Khoplang
Shanti- HSS
Taple
Raguwa
Kalika Devi Jhalak-PS
Bhagwati -SS
Dhawa
Navajagriti Chandi-HSS
Asrang
Saraswati- HSS
Bal Kalyan-LSS
Mirkot
Dharmodaya-SS
Chyngli
District HQ
Boriang
Shaheed Smrity- HSS
Bunkot
Janashakti HSS
Namjung
Tanglichowk-SS
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Bijaya Bhawani-HSS
Makaising
Bhagawati- HSS
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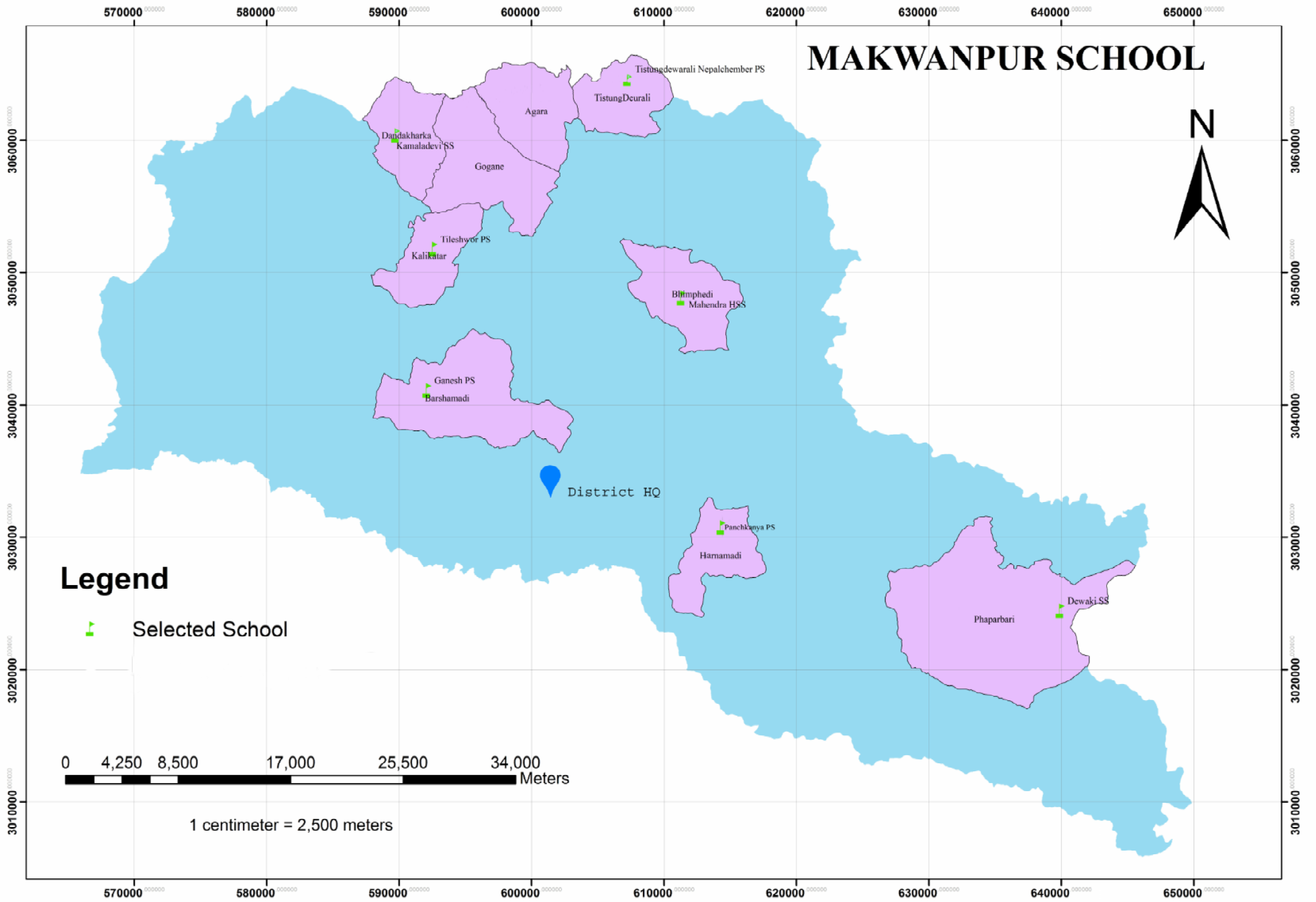
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Ganesh PS
Barshamadi
District HQ
Panchkanya PS
Harnamadi
Phaparbari
Dewaki SS
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Selected School
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4,250
8,500
17,000
25,500
34,000
Meters
1 centimeter = 2,500 meters

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP NE-P11)
Type Design

Academic Block, 2 Storey

Practical Block, 1 Storey

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP NE-P11)
Type Design

Multipurpose Hall

Toilet Combine Block

CONTENTS

1. BASIC CONCEPT

1.1 Basic Policy

Day to day supervision of the construction and installation works (hereinafter referred to as "the Works") to be carried out by the Contractor for 1st Batch of Emergency School Reconstruction Project (hereinafter referred to as "the Project") shall be executed by newly recruited Engineers and Sub-engineers (hereinafter collectively referred to as "the Engineer") for the Project and assigned to each target District Education Office (hereinafter referred to as "DEO") which is District Level Project Implementation Unit (DLPIU) on behalf of the Employer; namely, Ministry of Education (hereinafter referred to as "MOE") which is Central Level Project Implementation Unit (CLPIU).

On the other hand, since the Project will be implemented as one of Japanese ODA Loan Projects funded by Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA Consultant will provide monitoring services mainly as to the progress of the Project as a whole.

The day to day supervision of the Works by the Engineer shall be undertaken by paying special attention to the following concerns so that the Works for the Project will be executed appropriately, safely and smoothly:

(1) Conformity of the Works to Conditions of Contract, Technical Specifications, Drawings and so on (hereinafter collectively referred to as "the Contract Documents");
(2) Compliance of qualities, grades, and quantities of the materials to the Contract Documents;
(3) Quality control of the Works in relation to the overall work schedule;
(4) Management of various construction records such as, but not limited to, inspection reports, test results, data, and work progress photographs; and
(5) Overseeing healthy and safe working conditions and safety control on site.

In addition, the Engineer shall undertake any and all aspects of the construction supervisory responsibilities specified in the Contract Documents and described hereinafter, bearing the following in mind at all times:

(1) Reliable relationship with the Employer;
(2) Careful undertaking of any obligations as a professional engineer; and
(3) Transparency of activities, neutrality and fairness.

Furthermore, the Engineer shall also bear in mind that the Project will be implemented as Japan's Official Development Assistance (ODA) loan project; thus, the work schedule and the quality of the Works shall be strictly complied with the Contract Documents by giving consideration of JICA Procurement Guidelines.

1.2 Implementation Structure

The Employer will assign one (1) engineer and six (6) sub-engineers for each district covered by the Project in principle. However, since it is strongly recommended a sub-engineer to be assigned to and stationed in each target school as "Resident Engineer" to carry out day to day supervision of the Works, number of sub-engineer for each district may vary.

On the other hand, JICA Consultant for the Project will also assign one (1) engineer and one (1) sub-engineer for each tender package, i.e. planned to be sixteen (16) packages in total for the Project, in order to monitor the progress of the Works and to assist Employer's engineers and sub-engineers from time to time as necessary.

Proposed Overall Project Implementation Structure for construction supervision of the Works for all proposed numbers of contract packages is as shown in Fig. 1-1 hereinafter. However, it shall be noted that the number of target schools for the Project and the total number of contract packages as well as the number of contract packages for each district are yet to be finalized. In addition, proposed number of the Resident Engineers (sub-engineers) for each district may vary as explained hereinbefore.

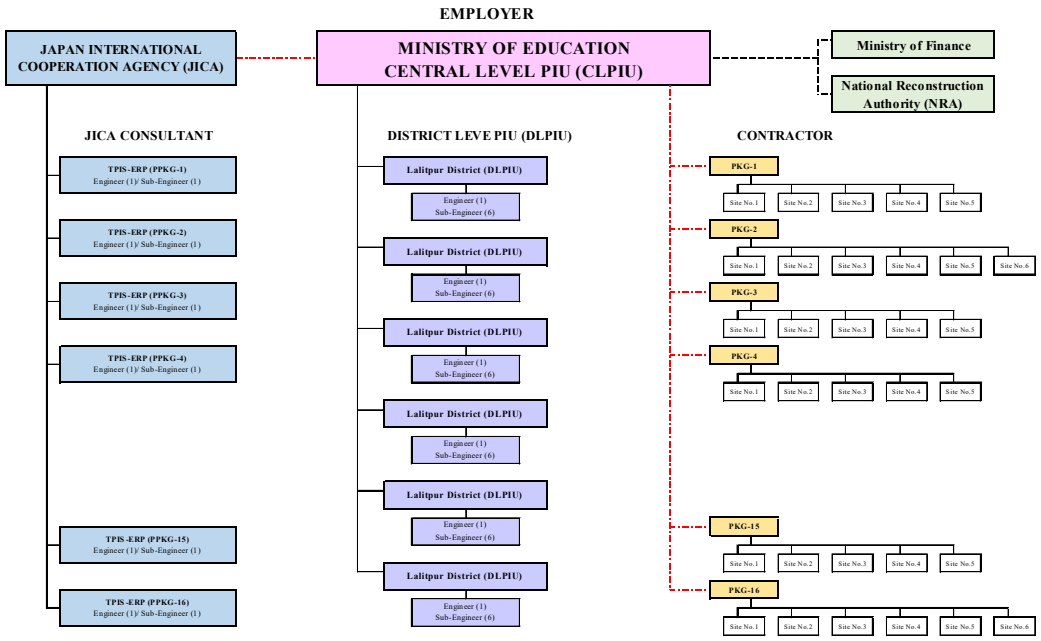


Fig. 1-1: Overall Project Implementation Structure (Reference Only)

On the other hand, Contract Package Based Implementation Structure for the construction supervision of the Works for each contract package is as shown in Figure 1-2 hereinafter.

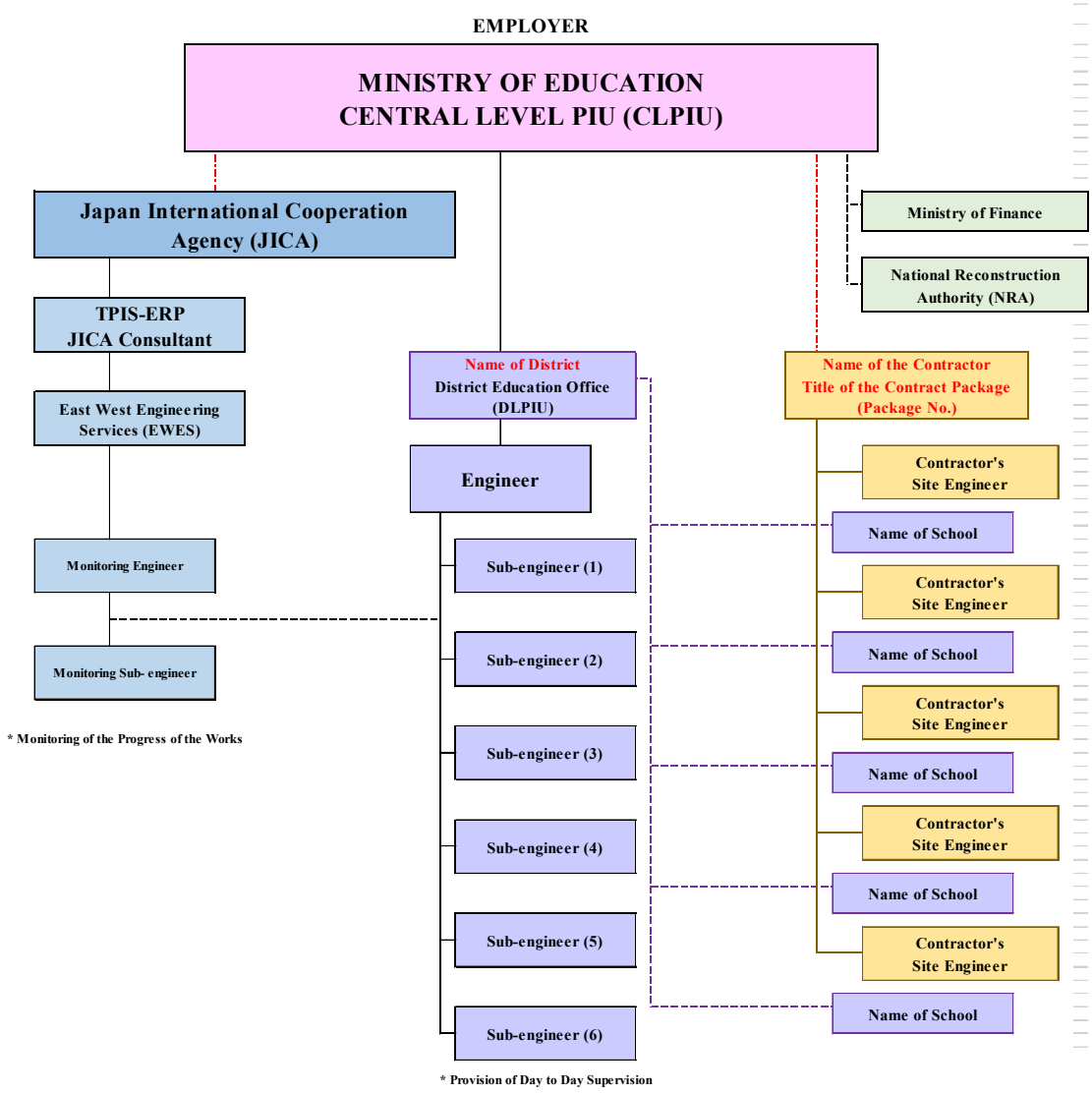


Fig. 1-2: Contract Package Based Implementation Structure (Reference Only)

1.3 Supervision Items

In general, supervision items for the Engineer to be attended to and/or carried out prior to the commencement and during the execution of the Works as well as after handover of the Works shall include the following, but not limited to:

- Holding "Kick-off Meeting" by coordinating with all parties concerned
- Review and approval of "Master Construction Schedule"
- Review and approval of "General Work Plan" Contractor's submittals

- Review and approval of "Method Statement of Work Procedures "
- Review and approval of "Quality Control Plan (QCP)"
- Review and approval of "Safety Control Plan (SCP)"
- Review and approval of Shop Drawings
- Review and approval of other Contractor's submittals
- Quality control for the Project as a whole
- Health and safety control for the Project as a whole
- Environment control incl. coordination of surrounding areas/ neighbors
- Cost control incl. issuance of variation order(s) and cost analysis thereof
- Review and approval of mock-ups and samples
- Issuance of necessary certificate(s)
- Confirmation of all necessary permit(s) and approval(s), if any
- Witness all tests and on-site inspection
- Joint inspection(s) with the Employer and the Consultant, if so required
- Submission of all required reports and results of tests and on-site inspections, etc.
- Holding monthly and weekly meetings as well as ad-hoc meeting(s), if so required
- Coordination with concerned parties (incl. Government agencies and authorities.)
- Final joint inspection with the Employer in the presence of JICA Consultant
- Review and approval of "Completion Documents"
- Other issues

And, in general, construction supervision by the Engineer during the execution of the Works shall in principal be carried out in accordance with the flows shown in Fig. 2.1 hereinafter.

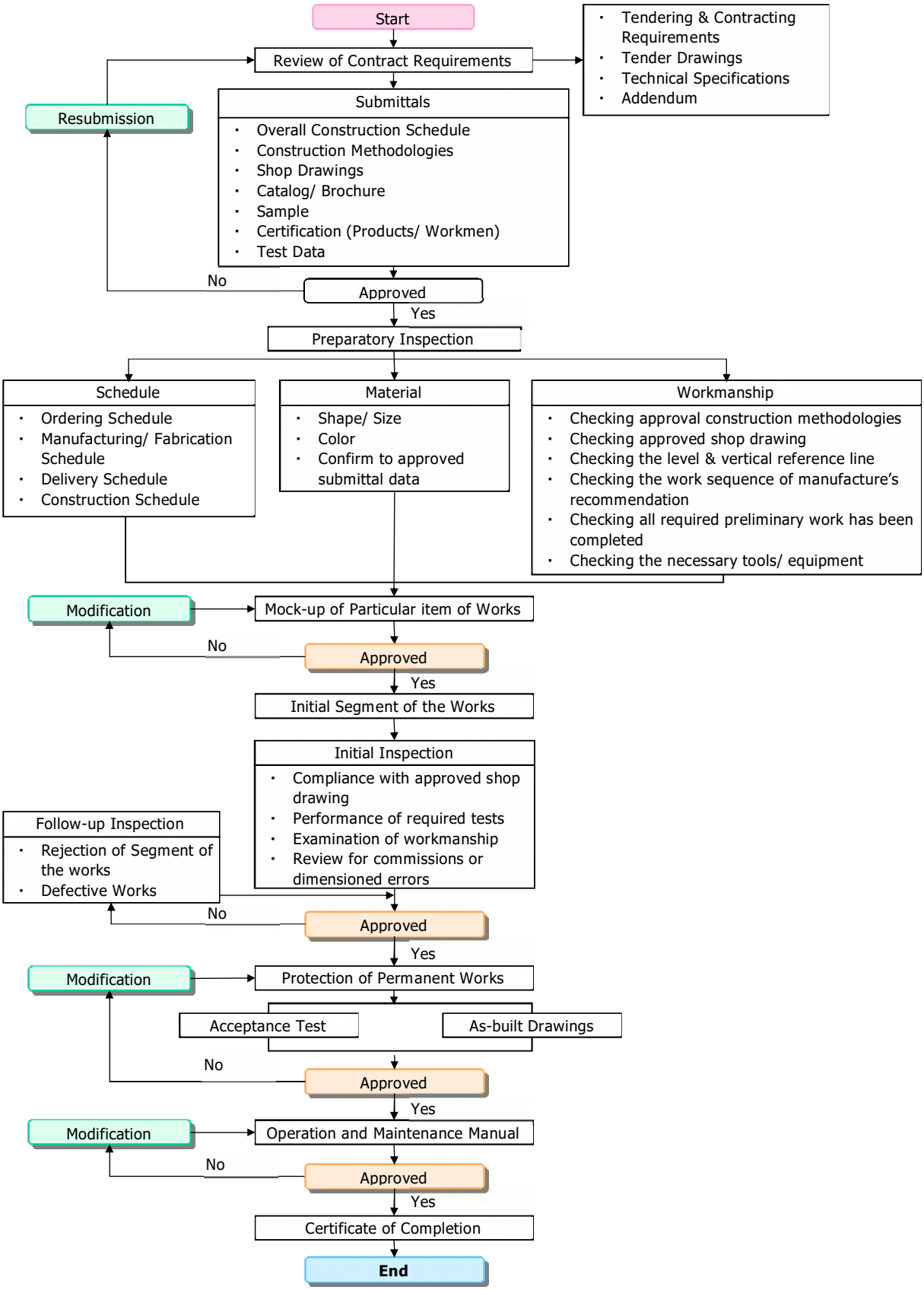


Fig. 2-1: Work Flow for Construction Supervision (Reference Only)

2. ENGINEER'S SUPERVISORY RESPONSIBILITIES

First of all, the Engineer should be well understood of the contents of the Contract Documents especially General Conditions of Contract and Special Conditions of Contract specified therein and Technical Specifications for the Works for the Project, which the Engineer shall refer to at all the times.

And, construction supervisory responsibilities of the Engineer for the Works are usually divided into the following three (3) principal components with specific objectives, summaries of which are described hereinafter:

(1) Review of Contract Documents
(2) Supervision of the Construction Works
(3) Supervising Post Construction Works (Defect Liability Period)

2.1 Review of Contract Documents

Prior to the commencement of and during the execution of the Works, the Engineer shall carefully review all the Contractor's submittals in addition to reviewing the Contract Documents in terms of the project implementation as a whole. The Engineer's principal responsibilities in reviewing all such documents shall be focused to the following concerns, but not limited to:

(1) Review of Project Master Construction Schedule (refer to GCC Clause 26 and Technical Specifications Division 1, Clause 9 (b))
(2) Review of the Contractor's Implementation Structure (Organization Chart)
(3) Review of Design and Engineering Products
(4) Approving of Shop Drawings, Mock-ups, Construction Materials, etc. (refer to Technical Specifications Division 1, Clause 9, (d) (e) (g))
(5) Evaluating and Assisting in Solving Contractor's Claim arising from Variation Orders, Force Majeure, etc., if applicable
(6) Preparing necessary documents for Variation Orders
(7) Review and recommend Analysis of Prices or Rates submitted by the Contractor

2.2 Supervision of the Construction Works

During the execution of the Works and prior to handover of the Works, the Engineer shall supervise all construction and installation works efficiently and effectively in compliance with the Contract Documents. The Engineer's principal responsibilities in supervision of all such construction and installation works shall be focused to the following concerns, but not limited to:

(1) Checking and Approval of General Work Plan
(2) Review and approval of monthly updated program prepared and submitted by the Contractor (refer to GCC Clause 26.3)
(3) Inspections and Control Services
(4) Checking and Approval of Materials and Method Statement of Work Procedures
(5) Checking and Approval of Quality and Safety Control Plans (QCP/ SCP)
(6) Records of Measurements and Tests/ On-site Inspections
(7) Kick-off Meeting and Regular Meetings
(8) Checking and Approval of Progress Payment/ Preparation of Change Order
(9) Reviewing and Approving As-Built Drawings (refer to Technical Specifications Division 1, Clause 9 (j))
(10) Final Inspection and Preparation of Documents for hand-over of Completed Work

2.3 Supervising Post Construction Works (Defect Liability Period)

Experience has shown that, no matter how good the design and no matter how well the quality of the construction and installation works are controlled, things can still go wrong when the facilities are put to use. So as to avoid this predicament, a defects liability clause is specified in the Contract Documents.

The Defects Liability Period (DLP) is good for a specified period, i.e. 365 days for this Project (refer to GCC Clause 34.1), after the Completion Certificate is issued. During this period, the Contractor is obliged to make good any work that is determined to have been faulty at the time of completion, or any defect, which develops during the DLP that is not caused, by neglect or abuse. At the time of completion of the Works, a list describing all defects and outstanding works will be prepared which will be the basis for the Contractor's liabilities to be attended to. Working in conjunction with DLPIU, the Engineer will endeavour to eliminate all defects and outstanding works by the end of the period.

On the other hand, during the DLP, it is important that the routine maintenance is carried out in strict compliance with O&M manuals and/or manufacturer's instructions. Failure to do so could result in the warranty being declared void. Most electronic equipment and/or systems carry a disclaimer that states that if anyone other than a factory-trained technician attempts to work on them, the warranty is void. For this reason, the Contract Documents clearly specify the Contractor has the responsibility of maintaining the system including equipment for 365 days after installation as well.

3. SCHEDULE CONTROL

3.1 Work Programme

The Engineer shall monitor and manage the overall work schedule giving consideration of scheduled work progress shown on the Master Construction Schedule to be submitted by the Contractor, as well as date of approval of the shop drawings prepared and submitted by the Contractor, and in accordance with appropriate quality and safety control methodology and thorough attaining understanding among the parties concerned.

Also, the Engineer shall review the Master Construction Schedule submitted by the Contractor and confirm the critical path(s) giving careful consideration to the said Master Construction Schedule.

In relation to reviewing the Master Construction Schedule, the Engineer shall also carefully check appropriateness of the General Work Plan, the Method of Installation and Construction for each essential work item proposed by the Contractor which shall be approved by the Engineer accordingly prior to the commencement of any construction works including temporary works planned to be carried out at each target school or the execution of such essential work item for the Works whichever is applicable.

In addition, the Engineer shall instruct the Contractor to submit monthly and weekly work schedules so as to monitor and/or acknowledge the scheduled and actual work progress at the monthly coordination meeting and weekly progress meeting respectively.

3.2 Revision of the Master Construction Schedule

The Engineer shall also instruct the Contractor to review the Original Master Construction Schedule and to submit the revised version thereof, if the monthly work schedule submitted to the Engineer by the Contractor indicates that there are some delays on the overall scheduled work progress with consideration of the actual work progress executed to date.

In order to do so, the Master Construction Schedule shall include the construction schedule for all target schools for each contract package.

4. QUALITY CONTROL

4.1 Quality Control Plan (QCP)

The Engineer shall review and comment on the Quality Control Plan (QCP) to be submitted by the Contractor to the Engineer for his approval (refer to Technical

Specifications Division 1, Clause 37), which shall provide detailed description of procedures, instructions, and reports used to ensure compliance with the Contract Documents. The QCP must be prepared by paying attention to the following concerns, but not limited to, and submitted together with the quality control organization chart to the Engineer for his approval:

(1) Quality control for materials
(2) Quality control for workmanship
(3) Tests and inspections

Furthermore, the said Contractor's QCP shall include the following as minimum:

(1) Organization chart identifying all personnel responsible for quality control and identifying the manager of the QC programme showing that the position is independent of the job supervisory staff with clear lines of authority. The QC manager or designated substitute shall be present at the project site at any time the work is in progress.

(2) Procedures for reviewing shop drawings, samples, mock-ups, certificates, and other submittals necessary for contract compliance including the name of all personnel authorized to sign the submittals for the Contractor certifying that they comply with the contract requirements.

(3) Procedures used to ensure compliance with the Contract Documents, as well as problem identification, reporting and resolution, including a copy of forms and reports used to document quality control operations and submittal status log listing required submittals and action required by the Contractor and/or the Engineer.

(4) A description of the services provided by outside organization such as testing laboratories and consulting engineers.

(5) A test and inspection schedule keyed to the Master Construction Schedule and following the order of the relevant Sections of the Technical Specifications indicating the following:

- inspections and tests required;
- names of responsible personnel for each segment of the Works: and
- schedule for each inspection and test.

(6) Document and submittal control procedure.

(7) Procedures to identify and control use of items and materials.

However, since contracts for the execution of the Works under the Project would be awarded to quite a few contractors, it is recommended that various forms intended to be used for reports and submittals by the Contractor as well as the Engineer shall be unified format as practical as possible so that all personnel of the concerned parties can easily understand what is written in the said various forms at glance.

4.2 Quality Control for Materials

Materials used for the permanent works of the Works shall be strictly conform to the quality and kind specified and/or required in the technical specifications and contract drawings of the Contract Documents. As for the building materials planned to be used for the Project, please refer to "*Annex-2: List of Building Materials*")

It is also recommended that references shall be made to *"Sub-section 1.2.3 Material Quality, Section 1.2 Guidance and Specifications for Technicians"* of PART II: GUIDANCE FOR TECHNICAL PEOPLE of the Construction Monitoring and Supervision Guideline issued by National Society for Earthquake Technology-Nepal (NSET) on June 2016 with the support of Asian Development Bank (ADB). (Please refer to *"ANNEX-1: Construction Monitoring and Supervision Guideline, Volume II Supervision Guideline for Technical People")*

In addition, items and tolerances, and methods, frequencies, etc., for required inspections of each work item covered by the technical specification of the Contract Documents are shown in *"ANNEX-3: Criteria for Overall Quality Control"*.

4.3 Quality Control for Workmanship

Workmanship expected for the permanent works of the Works shall be strictly conform to the quality with allowable tolerances specified and/or required in the technical specifications and contract drawings of the Contract Documents, as well as relevant codes and standards commonly accepted in Nepal.

It is also recommended that references shall be made to *"Sub-section 1.2.4 Material Handling and Workmanships, Section 1.2 Guidance and Specifications for Technicians"* of PART II: GUIDANCE FOR TECHNICAL PEOPLE of the Construction Monitoring and Supervision Guideline issued by National Society for Earthquake Technology-Nepal (NSET) on June 2016 with the support of Asian Development Bank (ADB). (Please refer to *"ANNEX-1: Construction Monitoring and Supervision Guideline, Volume II Supervision Guideline for Technical People")*

In addition, items and tolerances, and methods, frequencies, etc., for required inspections of each work item covered by the technical specification of the Contract

Documents are shown in *"ANNEX-4: Criteria for Quality Control for Site Works (Workmanship)"*.

4.4 Tests and Inspections

The Engineer shall attend to the materials inspections and/or tests, which shall be arranged by the Contractor prior to placing orders and commencement of each relevant construction work, and shall approve an acceptance of the material inspected and/or tested; otherwise a reasonable explanation shall be given to the Contractor for rejection of such material.

The Engineer shall also attend to the on-site inspections to be arranged by the Contractor during the course of the execution of the Works and shall approve to proceed with the relevant works; otherwise an appropriate instruction shall be given to the Contractor for rectification of the works inspected.

Flow chart for general inspection procedures for required tests and/or inspections in terms of quality assurance of the materials and workmanship including the final inspection of the Works is shown in Fig. 4-1 hereinafter.

On the other hand, all required on-site inspections for any essential and/or major work item shall be proceeded as shown in Fig. 4-2 hereinafter. (As for the procedures for inspection request, please also refer to *ANNEX-5: "Sample Formats for Various Submittals"*)

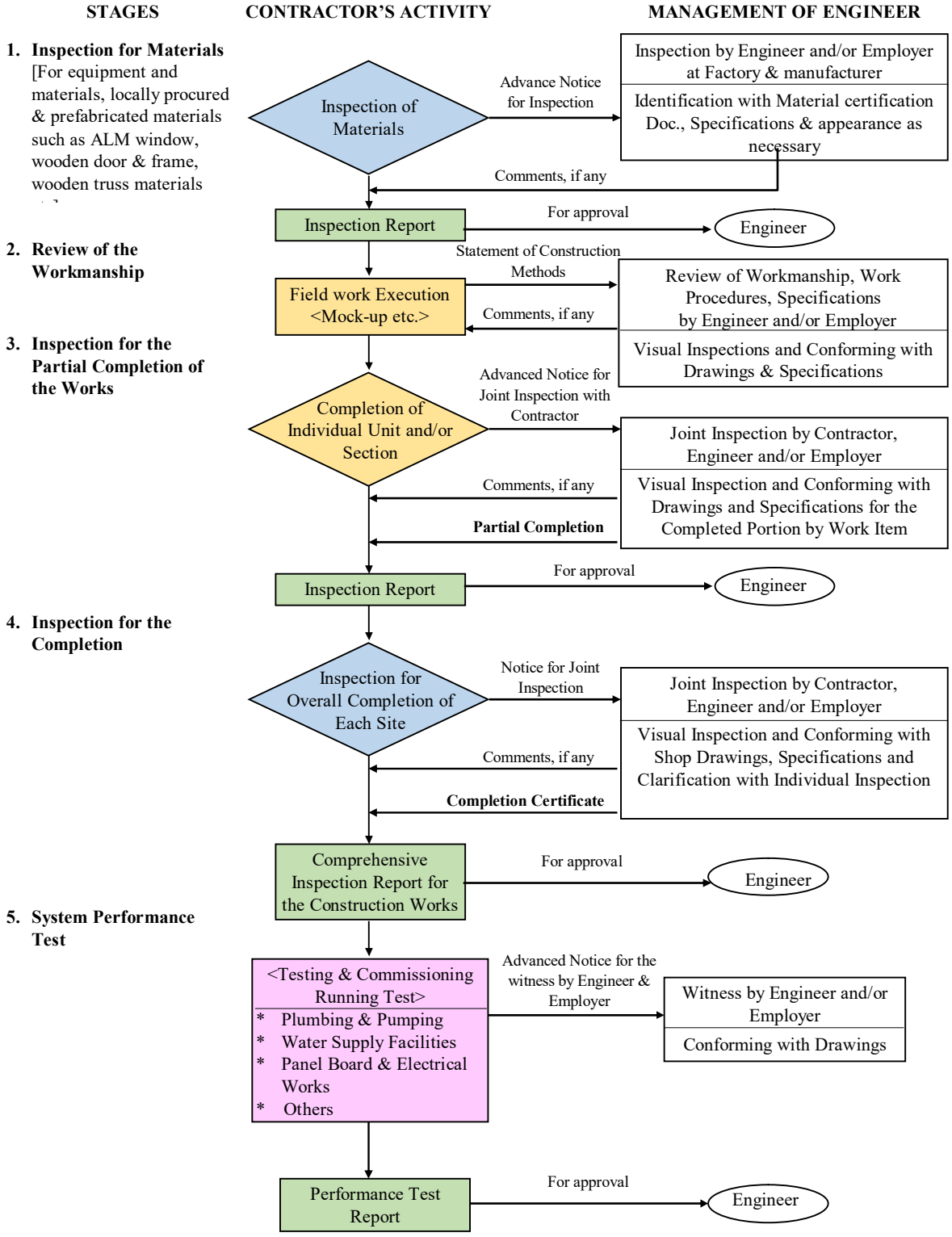
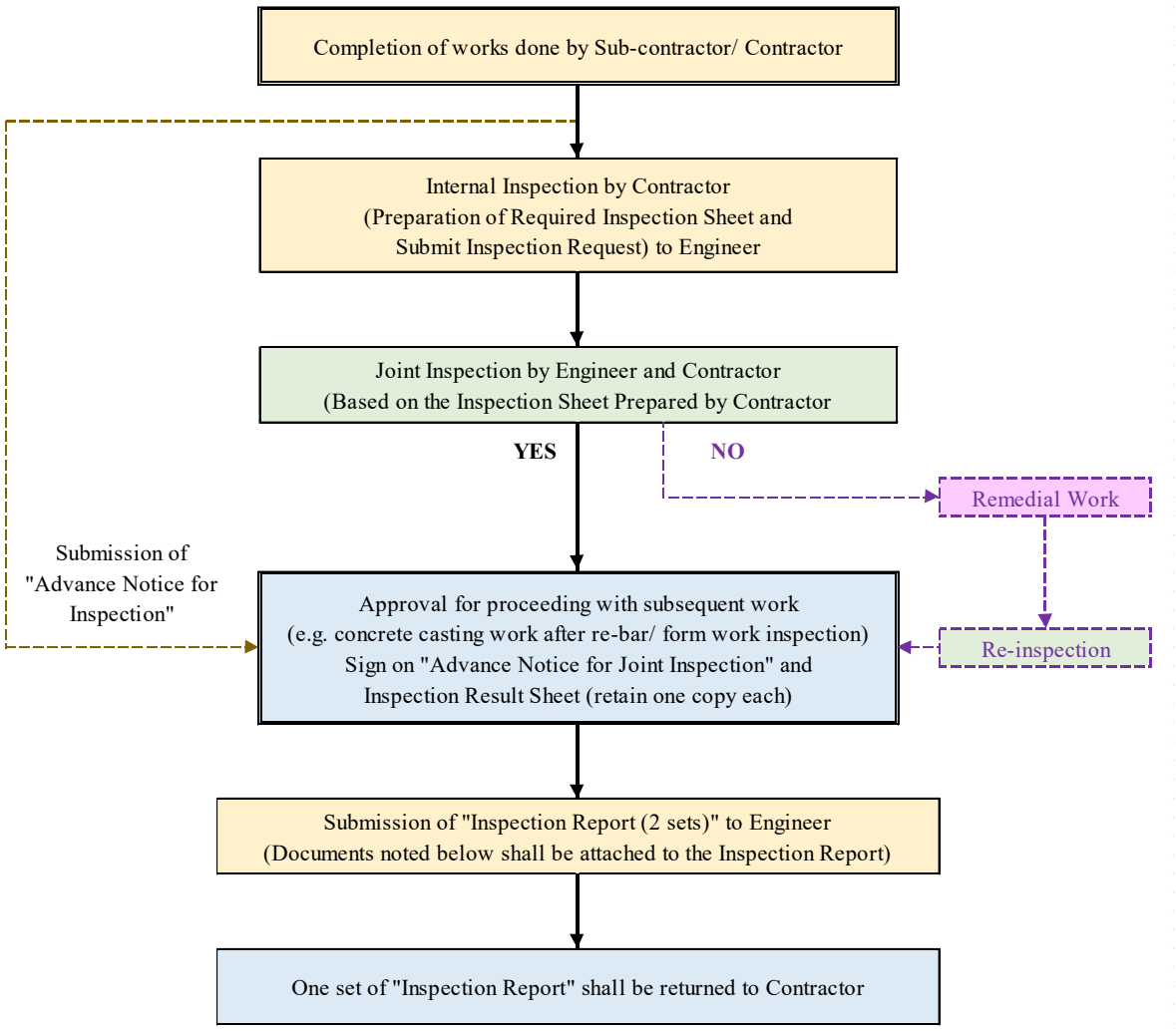


Fig. 4-1: Flow Chart for General Inspection Procedures (Reference Only)



Note: Documents to be attached to "Inspection Report" shall be as follow:

1. Inspection Sheet
2. Signed "Advance Notice for Inspection"
3. Inspection Resulta (Data)
4. Plans for Areas Inspected

Fig. 4-2 On-site Inspection Procedures for Major Work Item

(1) Materials inspections/ tests

The following materials inspections/ tests in accordance with the relevant technical specifications of the Contract Documents shall be conducted by the Contractor in the presence of the Engineer prior to the commencement of or proceeding with each relevant work except compressive strength tests for structural concrete which shall be conducted after casting in place as permanent works:

- Tensile and bending tests (cold-bend) of steel reinforcing bars
- Fine aggregate (sand) and coarse aggregates (crushed stone) for mixing

concrete (refer to Technical Specifications Division 1, Clause 21)

- Portland cement (tests required for mortar cube ccompressive strength and initial and final setting time)
- Concrete mixing proportion (trial mix) and compressive strength thereof
- Compressive strength tests of structural concrete @7 days and @28 days
- Brick (tests required for compressive strength, effloresce, and water absorbance)
- Water (tests required for pH value, percentage of solids, Chlorides, suspended matter, and Sulphate)
- Structural wood
- Wooden and aluminum joinery
- Others, as specified by the Engineer

As for the results of concrete compressive strength tests (@7 day and @28 day strengths including the ones for trial mixes) and of tensile strength tests, and cold-bend tests for steel reinforcing bars, the Engineer shall instruct the Contractor to summarize these results and indicate the summarized results by line charts for each project site so as to be understandable for any third party persons. (Please refer to *"ANNEX-6: Sample Formats for Concrete Test Results and Line Chart"*)

(2) On-site inspections/ tests

The following on-site inspections in accordance with the relevant technical specifications of the Contract Documents shall be conducted by the Contractor in the presence of the Engineer along with the progress of the Works:

- Inspection of earth work including excavation and compaction work
- Inspection of form work and re-bar arrangement work
- Inspection of concrete work including concrete slump test
- Mechanical Work related inspection
- Electrical work related inspection
- Others, as specified by the Engineer

As for the results of the on-site inspections, the Engineer shall confirm his acceptance of the results by signing the inspection request form submitted by the Contractor if the works can be proceeded with; otherwise write his instructions on the said request form for any corrections and/or rectifications to be made.

5. SAFETY AND ENVIRONMENTACONTROL

5.1 Health and Safety Control

The Engineer shall instruct the Contractor to submit a Safety Control Plan (SCP) for the Engineer's approval, so as to maintain a safe and sound working environment at all times, bearing in mind that the Contractor shall take full responsibility for the prevention of unhealthy or unsafe working conditions and for the promotion of healthy and safe working conditions and practices on each project site.. The SCP must be prepared by paying attention to the following general concerns, but not limited to:

(1) Protection and prevention of fires;
(2) Cleanliness of the site;
(3) Awareness of safe driving and securing safe access ways;
(4) Protection from and prevention of personal injuries and accidents;
(5) Prevention of dropping objects;
(6) Prevention of collapses;
(7) Protection and prevention of accidents involving construction equipment; and
(8) Protection from and prevention of electric shock.
(9) Dust control

Furthermore, the Contractor shall give a special attention to the following particular concerns during the course of the execution of any construction and installation works on the project site:

(1) to take necessary precautions and measures for safety of neighbors and visitors and to improve the safety control by installing temporary fences;
(2) to provide surveyed contour plans immediately after signing the Contract, so as to cautiously confirm a consistency of setting-out of benchmarks and leveling between actually surveyed and planned;
(3) to conduct surveys and carefully record the information regarding existing drainage ditch and existing underground pipe to take necessary measures not to damage existing services during the Work period;
(4) to carefully carry out trench excavation for foundations without disturbing the subsoil in order that the planned supporting structures and buildings shall have firm spread foundations; and
(5) to take necessary measures not to interfere with public traffic and to keep pedestrians safe when materials and equipment are delivered to the site.

The Contractor shall submit the above-mentioned SCP describing the following information immediately after the commencement of the execution of the Works, but not limited to, together with the safety control organization chart to the Engineer for his approval:

(1) Project summary;
(2) Map of the site;
(3) Construction management structure;
(4) Safety management structure;
(5) Detailed safety management plan describing its goal, slogan and so on;
(6) Emergency contact telephone numbers for relevant organizations such as emergency hospital, police station, fire station and so on including location map for each organization, as well as "Emergency Network" showing names of contact person and their telephone numbers etc. for all parties concerned;
(7) Master construction schedule; and
(8) Temporary work plan including drawings for temporary buildings and facilities.

It shall be noted that the Emergency Network mentioned above shall be prepared for each contract package by utilizing *Fig. 1-2: Contract Package Based Implementation Structure* shown hereinbefore and shall be displayed in the project site office at all the times.

It shall also be noted that the Contractor shall designate a minimum of one (1) senior and one (1) junior Safety Officers one of whom is to be present on the project site at all times, who can speak and read both Nepalese and English. They shall also have detailed knowledge of the Construction Safety Code and safety standards designated for the use in the Works.

5.2 Environmental Control

The Engineer shall instruct the Contractor to submit an Environmental Control Plan (ECP) for the Engineer's approval, so as to maintain a clean working environment and provision of a good environmental protection throughout the period of the execution of the Works (refer to Technical Specifications Division 1, Clause 25). The ECP must describe measures and/or actions to be taken in terms of the following, but not limited to, together with the environmental control organization chart to the Engineer for his approval:

(1) Environmental protection

Spills or discharges of pollutants resulting from the Contractor's operations, or under his control, that may cause adverse environmental effects shall be immediately reported to the Engineer.

The Engineer shall ensure that the Contractor will clean equipment used for the Works in locations where debris and run-off will be prevented from gaining access to storm water and drainage courses. The Engineer shall also ensure that the Contractor will preserve existing trees as practically as possible and that will not trim damage or remove trees, including their roots, unless previously authorized by the Engineer.

Trucks hauling excavated or other loose material from the project site on all roads other than those constructed solely as haul roads shall have loads trimmed before leaving the project site in order that no spillage occurs. Any spillage shall immediately be removed to the Engineer's satisfaction.

(2) Surrounding areas and neighbors

The Engineer shall ensure that the Contractor will protect all surrounding private and public property from damage during the execution of the Works and that the Contractor will provide adequate measures to control dust at all times during the performance of the Works, and cover or wet down materials to prevent blowing dust and debris, to the Engineer's satisfaction.

In summary, in order not to disturb surrounding areas and neighbors with any nuisance during the execution of the Works, the Engineer shall instruct the Contractor to take necessary measures against the following items:

- Noise
- Vibration/ Impact
- Water pollution
- Air pollution
- Disposal of wastes/ Recycling of wastes (include packing materials)

(3) On-site sanitary services

The Engineer shall ensure that the Contractor will provide suitable temporary toilet facilities for all persons employed in execution of the Works in a location or locations approved by the Engineer. Such toilet facilities shall be cleaned twice daily and all sanitary waste shall be removed from the project site at regular intervals.

(4) Disposal of waste

The Engineer shall ensure that the Contractor will make adequate arrangements to the satisfaction of the Engineer for the disposal of all waste, storm run-off and sub-soil water, sewage and all other waste materials arising from or connected with the execution of the Works.

6. DOCUMENT CONTROL

6.1 General

Since the Project consists of 16 contract packages with reconstruction of many schools and required construction supervision of the Works would be carried out by quite a few engineers and sub-engineers, it is recommended that various forms intended to be used for reports and submittals by the Contractor as well as the ones to be used by the Engineer shall be unified format as practical as possible so that all personnel of the concerned parties can easily understand what is written or described in the said various forms at glance. (Please refer to *ANNEX-5: "Sample Formats for Various Submittals"*)

6.2 Summary of Documentation

The Engineer shall ensure that the Contractor will prepare and submit all the documents specified in the Contract Documents including the following documents to the Engineer for his approval, which shall be prepared by the Contractor in accordance with the terms and conditions specified in the Contract Documents:

(1) General Work Plan with Implementation Structure (Organization Chart);
(2) Master Construction Schedule;
(3) Quality Control Plan (QCP);
(4) Safety Control Plan (SCP) with Emergency Network;
(5) Method of Installation and Construction (Method Statement of Work Procedures);
(6) Monthly Progress Report (MPR);
(7) Weekly and Monthly Work Schedules,
(8) Minutes of Meetings; and
(9) Inspections and Tests Related Documents.

Contents and deadlines for submission of the above-mentioned documents are also described and/or specified in the Contract Documents.

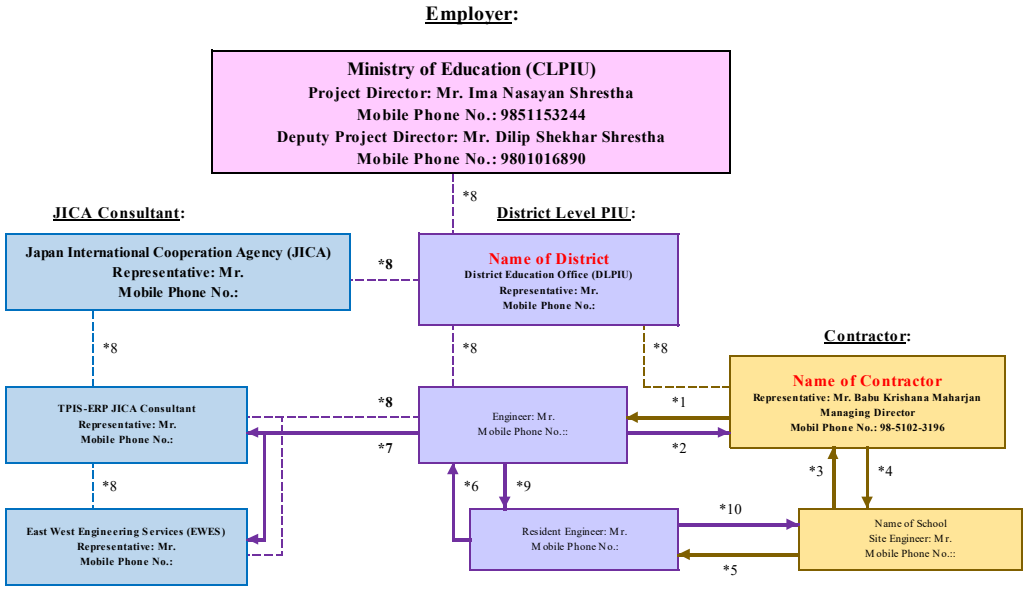
Any enquiries and questionnaires as well as notifications that are addressed to the Engineer shall be made by the Contractor in writing, since no verbal question and notification is acceptable except in emergency cases.

It is a rule that the Contractor shall submit all questions and notifications that are addressed to the Employer shall be submitted to the Engineer.

The Contractor shall address these questions and notifications to the Employer at the first meeting which is a kick-off meeting that is to be held prior to the commencement of the Wok on the project site, or at an alternative location designated by the Engineer, or at the beginning of the Work and keep them recorded in the minute.

6.3 Sequence of Submission

The sequence of submittals shall be as shown in Fig. 6-1 below:



Notes:

*1: Submit Contractor's Submittals required prior to the commencement of the Works
*2: Return Contractor's Submittals with comments or Approval
*3: Forward draft version of Submittals required after the commencement of the Works for checking
*4: Return draft version of Submittals after making necessary revision and/or corrections
*5: Submit Contractor's Submittals required after the commencement of the Works
*6: Forward Contractor's Sbmittals for checking
*7: Forward copies of Contractor's Submittals, if deemed necessary
*8: Coordination, if necessary
*9: Return Contractor's Submittals with comments
*10 Return Contractor's Submittals with comments or Approval

Fig. 6-1: Sequence of Submission of Documents

6.4 The number of copies and kinds of items to be submitted by the Contractor

Although kinds of items to be prepared and submitted by the Contractor to the Engineer are specified in the Contract Documents as well as Section *6.2 Summary of Documentation* hereinbefore, the Engineer shall confirm required number of copies

(hardcopy and softcopy) to be submitted by the Contractor during the kick-off meeting to be held prior to the commencement of the execution of the Works through the discussions among the Employer, JICA, the Consultant and the Contractor.

6.5 Descriptions of Submittals

The brief description of each submittal indicated in "*Section 6.2 Summary of Documentation*" hereinbefore is as shown below:

(1) General work plan with implementation structure (Organization chart)

The Engineer shall ensure that the Contractor will prepare and submit the General Work Plan which includes planned temporary works with implementation structure i.e. Organization Chart immediately after the signing of the Contract.

The Engineer shall review the said General Work Plan in terms of the following:

- How the Contractor manages the work plan and how it can be achieved;
- How the Contractor materializes the design into construction by following the terms and conditions enumerated in the Contract Documents; and
- How the Contractor recognizes fundamental necessities on each essential and/or major work item and adjusts the related works accordingly.

Thereafter, the Engineer shall approve it accordingly, otherwise give instructions to the Contractor to revise as early as practically possible, if there found some corrections and/or modifications to be made.

(2) Master construction schedule

The Engineer shall ensure that the Contractor will prepare and submit the master construction schedule showing overall work schedule with critical path(s) no later than 14 days from the commencement of the execution of the Works.

The Engineer shall review and approve it accordingly, otherwise give instructions to the Contractor to revise as early as practically possible, if there found some corrections and/or modifications to be made.

And, after the commencement of the Works and in case that the actual progress falls behind the original overall work schedule during the course of the execution of the Works, the Contractor shall promptly revise the original master construction schedule and submit the revision thereof to be approved by the Engineer. At this time, the Contractor shall also submit his proposal for practical measures to catch

up some of the delays to the Engineer for his review and comments.

In addition, the Contractor shall clearly indicate the actual work progress of each work item and overall work progress in percentage for the month and accumulated as of the end of each month during the execution of the Works.

(3) Quality control plan (QCP)

The Engineer shall ensure that the Contractor will prepare and submit the quality control plan (QCP), detailed descriptions and requirements of which shall be referred to "*Section 4.1 Quality Control Plan (QCP)"* hereinbefore.

(4) Safety control plan (SCP) with emergency network

The Engineer shall ensure that the Contractor will prepare and submit the safety control plan (SCP) with an appropriate emergency network, detailed descriptions and requirements of which shall be referred to "*Section 5.1 Health and Safety Control"* hereinbefore.

(5) Method of installation and construction (Method Statement of Work Procedures)

The Engineer shall ensure that the Contractor will prepare and submit the method of installation and construction (Method Statement of Work Procedures) for each essential and/or major work item of the Works no later than 21 days from the commencement of the execution of the Works.

The Engineer shall review the said Method Statement of Work Procedures in terms of the following:

- How the Contractor manages the execution of relevant essential and/or major work item efficiently and effectively;
- How the Contractor manages the execution of relevant essential and/or major work item in compliance with the quality (materials and workmanship) required and/or specified in the Contract Documents and in accordance with Quality Control Plan (QCP) prepared by the Contractor; and
- How the Contractor manages the execution of relevant essential and/or major work item in compliance with the health and safety requirements specified in the Contract Documents and in accordance with Safety Control Plan (SCP) prepared by the Contractor.

Thereafter, the Engineer shall approve it accordingly, otherwise give instructions to the Contractor to revise as early as practically possible, if there found some corrections and/or modifications to be made.

(6) Monthly progress reports (MPRs)

The Engineer shall ensure that the Contractor will prepare and submit his monthly progress report bound in A4 size to the Engineer by 5th day of the following month (refer to Technical Specifications Division 1, Clause 9 (i)). . Then, the Engineer shall submit the said monthly progress report (hereinafter referred to as "MPR") to the Employer, attaching a cover letter with summary which describe specific comments on the overall progress of the Works for the month and issues to be noted and/or actions to be taken by concerned party.

The monthly progress report to be submitted by the Contractor shall show and enclose at least the following, which shall be discussed and confirmed during the kick-off meeting:

- Outline of the Works;
- Cumulative executed amount of the Works as well as executed amount of each work item in percentage as of the end of the reporting month, in the overall work schedule showing S-curve;
- Descriptions of the construction and installation works executed during the reporting month;
- Numbers of labor for the reporting month for each work item;
- Cumulative labor hours as of the end of the reporting month;
- Weather records with summary of working days and non-working days;
- Descriptions of the construction and installation works scheduled for next month;
- Construction progress photos taken during the reporting month including interval shots from the fixed observation point(s) and measurement shots for any construction work completed during the reporting month with description of works with indication of locations (caption) and date of each photo taken.
- Minute of the monthly coordination meeting held during the reporting month; and
- Copies of records of tests and on-site inspections, including the summary of respective results, conducted during the reporting month.

(7) Weekly and monthly work schedules

The Engineer shall ensure that the Contractor will prepare and submit a weekly work schedule before the day of weekly progress meeting to be reviewed by the Engineer. The Contractor shall indicate the progress of the construction and installation works of each work item by bar charts of which actual work progresses are shown in bold "Black" continuous line while scheduled work progress are to be shown in bold "Red" dotted line in proportion to the degree of progresses.

The Contractor shall prepare the above-mentioned weekly work schedule which covers three (3) consecutive weeks i.e. last week showing work done to date, this week showing work in progress and next week showing work scheduled.

The Contractor shall also attach the following when submitting the weekly schedule to the Engineer for a record:

- minute of meeting of last week's weekly progress meeting;
- details of problems to be resolved this week including proposed solutions thereof, directions, and items to be approved;
- major construction and installation works scheduled to be executed for next week;
- requests for tests and/or on-site inspections scheduled for next week; and
- Other issues, if any.

The Contractor shall also submit a monthly work schedule prepared based on the original or revised master construction schedule five (5) working days prior to the day of the monthly coordination meeting to be reviewed and approved by the Engineer. In case any delay is foreseeable or actually observed, the Contractor should show them on the critical path(s) of the said master construction schedule.

(8) Minutes of meetings

The Engineer shall ensure that the Contractor will prepare and submit the minutes of all meetings including any ad-hoc meeting(s) held among the Employer, the Consultant and the Contractor on the next working day of each meeting to be reviewed and confirmed and acknowledged by the Engineer.

Any minutes that the Engineer deems necessary for the Employer to receive shall be forwarded to the Employer by the Engineer.

(9) Inspections and tests related documents

The Engineer shall ensure that the Contractor will prepare and submit necessary

requests for witnessed tests and/or on-site inspections to the Engineer two (2) working days prior to any scheduled test and/or on-site inspection, attaching the Contractor's own inspection results and other necessary documents. However, the request for any witnessed test and/or inspection scheduled to be conducted at out of the project site shall be submitted ten (10) working days in advance.

The Engineer shall also ensure that the Contractor will prepare and submit the records of tests and on-site inspections conducted by the Contractor in the presence of the Engineer and/or the Employer on the next working day of each test and on-site inspection to be reviewed and confirmed and acknowledged by the Engineer.

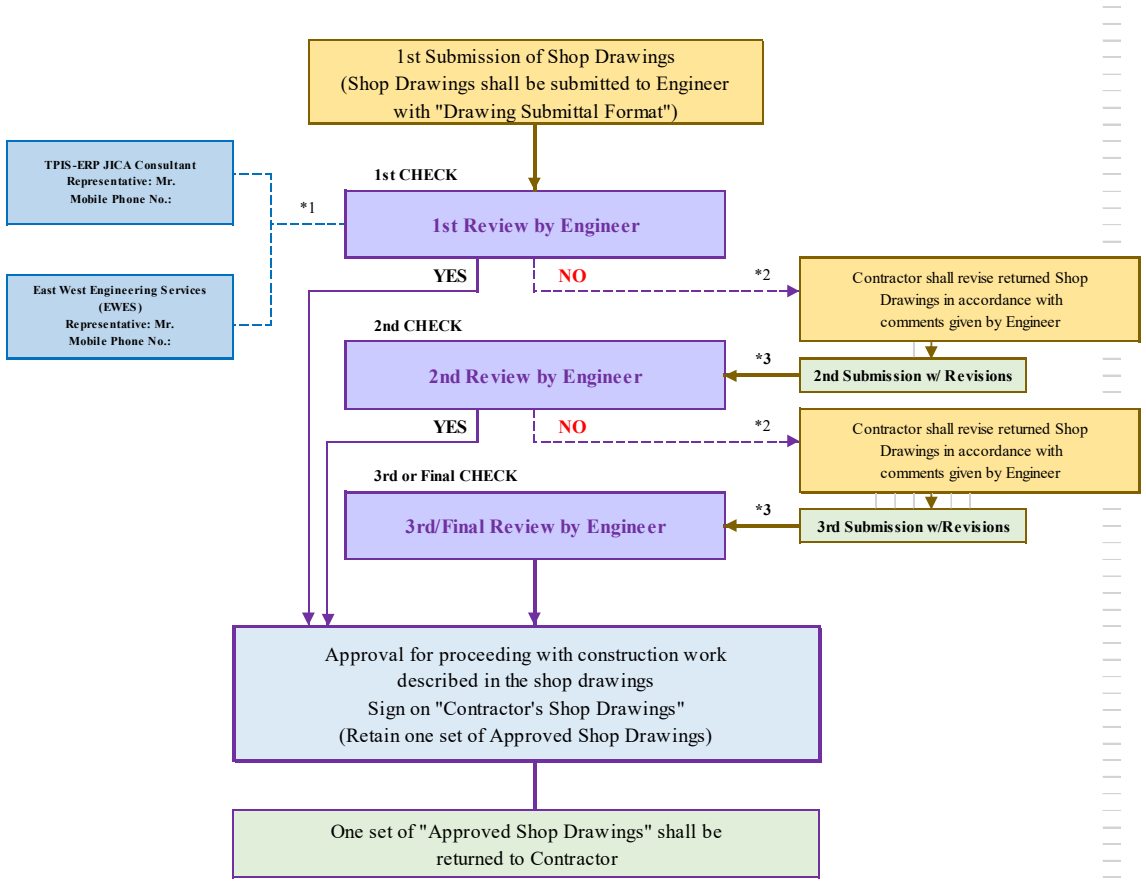
Any records that the Engineer deems necessary for the Employer to receive shall be forwarded to the Employer by the Engineer.

7. SUBMISSION AND APPROVAL OF SHOP DRAWINGS

Procedures for preparation, submittal and handling of the shop drawings to be submitted by the Contractor in accordance with the Contract Documents particularly the Technical Specifications for the Engineer's approval during the Work period are described hereinafter.

The Engineer shall be responsible for reviewing and commenting on the shop drawings, and instructing the Contractor to make necessary revisions, if anything found to be corrected and/or modified.

Flow chart for submission and approval of required shop drawings is as shown in Fig. 7-1 below:



Notes: *1: Clarification and/or coordination, if necessary
*2: Return with comments
*3: Submission of revised Shop Drawings

Fig. 7-1: Flow Chart for Submission and Approval of Shop Drawings

7.1 Submittal of List of Shop Drawings

The Engineer shall ensure that the Contractor will prepare the list of the shop drawings to be approved by the Engineer giving consideration of the following and submit the same to the Engineer for review and perusal as soon as practically possible after the commencement of the execution of the Works, prior to submission of any shop drawings:

(1) The list of the shop drawings to be approved by the Engineer shall be prepared in corresponding with each essential and/or major work item of the Works, with provision of columns for date of 1st submittal, date returned with comment(s), date of 2nd submittal, date approved, and so on (please also refer to *"ANNEX-5: Sample Formats for Various Submittals"*);

(2) The list of the shop drawings mentioned above shall also indicate desired date to be approved by for each shop drawing; and

(3) In principle, review and approval period by the Engineer shall be two (2) weeks.

7.2 Preparation and Submittal of Shop drawings

The Engineer shall ensure that the Contractor will prepare shop drawings deemed necessary for the execution of the Works and will submit the same to the Engineer in the manner described hereinafter (please refer to *"ANNEX-5: Sample Formats for Various Submittals"*):

(1) All shop drawings shall bear the name of the project, name of the drawing (drawing title), number of the drawing (drawing number), name of the contractor, submittal date, signature of the person in charge, and signature of project manager;
(2) In case of a part of whole, a small map showing the location or area of the part against the whole shall be inserted at the upper right corner of the drawing;
(3) Cross sections and details shall be prepared and incorporated as much as possible;
(4) Shop drawings prepared by manufacturers or subcontractors shall be submitted to the Engineer after the close examination and approval by the Contractor; and
(5) The submittals shall be made with printed copies and/or electronically stored data.

7.3 Number of copies to be submitted

Number of copies of shop drawings to be reviewed and approved by the Engineer shall be as follows (refer to Technical Specifications Division 1, Clause 9 (d) (vi)):

(1) First review drawing shall be 3 copies;
(2) Second review drawing, if any, shall be 3 copies; and
(3) Drawing to be approved shall be 3 copies

It shall be noted that the number of copies to be submitted mentioned above may be changed when directed by the Engineer.

7.4 Procedure of submittal of shop drawings

The Contractor shall submit the shop drawings well in advance giving consideration of desired date of approval and review and approval period by the Engineer described below:

(1) The parties to be submitted and the procedures for submittal of the shop drawings shall be directed by the Engineer (please also refer to *"Fig. 7-1: Flow*

chart for Submission and Approval of Shop Drawing");

(2) There may be cases that 1st submittals have been returned with comment(s) by the Engineer; thereby, re-submission of the revised shop drawings for approval by the Engineer may be required;
(3) The shop drawings shall be closely reviewed and examined by the Contractor before submitting to the Engineer;
(4) The desired date to be approved by shall be indicated on each submittal form; and
(5) The review and approval period by the Engineer shall be 14 days and 21 days for ordinal shop drawings and shop drawings for products which factory fabrications are required such as windows and doors respectively.

7.5 Size of printed shop drawings

The size of printed shop drawing shall be as follows; however, submission in CAD data may be accepted when so directed by the Engineer:

(1) A3 size for shop drawings; and
(2) Shop drawings for products and/or equipment bound in A4 size may also be accepted when so directed by the Engineer

8. REGULAR MEETINGS

The Engineer shall instruct the Contractor to convene weekly progress meeting and monthly coordination meeting which shall be led by the Engineer, and to prepare and submit the minutes of meetings and related documents which shall be confirmed and acknowledged by the Engineer.

Outlines of the said weekly progress meeting and the monthly coordination meeting are as described hereinafter:

8.1 Weekly Progress Meetings

Weekly progress meeting shall be held at each project site between the Engineer and the Contractor probably in the presence of the engineer or sub-engineer of the Consultant in order to confirm the work progress to date and discuss the issues to be resolved and/or actions to be taken, if any. The said weekly meeting shall be held as follows in principal:

Day/ Time: Every Mondays, Tuesdays or Wednesdays, at 10:00 am~ or 3:00 pm~ which shall be determined in the Kick-off Meeting to be held for each District giving consideration of the number of the project site

Location: Meeting Room of Site Office
Attendance: Engineer, Contractor and the representative of the Consultant

8.2 Monthly Coordination Meetings

Monthly coordination meeting shall be held for each district covered by the Project at DEO among the Employer (CLPIU and DLPIU), JICA Consultant and the Contractor in order to report the work progress to date and discuss the issues to be resolved and/or actions to be taken for the Project as a whole by parties concerned.

Agenda prepared by the Engineer for the said monthly coordination meeting shall be sent to all parties concerned well in advance and the meeting shall be held as follows in principal:

Day/ Time: The beginning of each month, 10:00 am~
Location: Conference Room of DEO or Site Office (one of the selected school sites)
Attendance: Employer's representatives including the Engineer, JICA Consultant, Contractor and others involved with the Project, if necessary

Venue, date with time, and agenda for the 1st monthly coordination meeting shall be confirmed well in advance by the Engineer through mutual consultation among the parties concerned.

On the other hand, the venue and date with time of the subsequent monthly coordination meeting shall be discussed and determined among the parties concerned before closing the 1st Monthly Coordination Meeting.

Minutes of the Monthly Coordination Meeting shall be prepared and distributed to all attendants within two (2) working days after the day the meeting was held, after reviewed and confirmed and acknowledged by the Engineer. (Please refer to "*ANNEX-7: Sample Format for Minutes of Monthly Coordination Meeting*"

9. OTHERS

9.1 Reporting

The Engineer shall be responsible for reporting to the Employer the progress of the Works for each school to be reconstructed under each contract package of the Project by submitting monthly progress report (MPR) which is described in *Section 6.5 (2)* hereinbefore. (Please refer to "*ANNEX-8: Sample Format for Monthly Progress Report*")

In addition, the Engineer shall be responsible for filling out site diary which records instructions given, tests and on-site inspections conducted, issues to be resolved, and visitors and so on. The said site diary can be read and/or cross-referenced by the Employer and the Consultant any time at all.

The Engineer shall also be responsible for reporting of any accident(s) and/or injurie(s) occurred on the project site to all relevant parties concerned under the Project in accordance with and by following the Emergency Network submitted by the Contractor described in *Section 5.1 "Health and Safety Control"* hereinbefore.

In particular, in the event of the occurrence of such accident(s) and/or injurie(s), JICA and the Consultant shall be notified immediately regardless of the time and the day, since the Project is being implemented under Japan's ODA Loan extended by JICA.

9.2 Inspections and Certificates

As for the required inspections, please refer to *Section 4.4 "Tests and Inspections"* hereinbefore for detailed descriptions and requirements.

And, brief descriptions of the various certificate which shall be issued by the Engineer during the course of the execution of the Works and after hand-over of the Works are as shown hereinafter:

(1) Certificates for monthly progress payment and final payment

The following payment related certificates shall be issued by the Engineer in accordance with the Contract Documents;

- Certificate of monthly progress payment
- Certificate of completion of the Works (final payment certificate)

(2) Certificates for materials and equipment inspections

The following certificates for materials and equipment inspections shall be issued by the Engineer in accordance with the Contract Documents:

- Compliance certificate for locally procured materials such as steel reinforcing bars, Portland cement, and so on.
- Compliance certificate for locally procured equipment such as high voltage (HV) transformer, HV switchgear, and so on.

(3) Certificates for on-site inspections

The following certificates for on-site inspections shall be issued by the Engineer

in accordance with the Contract Documents:

- Certificate of completion of on-site inspections for excavation work, re-bar arrangement work, form work, concrete work, and brick work and so on.
- Certificate of completion of mechanical work related on-site inspections.
- Certificate of completion of electrical work related on-site inspections.

(4) Certificate for completion of the defects liability period (DLP)

The certificate for completion of the defects liability period (DLP) shall be issued by the Engineer upon completion of all remedial works and/or outstanding works after maturity of the specified defects liability period i.e. 365 days after the date of Completion Certificate.

9.3 Cost Control

The Engineer shall be responsible for the following:

(1) Monthly progress payment(s)

The Engineer shall review and recommend the requests for the monthly progress payments prepared and submitted by the Contractor, giving consideration of the actual work progress executed on each project site for the month shown on the monthly construction schedule submitted by the Contractor.

In the event that the Engineer found any discrepancies on the above-mentioned payment request(s) submitted by the Contractor, the Engineer shall instruct the Contractor to amend or revise the same accordingly by giving reasonable and understandable reasons including arithmetic error(s).

(2) Variation order(s)

The Engineer shall prepare a necessary variation order(s) in the event that some changes such as addition and/or deletion of the contracted works or some design modifications are deemed necessary to complete the Works.

In preparation of any variation order(s), the Engineer shall review and analyze changes of quantities in the contracted bills of quantities and applicable unit rate(s) for new work item(s). Thereafter. The summary of such cost analysis shall be approved and/or acknowledged by the Employer prior to the issuance of the subject variation order(s) to the Contractor.

(3) Final account

The Engineer shall prepare final account for each contracted package of the Project prior to the issuance of the Completion Certificate of the Works.

9.4 Completion Documents

The Contractor shall submit to the Engineer the following completion documents approved by the Engineer within thirty (30) days after the date of final payment certificate of completion of the Works specified in Section 9.2 *"Inspections and certificates"* hereinbefore (also refer to GCC/SCC Clause 56.1). The number of copies of the said completion documents to be submitted shall be as indicated hereinafter in principal otherwise directed by the Engineer.

The Engineer shall be responsible for reviewing and commenting on the said completion documents, and instructing the Contractor to make necessary revisions, if anything found to be corrected and/or modified.

(1) As-built drawings

As-built drawings are important assets of DOE and DEO as well as each target school since it is indispensable information for future expansion, renovation, improvement and repair of buildings and/or facilities. The Engineer shall ensure the production and submission of the as-built drawings by the Contractor and safe-keeping of the same by DOE and DEO as well as each target school.

The said as-built drawings shall be produced by revising the contract drawings and by utilizing the construction drawings as well as shop drawings which have been approved by the Engineer during the course of the execution of the Work. Thereafter, the Contractor shall submit the same to the Engineer for his review and approval.

(2) Operation and maintenance manuals

Operation and maintenance (O&M) manuals are an important adjunct to training and are essential to the operation and maintenance of the buildings and facilities, as well as equipment, if installed any. The manuals should be prepared in accordance with internationally accepted practices and be user friendly. A typical O&M manual will contain various necessary information such as system description, operation instructions, maintenance procedures, list of building materials used and spare parts, testing and commissioning data, statutory documents and approvals, list of as-built drawings and emergency procedures including name of contact

person of the Contractor and/or agent with respective contact phone number and address (refer to Technical Specifications Division 1, Clause 9 (k)).

The Contractor shall produce the O&M manuals in useable form which is an onerous task. Draft versions of the same should be received by the Engineer at least thirty (30) days before handover in order to allow time for review by the Engineer and revision by the Contractor.

(3) Completion photographs

The Engineer shall instruct the Contractor to produce completion photographs, as required by Technical Specifications Division 1, Clause 9 (m), for each school reconstructed under the contract which shall be bound as photo album and submit to the Engineer.

Photos to be taken and selected, numbers of photograph to be included, title of album, caption for each photographs selected, and numbers of album to be submitted, and so on shall be directed separately by the Engineer upon completion of the Works.

ANNEXES

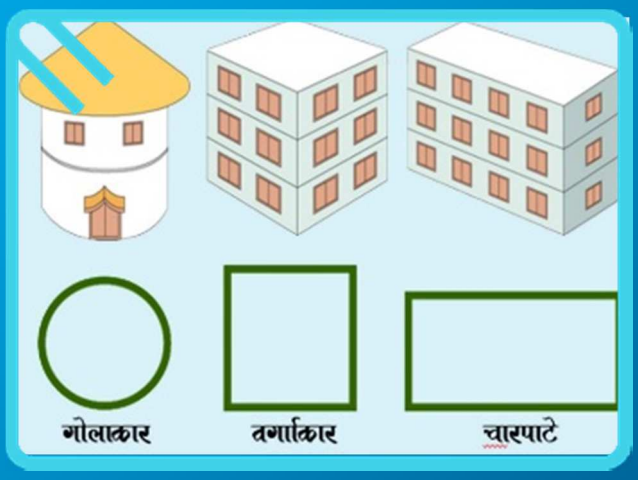
ANNEX-1

Construction Monitoring and Supervision Guideline

Volume II: Supervision Guideline for Technical People

(For reference only, subject to final approval by NRA)

Construction Monitoring and Supervision Guideline



Volume II

Supervision Guideline for Technical People

National Society for Earthquake Technology-Nepal (NSET)

June 2016

Table of Contents

1. PART-II: GUIDANCE FOR TECHNICAL PEOPLE

1.1 General

1.1.1 Supervision

Supervision is a continuous process of investigation, prevention of mishaps, evaluation, reviewing and taking necessary corrective action in different stages of a construction project. Supervision is necessary to ensure a higher level of quality by improving communications and understanding of project requirements. The school management should continuously supervise construction works (quality, schedule and budget) and also commissioning supervision on quality and schedule is needed. They should monitor the progress of works to ensure that they are executed in accordance with the accepted construction progress chart. All other remaining activities arising from the contract and regulations applicable to the certain type of works are also to be worked out.

1.1.2 Role of Technicians

Every construction shall meet some functional requirements at minimum cost with sufficient level of safety and durability. In this regard, technicians have the most important role to achieve the required level of strength and durability. Thus appropriate intervention of technical persons from DEO, and NRA along with technicians deployed by SMC or contractor is very important.

1.1.3 Site Diary

The contractor or working committee shall keep site diaries wherein full details of the work carried out during each day shall be fully recorded. The diaries shall be available for inspection by the engineer or higher authorities any time during normal office hours. The site diaries shall include:

Detailed Specifications of Building Works (Civil)

- Weather conditions, rainfall/snowfall, and river water level
- Description, quantity and location of work performed
- Shifts and working hours
- Number and category of workers working at site
- Plant in use and idle, or broken down

- Test carried out and results
- Inspection carried out by the Engineer
- Site instructions
- Visitors
- Accidents Measurement and Payment

The cost for these works shall be covered in overhead included in unit rates of related items in the BOQ.

1.2 Guidance and Specifications for Technicians

1.2.1 Site selection:

1.2.1.1 General Requirements:

Site selection is one of the most important step for successful construction of structure and its durability. Most the settlement problems is due to unstable soil or soil with low bearing capacity. Following preliminary key points should be considered for selection of suitable construction site.

The building site shall be the safest available with respect to natural hazards. Any existing buildings shall be studied for any evidence of inherent natural hazards in the locality. These hazards include susceptibility to landslides, erosion and land subsidence. The local practice used to manage such hazards, if any, shall be judged against the required level of acceptable risk. Areas with high potential of liquefaction during earthquake should also be avoided.

1.2.1.2 Geo-technical Investigation Works

All site investigations should address the following basic questions:

- Is there any danger of inherent natural susceptibility of the land to the process of sliding and erosion?
- Will the construction adversely affect the existing conditions and trigger landslide, erosion, land subsidence, pore pressure generation due to blockage of or otherwise the sub-surface flow of water; will the construction adversely affect the water table?
- What will be the extent of settlement of the building?
- Is the sub-surface capable of taking the load due to the proposed construction?
- Is there any other natural/geological process likely to threaten the integrity of the building? (Eg, changes in a river course, flooding, failure of an irrigation canal?)
- What are the possible engineering solutions for ensuring stability of the building foundation in view of the identified conditions?

Answers to some of these questions can be found by examining the existing local knowledge, records of any past exploration in the adjacent area and the behavior of existing similar structures. If satisfactory answers to the questions cannot be found, it will be necessary to undertake additional site investigation including subsurface

exploration, in-situ and laboratory testing, geophysical surveys and testing, probing, etc.

1.2.1.2.1 Simplified Soil Investigation

Especially for buildings having low budget (less than one crore), preliminary test of soil at site can be done as follow.

a. Dig at least two pit of size 1mx1m' to depth of 2m (or sound bed-rock level) and inspect type of soil
b. Observe ground water level
c. Study soil investigation report of nearby area if available.

The observed soil in the pit shall be classified as per the table below. Buildings can be constructed on hard, medium and soft soils, but it is not recommended to construct buildings on weak soils. If soil of site is found suspicious then recommend for Geotechnical soil investigation.

Type of Foundation Materials	**Soil Classification**
Rocks in different state of weathering; Boulder bed, gravel, sandy gravel and sand-gravel mixture; Dense or loose coarse to medium sand offering high resistance to penetration when excavated by tools; Stiff to medium clay which is readily indented with a thumb nail	Hard
Fine sand and silt (dry lumps easily pulverised by the fingers); Moist clay and sand-clay mixture which can be indented with strong thumb pressure	Medium
Fine sand, loose and dry; Soft clay indented with moderate thumb pressure	Soft
Very soft clay which can be penetrated several centimetres with the thumb; Wet clays	Weak

A simple preliminary test can be conducted to get rough idea on the soil quality. For this, following procedure can be carried out.

- Dig a pit of 1mx1mx1m
- Fill the pit with the same soil with simple compaction.
- If pit is not filled with the soil, then soil is weak

- If pit is just filled with the soil, then soil is medium type
- If soil remains after filling the same pit, then soil is hard.

1.2.1.2.2 Geotechnical Soil Investigation

For RCC structures more than one crore budget, detail geo-technical investigation must be done. For masonry structure of more than one crore budget still simple soil investigation method stated above can be done.

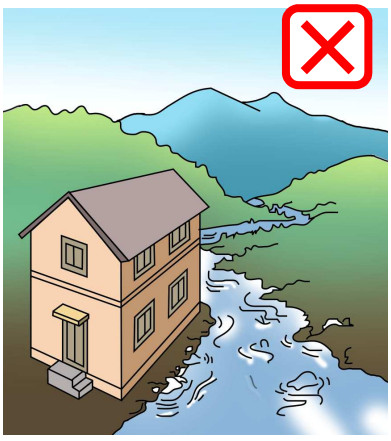
a. In soil investigation report, liquefaction potential analysis must also be included.
b. Bore-hole location must lie within proposed building area in site plan.
c. A copy of soil-test report shall be submitted to relevant department of government.

Earthquake Shaking increases in soft, thick, wet soils. In certain soils the ground surface may settle or slide during shaking.

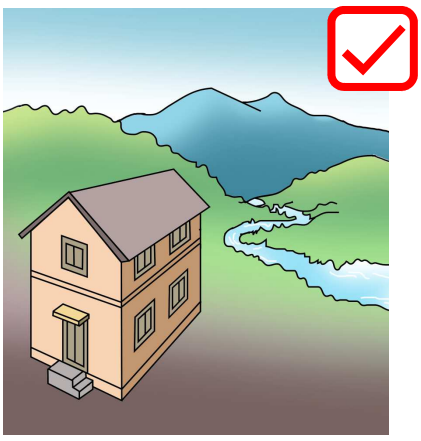
1.2.1.3 Guidelines on Site Selection

1. River bank

Avoid site close to river to protect building against flood and Liquefaction susceptibility. In unavoidable situations, constructions on such areas can be undertaken only after carrying out protection works as suggested by specialists.



Building near river bank



Building with certain distance from river bank

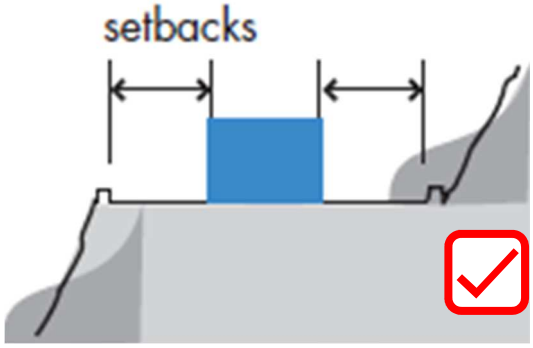
2. Landslide prone area

Areas likely to experience frequent landslides shall be avoided for construction of buildings. The simplest indication of sustained stability of a slope is the

upright standing of the trees on it. They would be inclined downwards in the case of unstable slopes

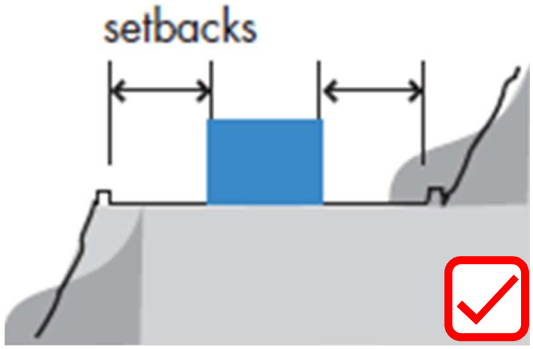
Effects of earthquake induced ground motion is sufficient to cause landslides in marginally stable slopes. Up-slope slides can inundate the site with debris, damaging the building and even sweep away the building. Down-slope slides can undermine the building foundation resulting in damage and toppling of the building.

Below land slide prone area



Maintain sufficient setback from toe

Above land slide prone area



Maintain sufficient distance from slope and do the necessary protection work

3. Rock fall area

Boulders can roll down and damage building in bare hills or mountains. Such condition is more severe in earthquake shaking. Therefore, buildings shall be constructed in such areas only after the provision of proper prevention.

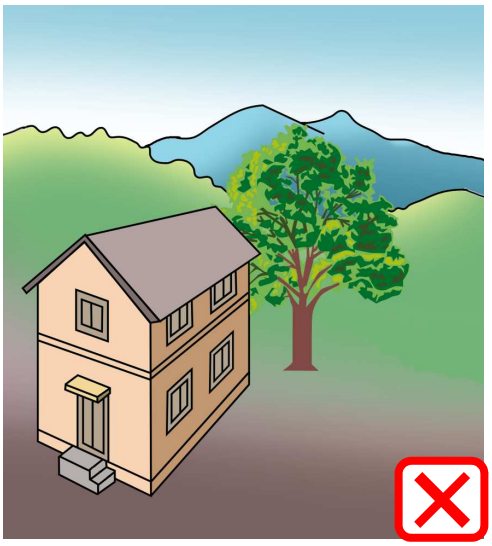
c

Damage to building due to rockfall

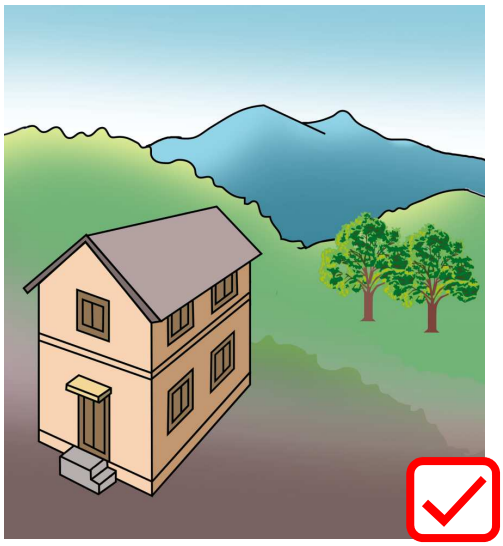
Rockfall protection work

4. Large tree

Buildings should not be located near big trees. Roots of big trees near the building can damage the foundation of the building. Moreover, the trees may get uprooted and may fall on the building during strong earthquake shaking or during strong wind.



Building very near to tree



Building far from tree

5. Geological fault or ruptured areas:

Geological fault lines or rupture lines that are usually visible to the naked eye and are permanent, deep and active cracks should be avoided. Buildings should be constructed at least 500 m away from these lines.

6. Steep slope:

Generally, soil slopes up to 20° are stable and good for construction. However, constructions on steeper slopes shall only be done after cutting it to flat and proper retaining works as advised by specialist.

7. Water-logged area:

Sites with permanent water-logged areas should be avoided. If such sites are unavoidable then it could be done after geotechnical investigation and treatment.

8. Filled area:

No building foundations shall rest on filled ground. If a building is to be constructed in a filled-ground, the foundation shall be deep enough so as to rest on the firm natural ground surface beneath the fill.

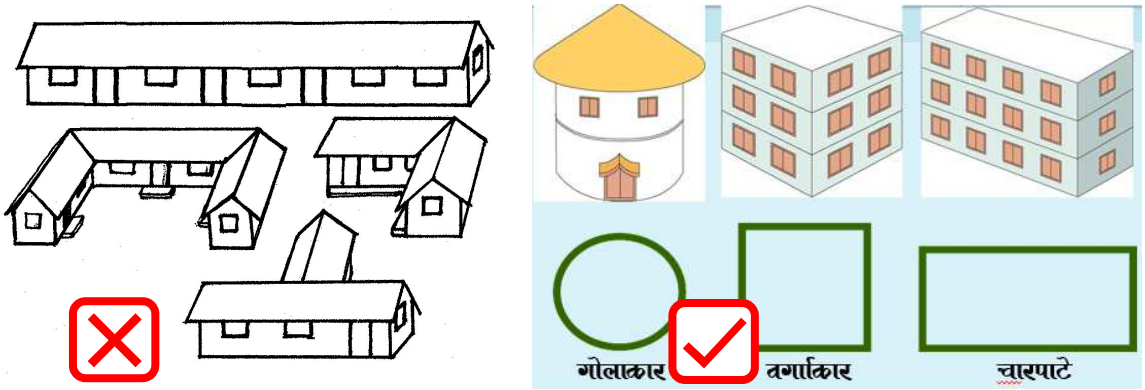
1.2.2 Building planning

1.2.2.1 Building configuration

Following simple guidelines are very useful in the planning of building configuration.

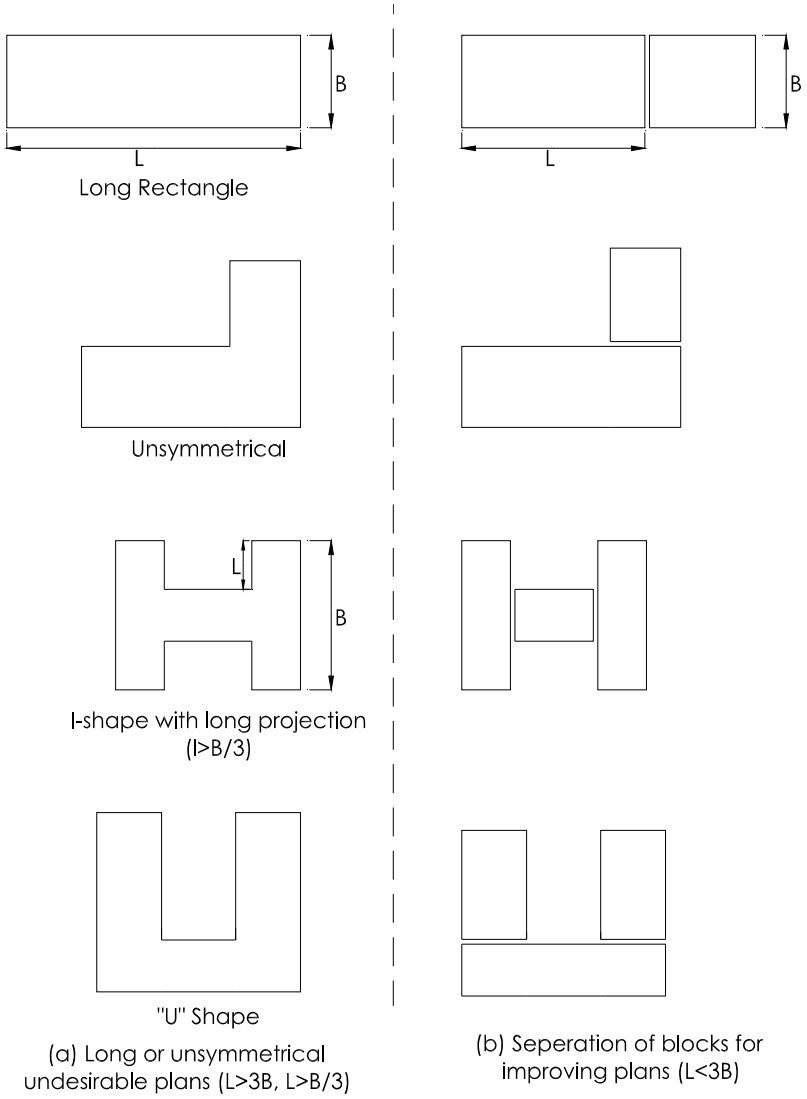
1. Regular/simplified shape

The building shall be simple and regular so as to avoid unequal load distribution, unequal displacements and stress concentration in the structure during earthquake shaking. Buildings with 'L', 'T' , 'E' shapes should be avoided, simple rectangular shapes shuld followed. Such irregular shapes can be avoided by construction multiple buildings with simple rectangular shape so that they are structurally isolated.



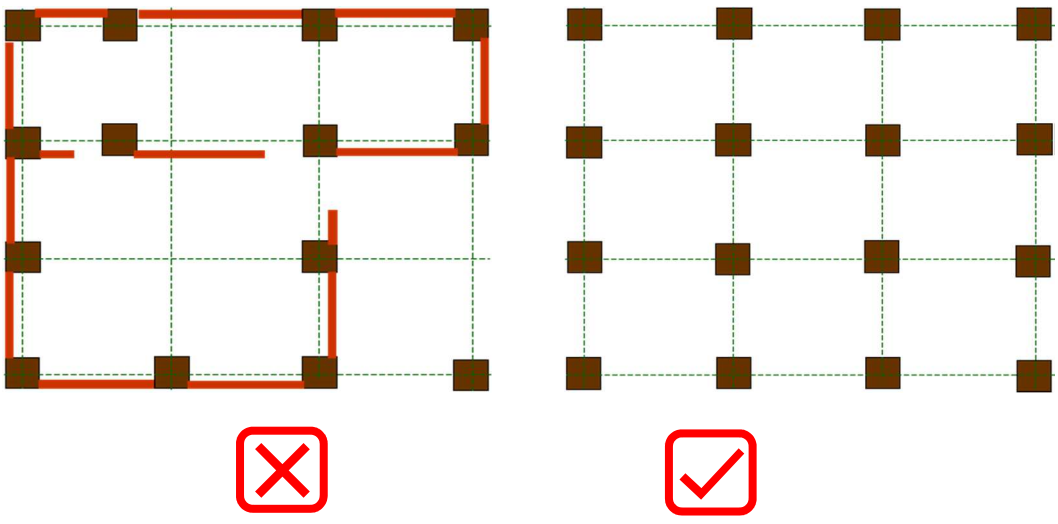
2. Length/Height should not be more than 3 times of width

The length and height of building shall normally not exceed three times the minimum width of the buildings. In difficult cases, such buildings shall only be constructed after detailed structural analysis from experts.



3. Distribution of Structural Elements:

Reinforced cement concrete (RCC) structures, generally columns should be placed in regular grid, with beam running from column to column. All column shall be connected with beams in at least two directions.



4. **Do not attach with the existing buildings**

If new building is to be constructed near the old building, then sufficient gap shall be provided for easy workmanship round the buildings. Normally, more than 1m gap is recommended if space is available. However, if there is not sufficient space, at least the building shall be separated equal to seismic gap recommended in the following section.

5. **Provide seismic gaps in case of long, and irregular shapes**

If any building is required to be irregular due to other constraints, then it shall be separated into simpler pieces structurally with a seismic gap. Such gap shall not be less than that from design calculations or number of stories times 50mm.

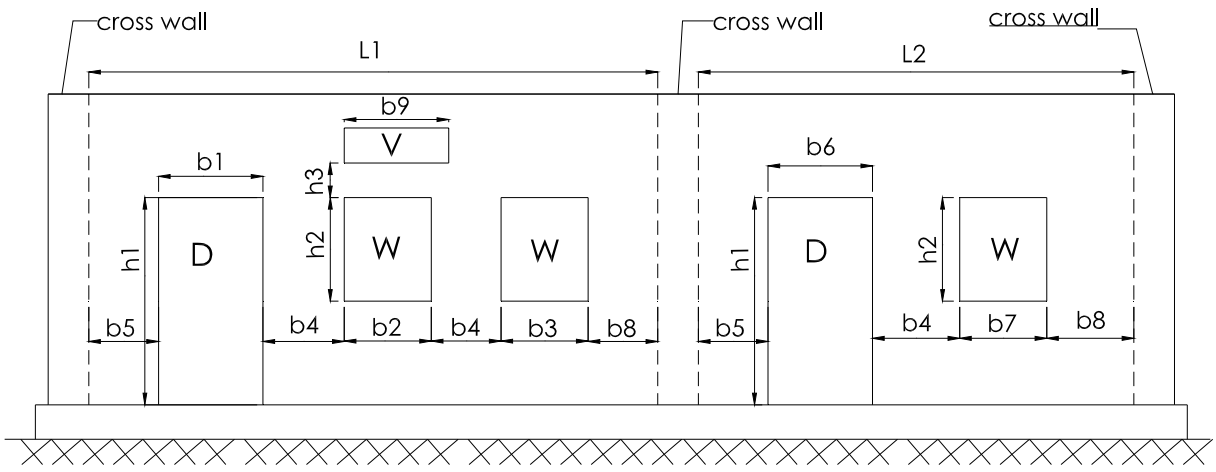
1.2.2.2 Opening in Wall

For masonry structures:

Opening width in masonry structures shall be within specified limit for masonry structures

Openings in a wall generally describe those for doors and windows. However, the partial puncture of a wall such as built in wardrobe, closet, dalan covered verandah with walls on three sides, shall also be considered as openings in this guideline.

Unbalanced openings contribute to the increased vulnerability of buildings during an earthquake. For buildings to be safer, the size and location of the openings shall be controlled as illustrated in Figure below.



Note:
b1+b2+b3 ≤ 0.5L1for one storey and 0.42L1 for two storey
b6+b7 ≤ 0.5L2 for one storey and 0.42L2 for two storey
b4 ≥ 0.5h2 but not less than 600mm
b8 ≥ 0.25h2 but not less than 600mm
b5 ≥ 0.25h1 but not less than 600mm
h3 ≥ (greater of 0.5b2, 0.5b9 and 600mm)

D = Door
W = Window
V = Ventilation

For RCC structures:

For RCC structures, height of openings that are less than 600mm away from column face shall not be lesser than half of the clear height of column. It will cause short column effect making the column more vulnerable in shear damage.

1.2.2.3 Lighting and Ventilation

All habitable rooms shall have external wall openings not less than 1/10th the floor area of the room. Habitable rooms are defined as those areas not less than 2000 mm x 2000 mm used for extended periods of time for living, study, sleeping, eating and working. Areas such as bathrooms, stores, laundry, passages and attics are not included in habitable area. Incase of windows placed in courtyard for lighting, the size of courtyard should be at least 3m x 3m wide.

No portion of the room shall be considered naturally lighted if it is more than 7500 mm from the opening. For natural ventilation, openable exterior openings shall be not less than 1/20th of the floor area. For ventilating spaces for water closets and bathrooms, the minimum size of the ventilation shaft shall be 1 sq. m.

Where natural lighting and ventilation requirements are not possible to meet, the same shall be assured through artificial lighting and mechanical ventilation.

Accessibility for persons with physical disabilities:

At least one primary entrance of any building shall be usable by person with physical disabilities and be on the level that would provide access to elevators where provided.

Ramps for wheelchairs shall not have gradients more than 1:12. Level platforms shall be provided at max. 1800 mm flight. Level platforms shall also be provided at tops and changes of direction. The minimum widths of wheelchair accessible ramps shall be 1000 mm. Handrails are required when the total rise exceeds 600 mm.

The areas accessible by wheelchair shall have a flush threshold and openings with minimum clear width of 775mm. If double leaf entrance door shutters are provided, the single leaf opening shall meet the above clear width.

1.2.2.4 Staircase:

Every stair having two or more risers shall confirm to the following conditions in addition to Fire Safety requirement set out in NBC 107

The minimum clear width (unobstructed by projections or handrails) of staircase shall be 2000 mm for educational buildings.

The minimum tread shall be 250 mm excluding nosing and the maximum riser will be 175 mm for all buildings except for internal staircases of Apartments, which can be permitted up to 190 mm.

Handrails shall be provided in all open staircases

Handrails shall not be lower than 900 mm from the center of the tread.

The maximum number of risers shall be limited to 15 per flight.

The minimum headroom under a staircase shall not be less than 2000 mm measured vertically from the nosing of the tread to the soffit plane above.

1.2.3 Material Quality:

It is simply not enough that the elements are carefully and professionally designed. If quality of material is not good then even good efforts in construction will not result good product. To achieve assumed construction product, quality control begins with selection of good quality construction material as specified in the design. Therefore building materials should be chosen to comply with the relevant standard.

If good designs are badly constructed they are not safe for school children.

1.2.3.1 Cement

The cement used should be fine, uniform in color, feel smooth while rubbing and shold not contain any lumps. The age of cement should not exceed 2 months from date of manufacture. The cement should be fine and should not contain lumps. It should be stored in a dry place, in regular piles not exceeding ten bags high and in such a manner that it will be efficiently protected from moisture and contamination. It is advisable to use cement which has obtained the NS mark if independent tests as per NS: 049-2041 is not carried out.

Cement stored in ground above brick soling

Cement stored above wooden plank

Hardened particles

Manufacture date

1.2.3.2 Sand

The sand should not contain clay, silt and decomposable particles. Sand shall consist of a siliceous material having hard strong, durable, uncoated particles.

It shall be free from undesirable amounts of dust lumps, soft or flaky particles, shale, salts, organic matter, loam, mica or other deleterious substances. In no case shall the total of all the undesirable substances exceed five percent by weight.

Adulterated sand

Clean sand

Field test of Sand

Simple field test can be carried out to determine the proportion of undesirable fine particles in the sand.

- Fill a jar with dry sand up to 60 mm
- Fill water 25mm above the sand
- Add one spoon salt
- Shake until mixture is uniform
- Let the Jar in still position for three hours
- Measure the silt above the sand
- Silt content shall not be more than 5%

1.2.3.3 Coarse aggregate

Coarse aggregates should not be flakey and elongated. It should be angular in shape and rounded aggregate should be avoided. Aggregate of variable size (well graded aggregate) should be used. It should be free from organic materials and dust.

Coarse aggregates shall consist of crushed or broken stone and shall be hard, strong, dense, durable, clean, of proper grading and free from any coating likely to prevent the adhesion of mortar. The aggregates shall conform to the requirements of IS: 383-1970 and IS: 515-1959.

The coarse aggregates shall be of following sizes:

a. Cement concrete with thickness of 100mm or more: Graded from 20 mm downwards
b. Cement concrete with thickness of 40 mm to 100 mm: Graded from 12 mm downwards

Flaky and elongated aggregate

Well graded angular aggregate

1.2.3.4 Water

The water used should be clean. No impurities should be seen with naked eyes.

Contaminated water

Clean Palatable water

1.2.3.5 Stone

Stones should be tough, hard and strong. If stone from river bed is to be used then use only after breaking to proper shape.

Rounded shape stone

Hard and tough irregular shape stone

1.2.3.6 Brick

The bricks shall be of a standard rectangular shape, burnt red, hand-formed or machine-made, and of crushing strength not less than 3.5 N/mm². The higher the density and the strength, the better they will be. The standard brick size of 240 x 115 x 57 mm with 10 mm thick horizontal and vertical mortar joints is preferable. Tolerances of ±10 mm on length, ±5 mm on width and ±3 mm on thickness shall be acceptable for the purpose of thick walls.

Over burned / irregular bricks

Bricks uniformly burned

The brick should be uniform in color and size. It should produce metallic sound while two bricks are hit. It should not break when dropped from a height of 3 feet on hard surface. It should have uniform texture on broken surface.

1.2.3.7 Timber / Wood

Structural timber should not contain large knots or concentrated knots at a location. Decayed timber shall not be used, and seasoned wood shall be used for structural elements as far as possible.

Wood with large knots

Wood free from knots

Generally the timber shall be Sal wood unless otherwise stated of the best quality obtained from an approved saw mill. Timber for structures shall be straight and free from twist, sapwood, shakes, dead and loose knots, worm holes, other holes, signs of decay and other defects. It should have adequate strength, durability for the purpose for which it is required. It shall comply with the requirements of IS 883-1994. The minimum compressive strength of the timber shall be 70 kg/cm2.

1.2.3.8 Mortar:

Cement-sand mixes of 1:6 and 1:4 shall be adopted for one-brick and a half brick thick walls, respectively. Addition of ¼ to ½ bag of freshly hydrated lime to one bag of cement in mortar will greatly plasticity without reducing the strength of the mortar. Hence, the addition of lime within these limits is encouraged.

1.2.3.9 Plaster

All plasters should have a cement-sand mix not leaner than 1:6. They shall have a minimum 28 days cube crushing strength of 3 N/mm².

1.2.3.10 Reinforcing steel

It shall be clean and free of loose mill-scale, dust, loose rust and coats of paints, oil, grease or other coatings, which may impair or reduce bond.

- Fe 500 with ductility 14% elongation
- Fe 415 with ductility 14% elongation
- Fe 250 with ductility 20% elongation

1.2.4 Material handling and workmanships:

Efficient material handling will increase product quality and productivity of the workers. It also reduces project cost and prevent from injuries at work place. Good workmanship is always assumed during design. Poor workmanship even with good materials also do not result a good product. Therefore to achieve a good product both good workmanship with good material is compulsory.

If good designs are implemented with poor workmanship, school children will not be safe within these structures.

1.2.4.1 General

One of the basic parameter of achieving the desired strength, durability and safety of a structure is proper handling of construction materials. This will not only contribute to the quality control but also the use of building.

1.2.4.2 Earth Works:

The most important Inspection Points are at the foundation stage. This is because defective work at this stage of construction is the most critical and the most difficult to repair.

1.2.4.2.1 Excavation:

The minimum depth of foundation from general ground level should be 1.5m unless specified.It should be well compacted with rammer before soling is done.

Poorly compacted earth

Well compacted earth

1.2.4.2.2 Site management:

Clear the excavated soil form construction site to protect concrete from mixing with soil during foundation work

Exacavated soil cleared from site

Excavated soil not cleared from site

1.2.4.3 Masonry Works

1.2.4.3.1 Preparation before laying

Bricks should be deeped into water till the saturation point before laying on a wall. Normally, this can be achieved by soaking the bricks in a pool of water for minimum 7 hours. stones shall also be moistened before laying.

Just spraying water over brick before laying

Bricks immersed in water before laying

1.2.4.3.2 Bond and Construction joint

Vertical joint shall be broken from course to course. Stepped joint is always recommended and constructed in a lift of about 600mm. Toothed end should be replaced by stepped end when the wall is left to connect to another wall.

Toothing left for later construction joint

Stepping left for later construction joint

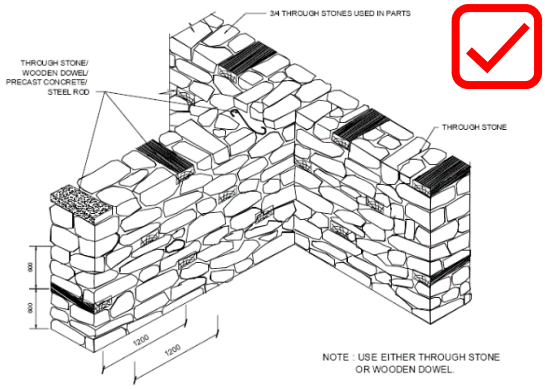
1.2.4.3.1 Coursing

Bedding planes shall be horizontal and fully covered with mortar. In stone masonry also, coursing is recommended to achieve a same bedding level in about every 600mm.

1.2.4.3.2 Stone Wall

When built in two layers with packing, connecting stones (through stones) should be provided 1200 mm in the horizontal direction and 600 mm vertically. Through stones help to act as bonding element between two witches of the wall. Lack of through stones can lead to separation of witches as well as delamination.

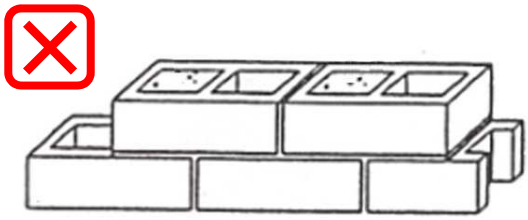
Weak masonry with round shaped stones



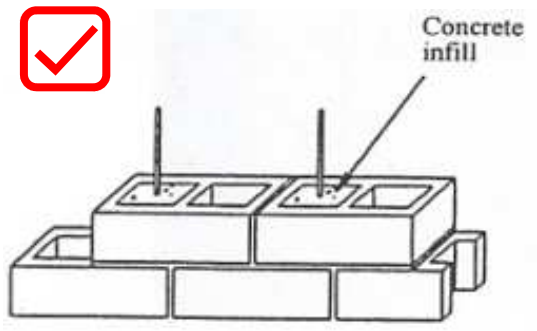
Stone masonry with proper through stones

1.2.4.3.3 Hollow Block

Hollow masonry units shall be used with Vertical reinforcement in the holes at certain spacing and such holes shall be filled with concrete or grout.



Hollow bricks without reinforcement



Hollow bricks with vertical reinforcement

1.2.4.3.1 Parapets

Normally, Parapets above roofs and at the edges of the balconies shall not be taller than one meter. They should either be constructed in reinforced concrete or be reinforced with vertical RC elements spaced not more than 1.5 m apart. Nominally reinforced masonry parapets are not recommended to be taller than 1.5 times its thickness.

1.2.4.4 Reinforcement Works (Steel works)

1.2.4.4.1 Footing mesh

Bend the bars of footing mesh at the ends

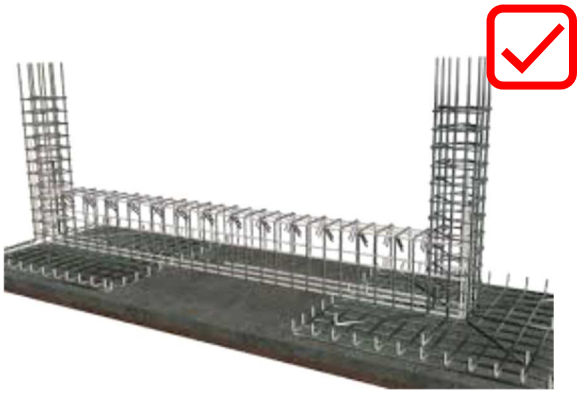
Ends of footing mesh not bent up

Ends of the footing mesh bent up

Eccentric footing

Strap beams must be provided in case of the columns placed at the end of the property line. This will minimize the eccentricity effects.

Strap beam not provided for eccentric column



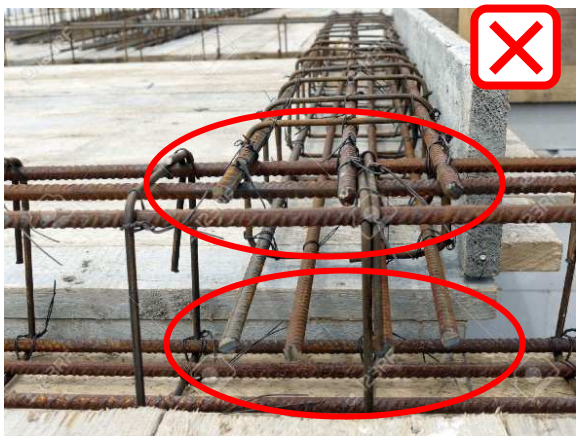
For one side eccentric column strap beam provided

1.2.4.4.2 Joint detailing

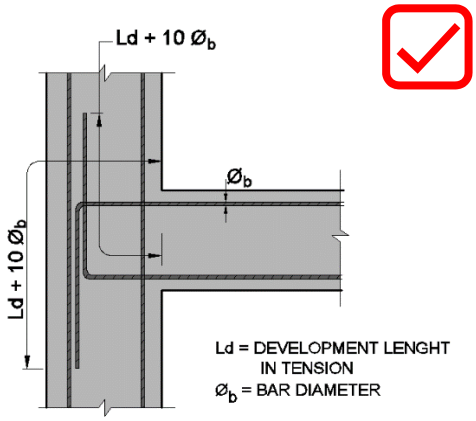
1. Development length should be 60 times the diameter of bar used.
2. The lapping should be avoided in joints between column and beam.
3. All the bars of beam should lie within the column reinforcement.

The case where beam reinforcement passing outside of column reinforcement

reinforcements of beam confined by column reinforceds



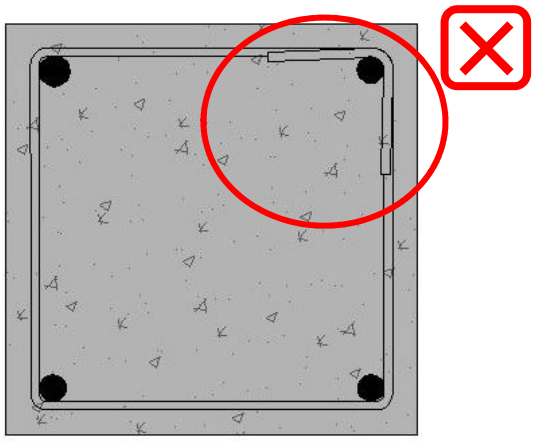
Insufficient development length



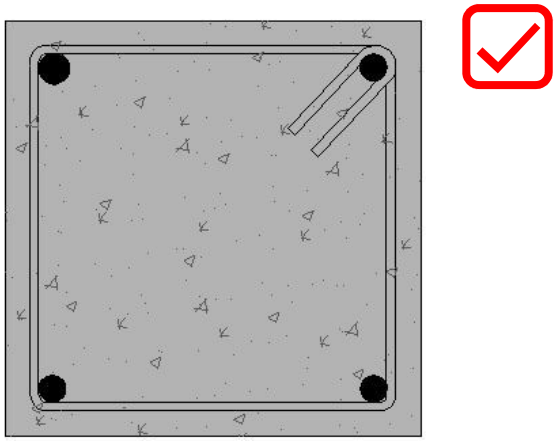
Sufficient development length

1.2.4.4.3 Stirrup detailing

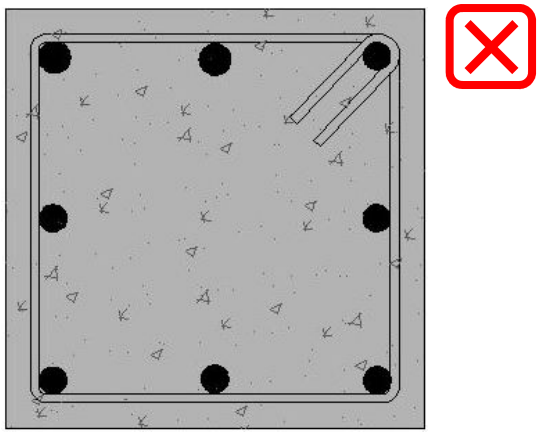
Stirrup bent length min 75 mm or 10 times diameter of bar whichever greater and bent inside as shown. Vertical bars should be fixed properly in its position. Each longitudinal bar of column should lie at the edge of stirrup as shown.



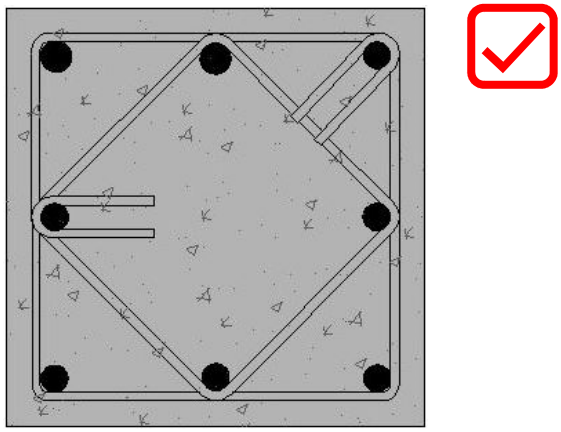
Stirrup left without proper bending



Sufficient length with proper bending angle



In case of vertical bars more than 4 nos, 2 legged stirrups are no sufficient



Technique of placing stirrups where no of vertical bars in column are more than 4

Stirrup placement

Shear reinforcement should be provided at the interval of 4 inch near joints and along lapping length. Each rebar of column should be braced by lateral tie.

Lack of stirrups above column to hold the reinforcement in position

Proper way of using stirrups above casted concrete (spacing of stirrups shall not be more than 100 mm or as specified in design)

Inserting stirrups in beam column joint:

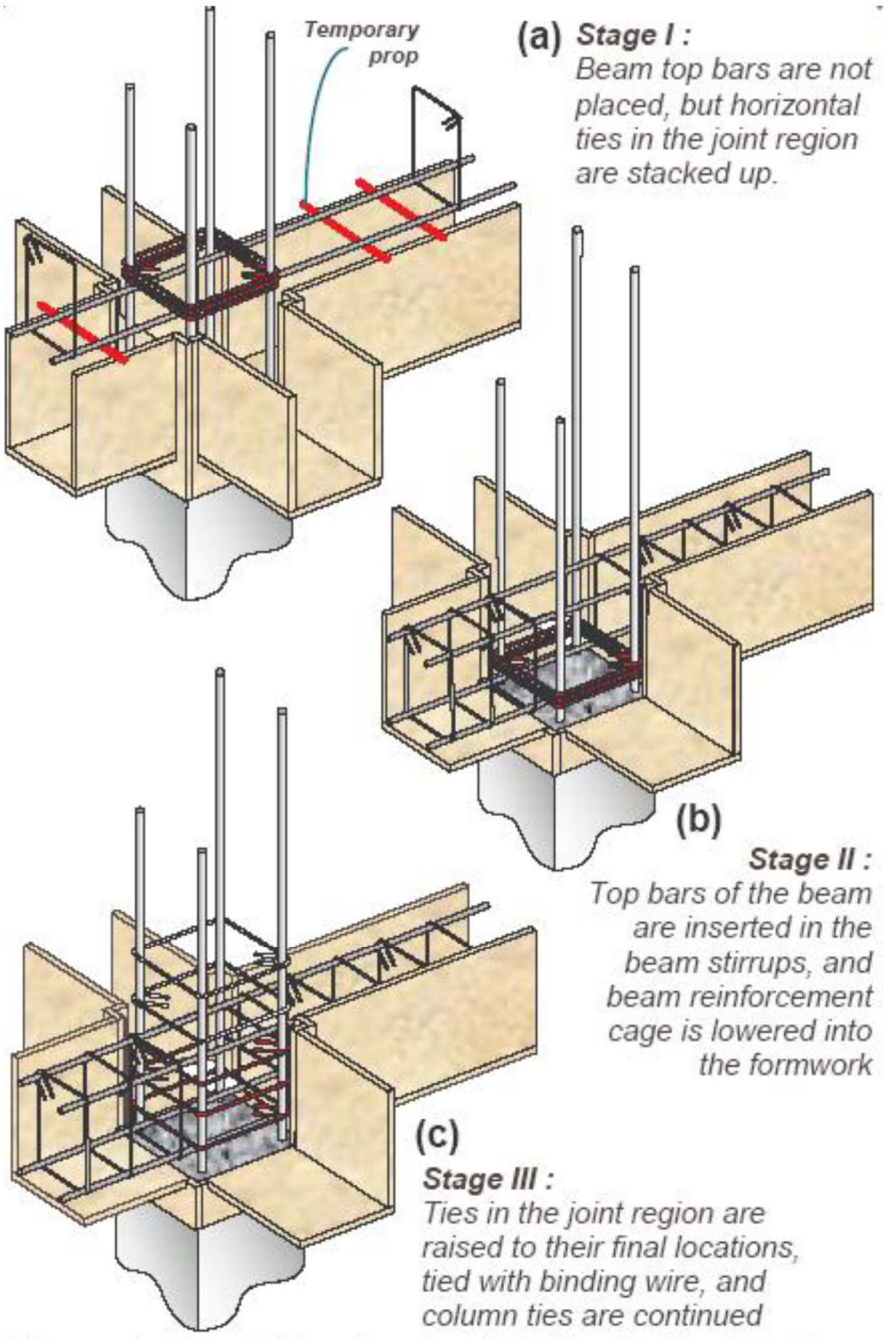
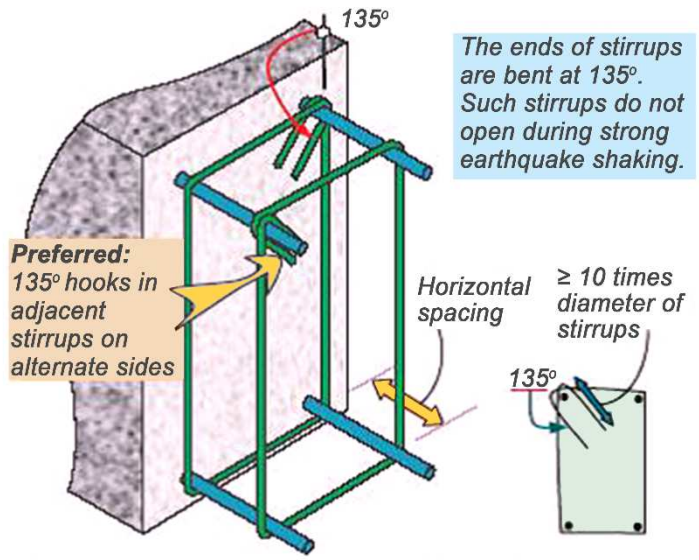


Figure 4: Providing horizontal ties in the joints – *three-stage procedure is required.*

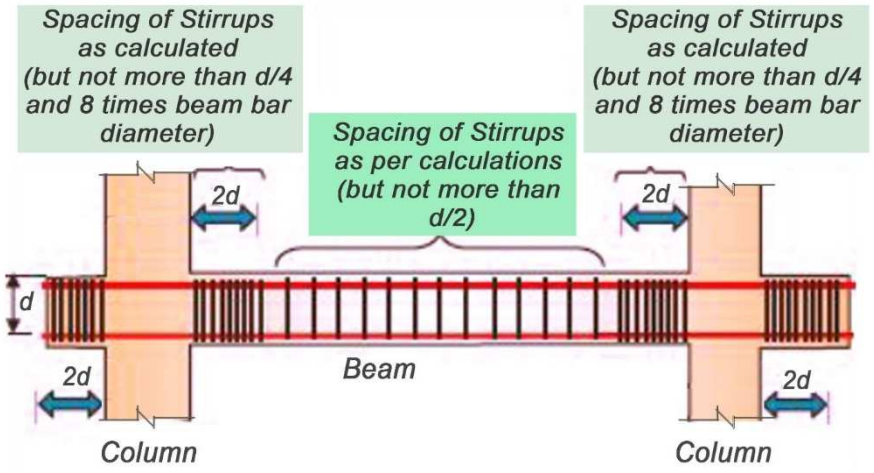
Requirement of Stirrups:



Stirrups help in three ways:

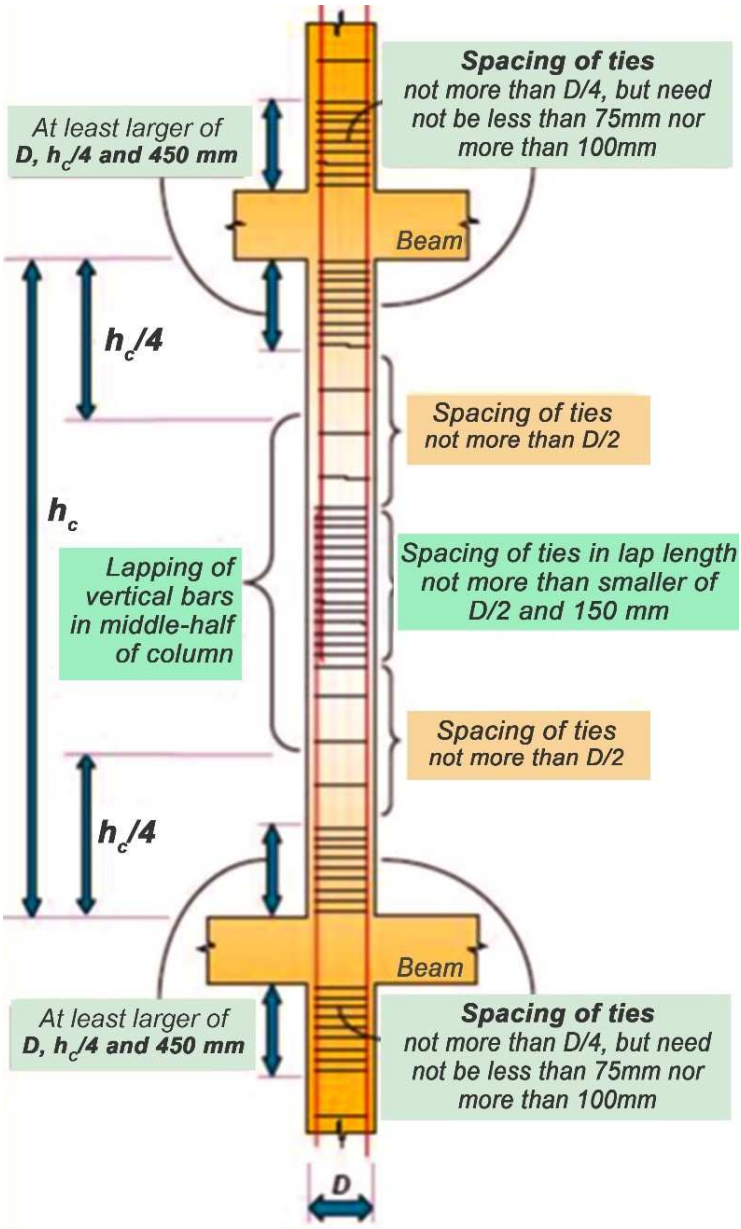
- Carry shear force and resist diagonal crack.
- Protect concrete from bulging outward due to flexure
- Prevent buckling of compressed longitudinal bar due

5



- Diameter at least 6 mm but not less than 8 mm for beam longer than 5 m.
- 135 hook at both end and 10 times diameter extension.
- Maximum spacing less than half the depth of beam.
- Maximum spacing less than quarter the depth of beam for twice the depth of beam from support.

1.2.4.4.4 Column reinforcement detailing:



Height of Confinement Zone (CZ):
Larger of D, hc /6 or 450 mm

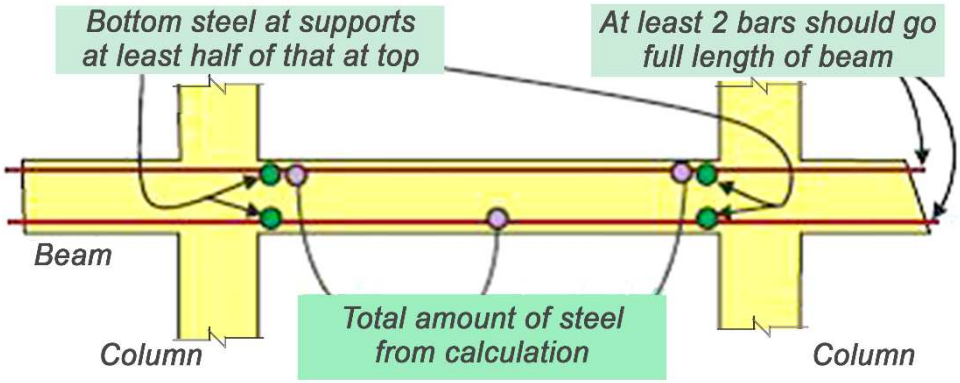
Spacing of ties in CZ:
< D/4 but >75 mm and < 100 mm

Spacing of ties in Lap Zone:
< D/2 and < 150 mm

Spacing of ties in rest:
< D/2

But checked against strength

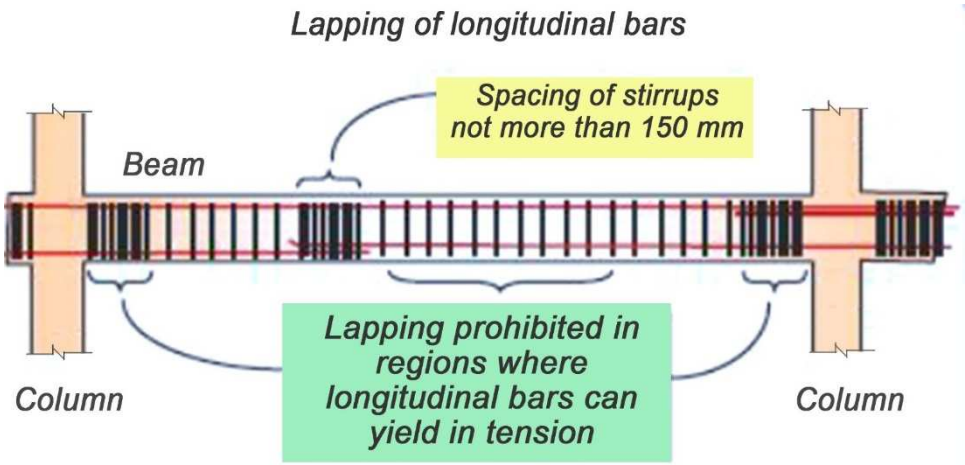
1.2.4.4.5 Beam Reinforcement Detailing



Longitudinal Bars: are provided to resist flexure

- Requires on both faces at the ends and on the bottom face at mid length
- At least two bars go through the full length of the beam at the top as well as at the bottom of the beam.
- At the ends of the beams, the amount of steel provided at the bottom is at least half of that at the top.

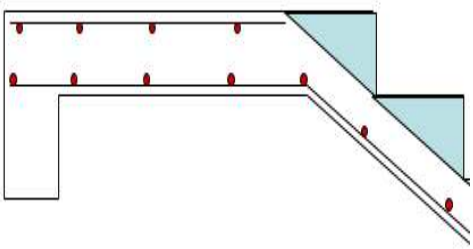
Rebar Lapping in Beam



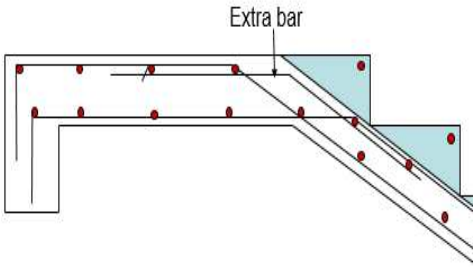
a. Made away from the face of column.
b. Not made at locations where they are likely to stretch by large amounts and yield (e.g. Bottom bars at mid length of the beam)
c. At the location of laps, vertical stirrups should be provided at closer spacing

1.2.4.4.6 Staircase detailing

Four layer of reinforcement at the ends and two layer of reinforcement in the mid portion of staircase with sufficient development length must be used.



In adequate reinforcement without proper development length



Adequate reinforcement with sufficient development length

1.2.4.1 Formwork

The wood used as formwork should be hard and durable also it should not absorb water from concrete.

Improper method of formwork

Proper method of formwork

The placing of formwork shall be as shown in the right figure. In the left figure, the column doesn't get full strength as the compacting of concrete is not possible.

1.2.4.2 Concrete: Production and Handling

The quality, strength and other properties of concrete shall be as per specification. Concrete used as structural elements/bands in buildings shall not be weaker than M20 in any case. Where adequate care has been taken in selection of materials; mixing; correct proportioning; proper placing; compacting and curing of the concrete, a nominal mix of 1:1.5:3 (cement : sand : coarse stone aggregate) is expected to produce M20 grade concrete. However water-cement ratio shall not exceed 0.6 (i.e. not more than 30 liters of water per 50kg of cement shall be used).

1.2.4.2.1 Batching

Use standard batching box for measuring the exact quantity of materials

Measurement of ingridients by unstandard container

Measurement of ingridients by standard box

1.2.4.2.2 Concrete mixing

It should be mixed over clean place. The mixing ratio should be as specified. After mixing the concrete it should be use within 30 minutes. In case of manual mixing add 10% extra cement than specified.

Concrete mixing manually with poor quality

Concrete mixing by machine

Slump test:

Concrete should have a slump of 100mm +/-25mm for concrete being placed without mechanical vibrator, or 75mm +/- 25mm if vibrator is used.

For excessively wet or dry mixes. Add additional materials or water to achieve desired workability.

Slump test using standard cone- 300mm height with 200mm bottom diameter and 100mm top diameter.

Group	Approximate mix proportions	Grade designation	**Characteristics compressive strength of 150 mm cube at 28 days, N/mm2**
Lean Mix	1:5:10	M5	5
	1:4:8	M7.5	7.5
Ordinary Concrete	1:3:6	M10	10
	1:2:4	M15	15
	1:1.5:3	M20	20
Standard Concrete	1:1:2	M25	25
	To be designed	M30	30
		M35	35
		M40	40
		M45	45
		M50	50
		M55	55
High Strength Concrete		M60	60
		M65	65
		M70	70
		M75	75
		M80	80

1.2.4.2.1 Concrete Cover

Sufficient concrete cover should be provided in all structural member. It should be minimum of as per;

Column- 40mm (1.5inch)
Beam- 25mm (1 inch)
Slab- 15mm

Foundation > 75 mm or as per drawing

Use cover blocks to maintain proper cover to reinforcement. If inadequate cover is provided, the consequences are the structure will not get full strength or the reinforcing bars get rusted due to moisture

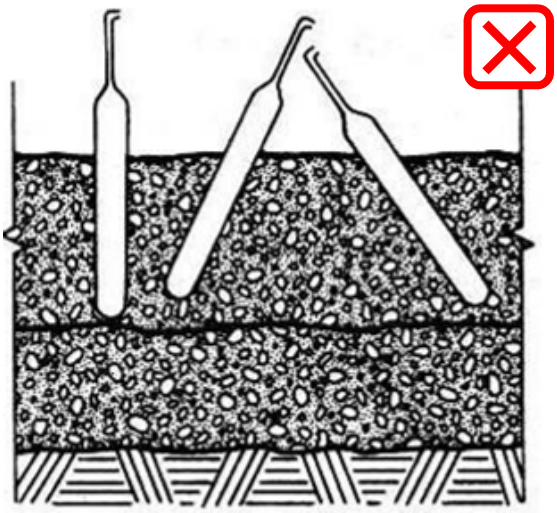
Cover not maintained

Proper use of Cover block

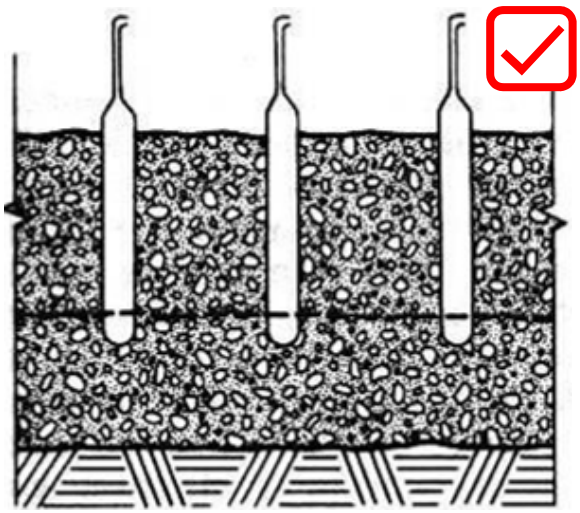
1.2.4.3 Compaction, Finishing and Curing

1.2.4.3.1 Use of Vibrator

The vibrator shall be penetrated vertically to maximize its effects, it should penetrate at least 6 inch into the previous layer.



Vibrator position inclined and not penetrated through previous layer



Kept vertically and penetrated through previous layer

1.2.4.3.2 Curing

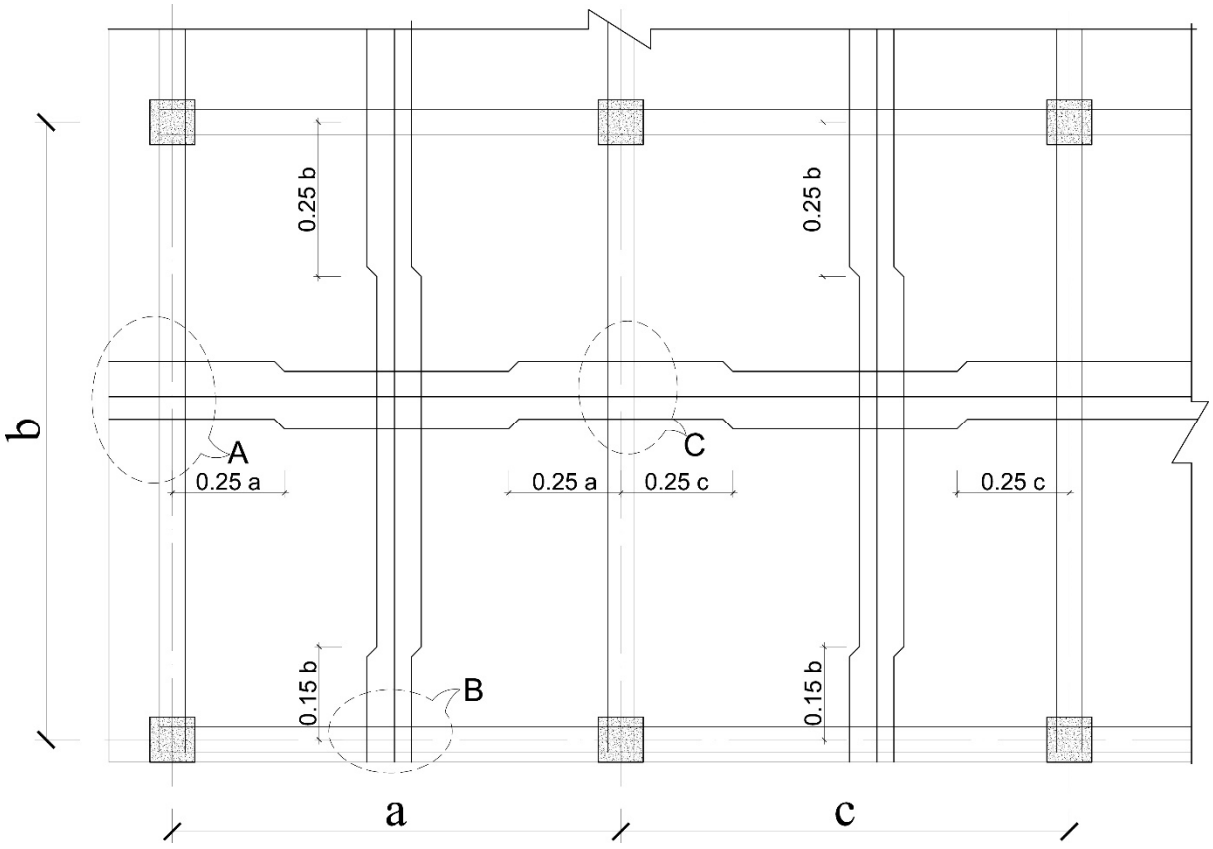
Curing should be done with jute sack in column and beam, while water ponding is necessary in slab. Curing work should be carried for minimum of 14 days in all structural member.

Curing with water sprinkling only

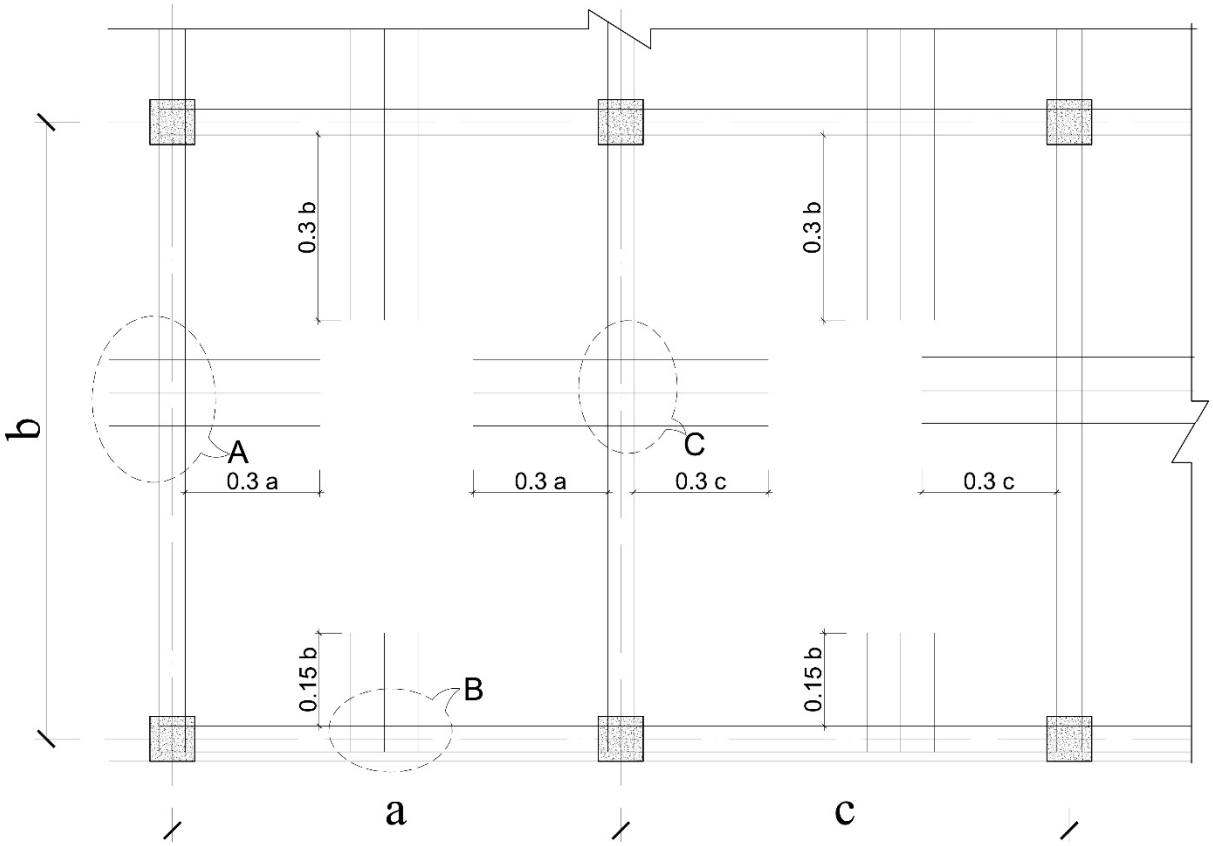
Curing with Juke sack

Some general typical detailings:

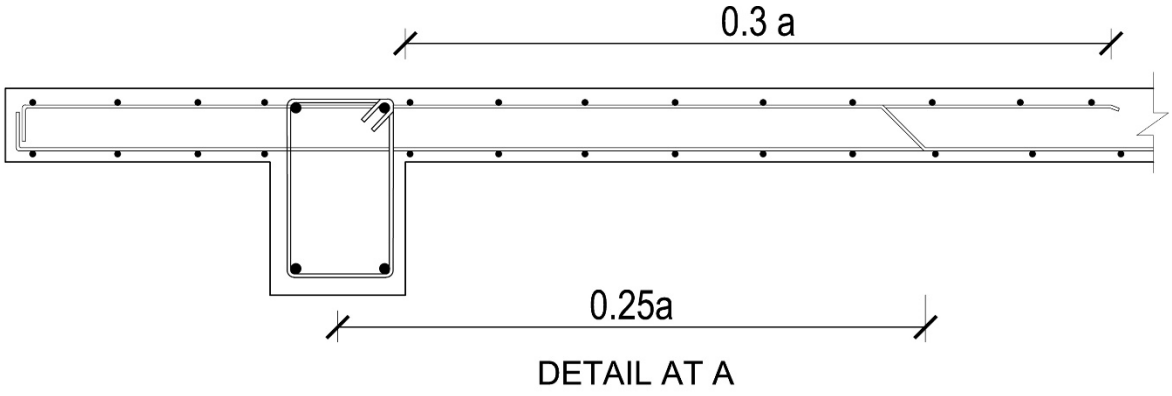
Slab reinforcement detailing

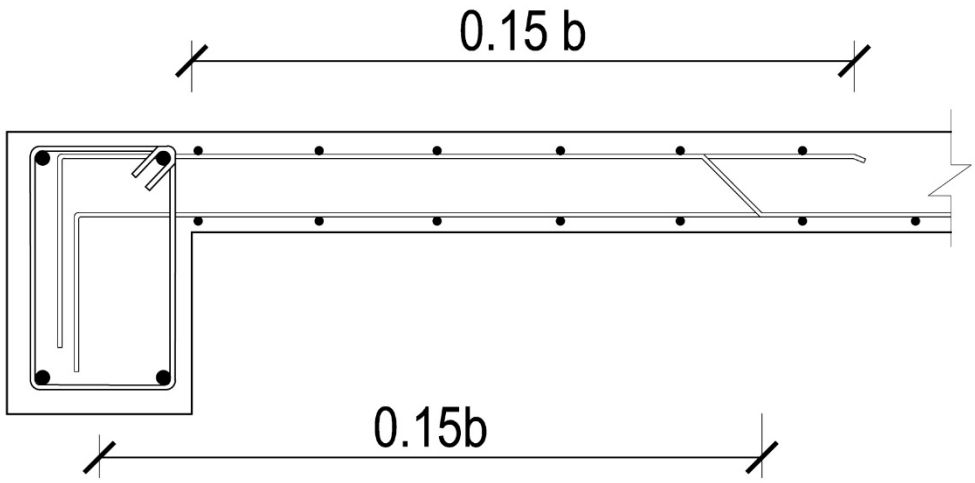


Slab Bottom Continuous/ Cranked bars Details along X and Ydirections

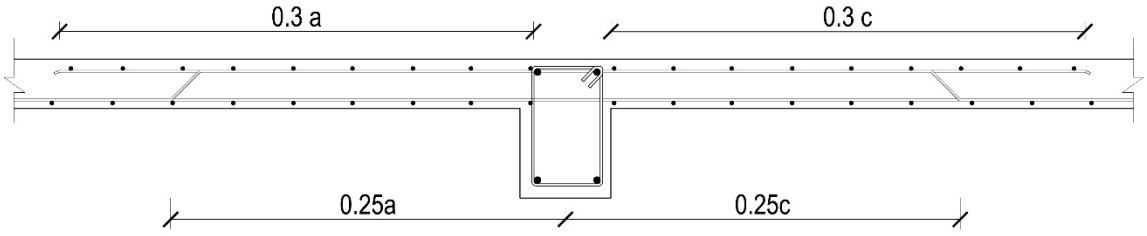


Slab top extra reinforcement detail in x and y direction



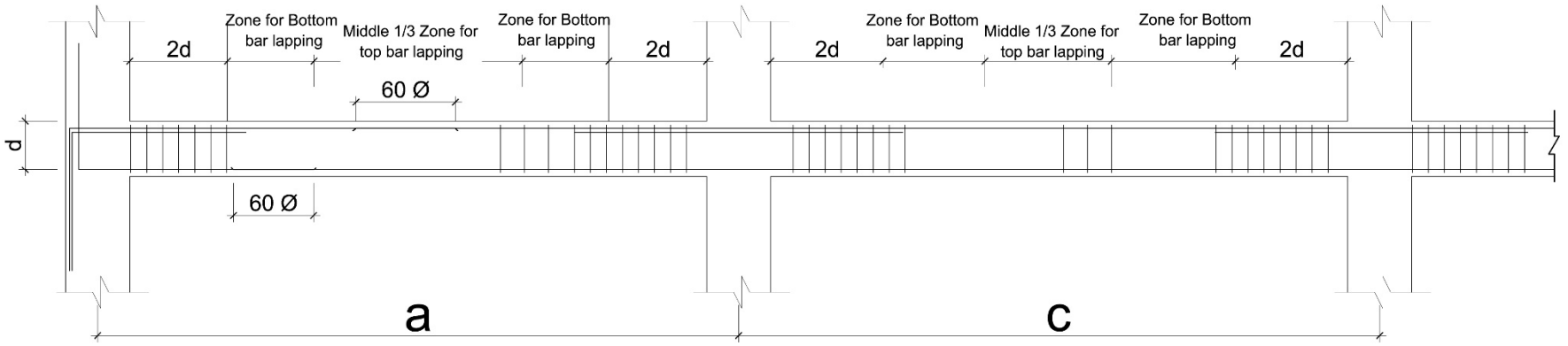


DETAIL AT B

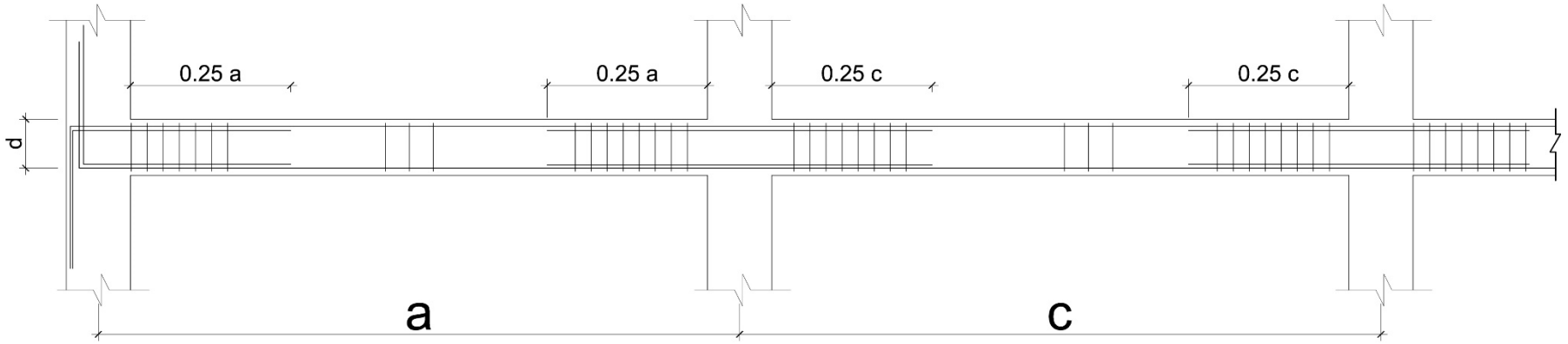


DETAIL AT C

Beam reinforcement detailing

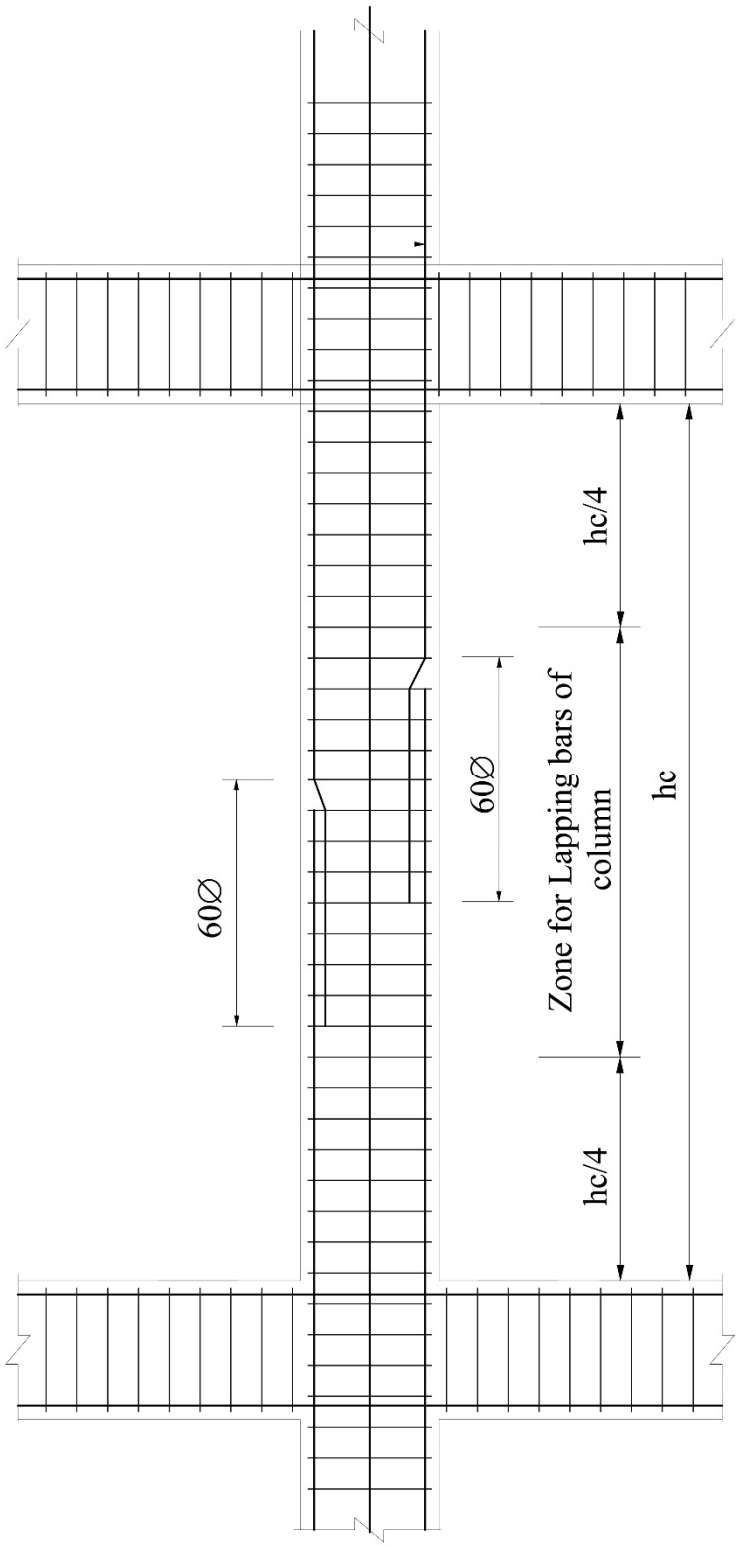


Zone for top and bottom bar lapping in beam



Extra bar length required in beams

Column reinforcement detailing



Zone for column bar lapping

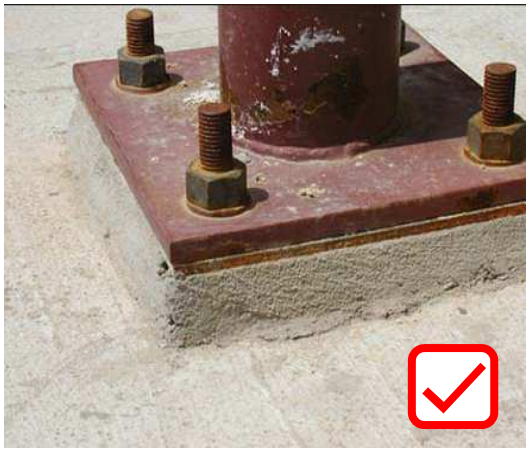
1.2.4.4 Steel Connections:

Most major structural failures have been due to some form of connection failure. Connections are the glue that holds a steel structure together

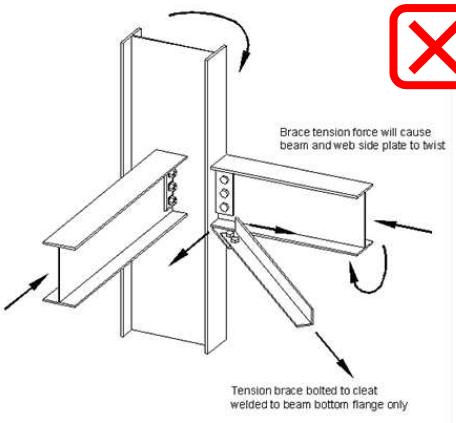
Steel joint

Joint of steel structure should be strong enough to transfer member forces, otherwise well below member strength joints will fail leading to failure of structure. Bolting is preferred in earthquake zone rather than welding.

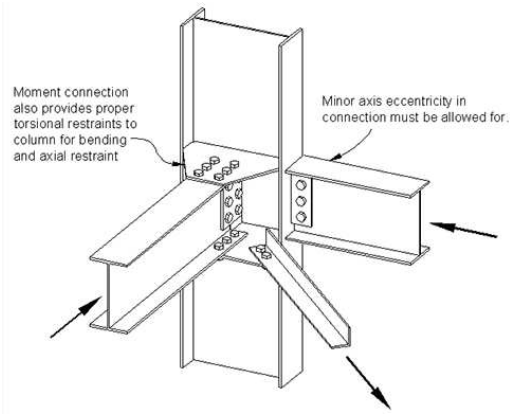
Simply rested on the ground



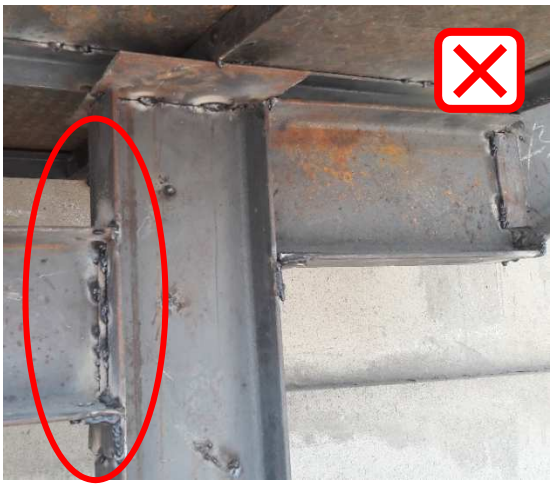
Proper joint at footing



Poor Structural Detailing (the bolts should be provided is not sufficient

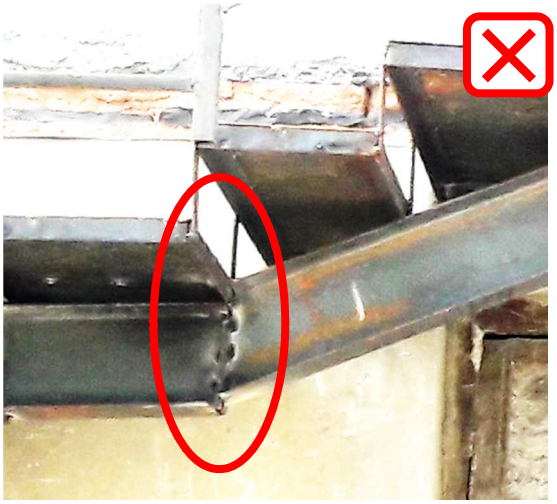


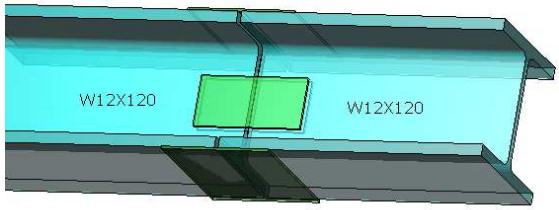
Improved Design



Insufficient welding at joint

Proper through welding





Proper welding with additional member

Weak connection

Weak joint with single nut bolt

Proper connection as designed

1.2.4.1 Wooden Connections:

1.2.4.1.1 Connection of wood with floor

Direct ground contact of wood without any treatement is highly vulnerable to decay hazard. The decay hazard is severe because soil retains damaging moisture for long periods of time. Also soil inhibits wood-rotting basidiomycetes, soft rot fungi, and wood degrading bacteria to decay the wood in contact.

Wood without protection at ground

Wood protected at its base

Improper Wooden connection at ground floor level

Proper Wooden connection at ground floor level

Post simply supporting floor

Post with capital

Wooden member simply resting on floor

Wooden member laterally restrained

1.2.4.1.2 Connection of wooden members

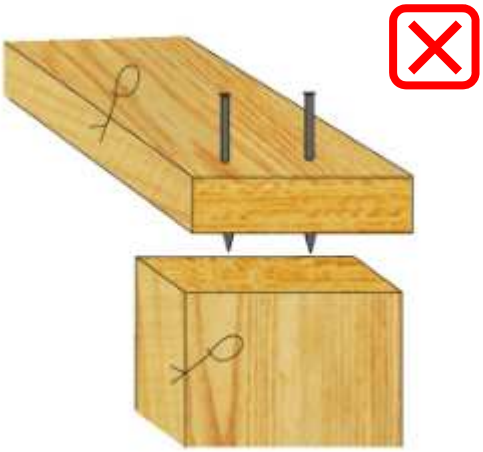
Connections are the major critical points for the wooden structure. Wooden connections can be improved by using proper metal strips with nut-bolts or nails.

Simple inferior joint

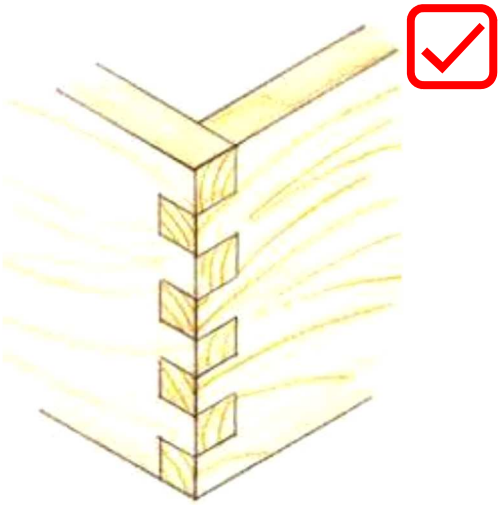
Dog legged joint

Improper connection of wooden truss

Proper connection of members of wodden truss



Improper connection of wooden truss



Proper connection of members of wodden truss

1.2.4.1 Anchorage of non-structural components

All the non-structural components used permanently on the buildings shall be properly anchored to structures. In event of earthquakes, they may fall and cause serious effects.

Special attention is required for properly anchoring water-tank on the roof to prevent falling during the earthquake.

Water tank placed at roof corner without any protection

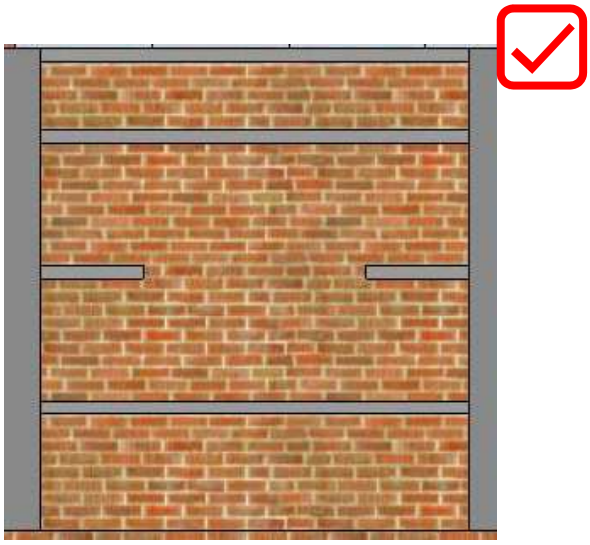
Safe placing of water tanks

1.2.4.2 Additional considerations for RCC structures

1.2.4.2.1 Infill walls:

The infill walls should be tied with column by horizontal band. Vertical joint should be avoided in walls.

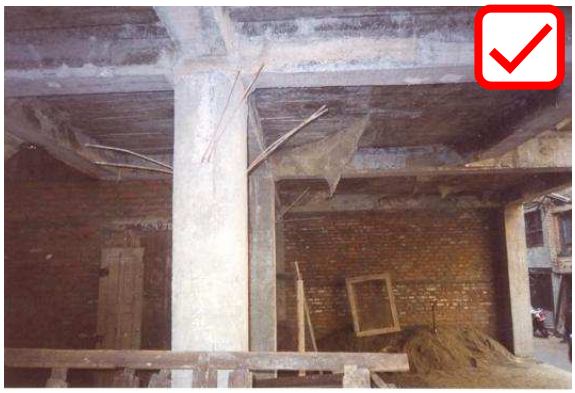
Weak vertical plane created



Vertical plane avoided in wall

Reinforcement from column for integration of walls to frame

Reinforcements not drawn from column for wall connection



Reinforcements from column for wall connection

Horizontal bands in wall of RC frame structure tie the walls to structural elements of building and maintain structural integrity. It prevent out of plain failure of the wall during earthquake.

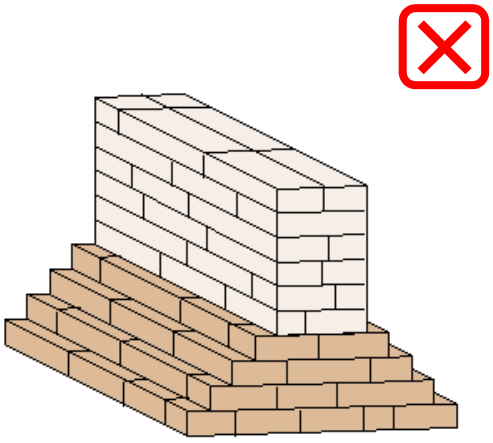
Wall without horizontal band

Wall braced by horizontal band

1.2.4.3 Additional considerations for masonry structures

1.2.4.3.1 Foundation Band

Foundation band must be kept in masonry structure at foundation level, vertical reinforcement will start from this band.



Masonry construction without foundation band

Foundation band in masonry structure

1.2.4.3.2 Vertical and horizontal reinforcements/ bands

Vertical reinforcement and horizontal bands in masonry structure make the structure ductile and integrate hole structure as a unit and enhance seismic resistance capacity of the structure. The horizontal bands are to be provided at foundation, plinth, sill, lintel, eves level and at gable if provided. Construction of masonry gable walls are discouraged as these are more vulnerable element of a building. These are seismic resistant elements in msonry structure.

Horizontal bandsBands shall cover entire length of the building walls. Vertical reinforcement shall be extended up to the top floor or roof level and shall be anchored properly with the roof structure.

Masonry wall without bands

Masonry wall with bands and vertical reinforcement.

Reinforcement placing for stitch bands

1.2.4.3.3 Line of Wall

The masonry walls in upper stories shall be exactly above the walls in the lower storey. No any load-bearing walls shall be constructed on cantilever portion of the buildings.

1.2.5 Construction safety:

Use of Helmets and Gloves

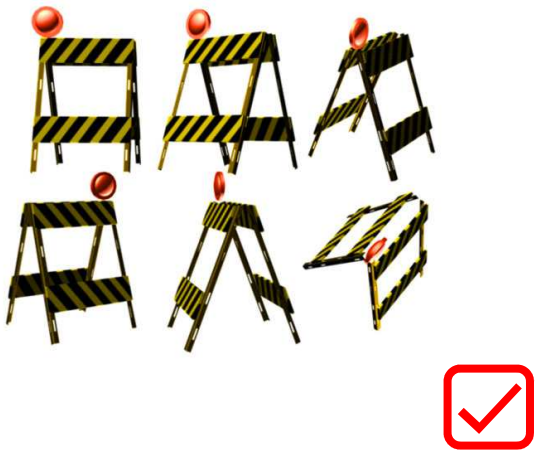
Helmets are useful as safety gear to prevent injuries in an uncontrolled environment.

Mask

Wearing mask is important while doing work that may generate dust. Silica dust, from bricks, can cause lung and airway diseases such as emphysema, bronchitis and silicosis, and may increase cancer risks. Carbon monoxide, from petrol powered tools, can cause headaches, fatigue and shortness of breath, leading to more serious illnesses after exposure to high concentrations or prolonged exposure.

Safety Barriers

Barriers can play an important part in safety on a construction site. Barriers isolate the construction site and makes workers and visitors cautious about their safety.

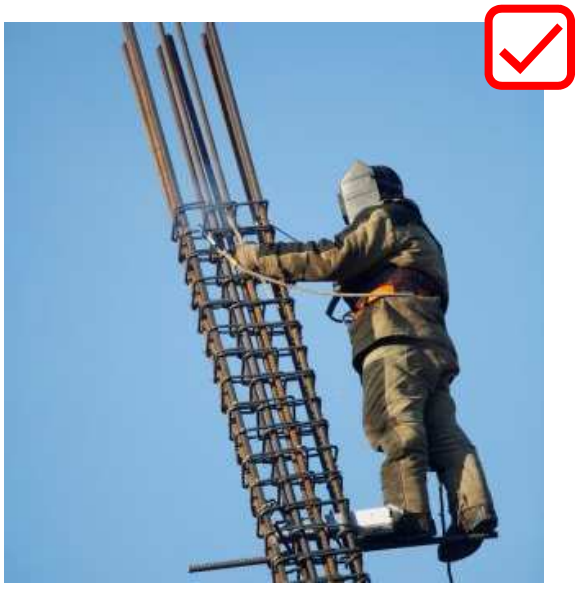


Jackets

At the construction site, the visibility of workers is pertinent to their safety. Construction workers typically wear garments with a variety of fluorescent colors, including orange, yellow or green. These garments can be construction safety vests, shirts or jackets. They provide an easy way to identify employees and their location within a construction site.

Belts

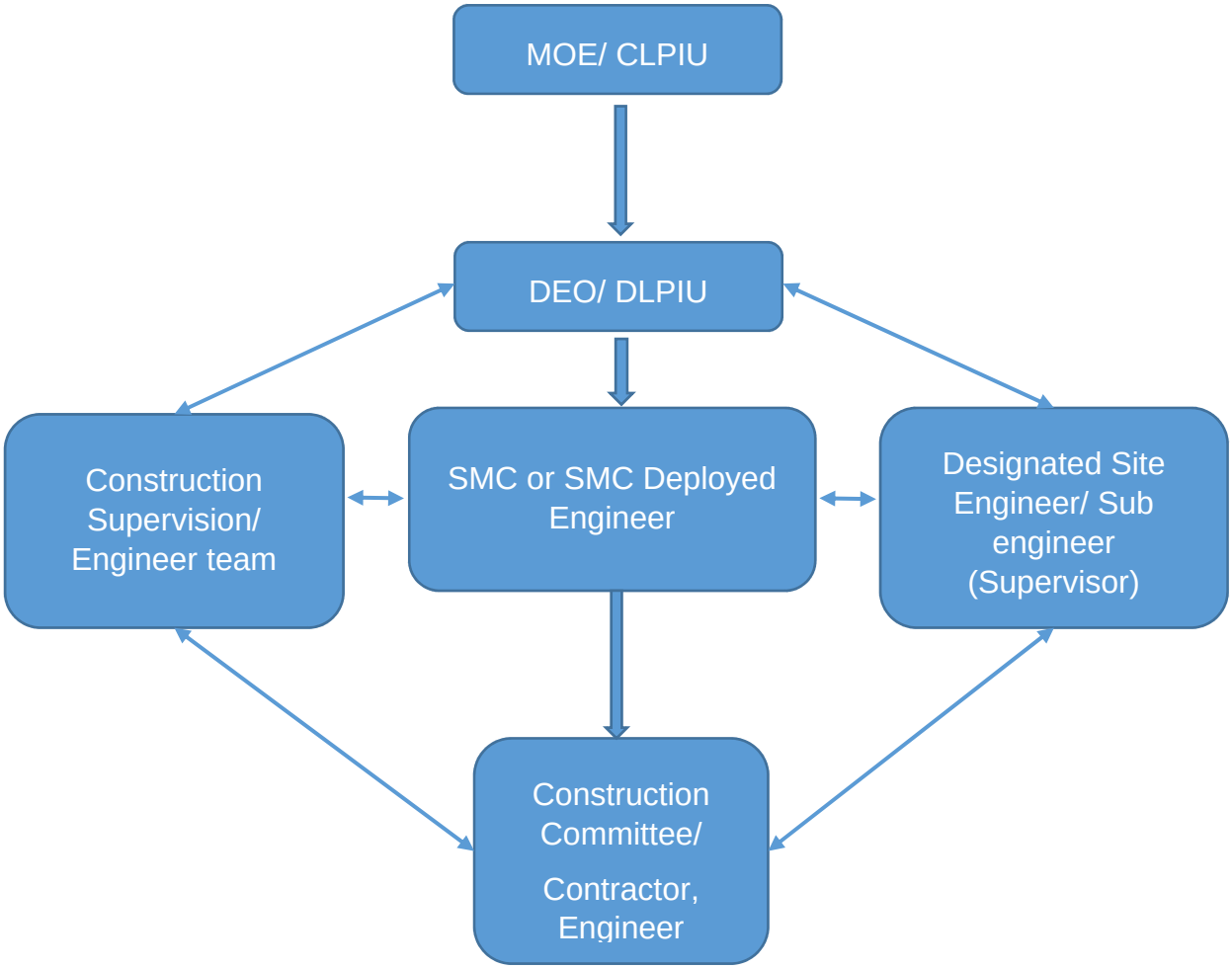
If there's a chance of falling then safety belts must be used.



1.3 Supervision and Reporting Mechanism

1.3.1 Supervision Flow chart

The overall supervision mechanism is as shown in flow diagram below.



1.3.2 Reporting Mechanism

SMC/ SMC Deployed engineer consult with construction supervision/ Engineer team and Designated Site Engineer/ Sub engineer (Supervisor) - inform Construction committee/ contractor for any type of rectification

The SMC can ask the construction committee/ contractor to stop the work and report to Site Engineer/ Sub Engineer or Construction supervision/ Engineer team.

The Construction Supervision/ Engineer team and Designated site engineer instructs construction committee/ contractor to rectify with technical guidance

Incase major quality deficiency the SMC reports to the DEO for necessary action.

1.3.3 Supervision Comments

Required number of regular supervision at various stages is not possible by existing technical staff of district education office, especially in earthquake affected districts where demand of construction is very high. For supervision SMC can also deploy a technician if frequent visit of supervisor is not possible and there is possibility of degradation of quality. Photographs of various construction stages and detailing of critical locations shall be kept for supervisor's verification. Incase supervisor couldnot visit the site at key stages, in addition to visual inspection photographs of during construction would help supervisor for assurance of quality.The critical construction stage photographs couldbe maintained by School management committee/construction committee or SMC deployed supervisor. The major points to be checked by supervisor for quality assurance as per ANNEX 3

ANNEX 3. SUPERVISION COMMENTS

Activity	Date	Note any deficiencies that were discovered (if any) and corrective action taken to ensure compliance with the code and/or reference standards.
(A) Foundation		
1. Site preparation		
2. Foundation layout		
3. Exacavation, Preparation of bearing soil		
4. Placement of reinforcement		
5. Placement of concrete		
6. backfilling		
(B) Super Structure		
(I) RC frame structure		
1. Reinforcement detailing		
2. Concrete quality		
3. Concrete placing		
4. Wall construction		

5. Wall frame connection		
6. Floor		
7. Roof/ Ceiling		
(II) Masonry Structure		
1. Vertical reinforcements		
2. Wall construction		
3. Horizontal bands		
4. Corner Stitches		
5. Wall roof connection		
6. Roof/ Ceiling		
(III) Steel frame		
1. Member Size/ thickness		
2. Connections welding/ bolting		
3. Wall construction (light/ heavy)		
4. Roof and frame connection		
5. Connection of covering with roof structure		

7. Roof cross bracing		

ANNEX-2

List of Building Materials

LIST OF BUILDING MATERIALS

S.No.	Description	Specification
1.	**Foundation**	As per design assuming 150 KN/sq.m. bearing capacity.
2.	Super-Structure	
2.1	Structure	R.C.C. framed construction with 230 thk. fare face brick filler walls , stone masonry wall below sill level
2.2	Internal Partitions	230/120 thk. Brick masonry wall/Plywood /Cement fiber board partition
3.	**Doors & Windows**	
3.1	Frames	Pressed steel frame made out of corrosion resistant coated sheet of 1.2 mm thick with single rebate
3.2	Shutters	
3.2.1	Windows	Steel glazed shutter
3.2.2	Doors	Pressed steel panel door shutter
3.2.3	Hardware	Baked enamel finish tower bolts, hinges, handles, eye-hook, aldrops with pad lock
4.	**Flooring**	
4.1	Corridor, Stairs, Ramp	Hardened cement concrete flooring
4.2	Class rooms/Offices, Store	Hardened cement concrete flooring
4.3	Lab/Kitchen/Toilet	Hardened cement concrete
4.4	ECD	Rubber Matt over Hardened concrete floor
5.	**Roofing**	
5.1	Supporting structure	MS Tubular truss
5.2	Roof Cover	24 gauge Colored CGI sheet (Heritage)
5.3	Eaves	2 mm thick G.I eaves
5.4	Barge Board	Color coated pre-finished metal sheet.
5.5	False Ceiling	6mm thk. Cement fiber board with rock wool insulation
6.	**Finishing**	
6.1	External Wall	Fair-faced brickwork/stone masonry with water repellant silicon based coating. RCC band plastered and painted with waterproof cement paint
6.2	Internal class room and office rooms	Cement plaster and painted with distemper painting.
6.3	Doors & window painting	Low V.O.C. enamel paint matt finish.
6.3	Plastered ceiling	Distemper paint.
6.4	False ceiling painting	Distemper paint.
6.5	Toilet Wall	Low V.O.C. Enamel paint above 1.2 m Terrazzo dado finish
7.	**Railings**	
7.1	Verandah/Stair	MS Railing with painting
8.	**Toilets fixtures**	
8.1	WC fixtures	Ceramic/SS pan
8.2	Taps	Push type CP Cock
8.3	Door Shutter	Solid PVC shutter 28 mm
8.4	Urinals	SS sheet on wall upto 1200 height
8.5	Water supply pipes	CPVC pipes & fittings
8.6	Drainage pipes	UPVC pipes

8.7	Floor Drains	PVC multi port trap
8.8	Water Tank	Plastic Tank
S.No.	**Description**	**Specification**
8.9	Soil/waster Disposal	Conventional septic tank and soak pit
9.	**Electrification**	
9.1	Wiring	Cancelled or surface as required
9.2	Conduits	Rigid PVC
9.3	Electrical distribution system	Single Phase
9.4	Power Outlets	Single phase 5/15 amp flat & round pin
9.5	Switch sockets	Unbreakable switch sockets.
9.7	Light fixtures	Power saving CFL fixtures
9.8	Earthing	Separately in each building
10.	**Site Development Works**	
10.1	Site leveling	Earth Cutting & Filling
10.2	Retaining walls	Stone masonry in cement mortar 1:4
10.3	Pathways	Flag stone paving in cement mortar
10.4	Main Entrance Gate	Mild Steel frame and shutter
10.5	Fencing	Chain link fence
11	**Flag pole -3 nos**	G.I Pipe over concrete base

ANNEX-3

Criteria for Overall Quality Control

Criteria for Overall Quality Control

	Work	Material	Item	Method	Standard	Frequency	Record / Report	Notes	
1	Job-mixed concrete work	Cement	Type of cement	Visual inspection	Ordinary portland cement IS:456 IS:8112, IS:403, IS:4031 NS:49	Upon material selection	Submission of report together with photographs		
			Conformity to IS and NS	Test result report from the manufactuerer		Upon material selection	submission of test results report		
			Delivery of cement	Observation		Every delivery	Record of delivery Filing of invoices	in the presence of Consultant if necessary	
			Storage of cement	Observation	Specification Div. 4, Clause 2.3 Cement. IS:4082 Recommendations on stacking and storage of construction materials and components at site	At construction of storage place Every delivery	Record of storage	in the presence of Consultant if necessary	
			Duration of storage	Indication of delivery date	IS:8112	Prior to use	Record of storage		
		Aggregate	Type Max. size of coarse aggregate	Visual inspection	IS:383; IS:2386	Any time	Sample of coarse and fine aggregate Record	in the presence of Consultant if necessary	
			Grading of aggregate	Test at laboratry	IS:383; IS:2386	Prior to proportioning	submission of test results report	in the presence of Consultant if necessary	
			<Fine aggregate> Specific gravity Water absorption ratio	Test at laboratry	IS:383; IS:2386	Prior to proportioning	submission of test results report	in the presence of Consultant if necessary	
			Alkari-aggegate reaction test	Test at laboratry	IS:383; IS:2386	Prior to proportioning	submission of test results report	in the presence of Consultant if necessary	
		Water (except tap water)	Effect on consrete strength	Test at laboratry	IS:3025	Prior to proportioning	submission of test results report	in the presence of Consultant if necessary	
			Harmoful material	Test at laboratry	IS:2386 part I to V	Prior to proportioning	submission of test results report	in the presence of Consultant if necessary	
		Admixture			IS:9103				
		Mix proportion	Trial mix / Gravity of aggregate	Conformity to Specifications	IS 456 and IS 10262 or ACI -211.1	Upon trial mix	submission of test results report	in the presence of Consultatnt	

Criteria for Overall Quality Control

	Work	Material	Item		Method	Standard	Frequency	Record / Report	Notes	
	Job-mixed concrete work (… cont.)			Slump	Conformity to Specifications "Slump Limits"	IS:456,	Upon trial mix	submission of test results report	in the presence of Consultatnt	
				Compressive strength	Compresseive strength test 7 d: 3cube specimens 28d: 3cube specimens	IS:456, 516, 1199	Upon trial mix	submission of test results report	in the presence of Consultatnt	
				Chloride content	Chloride test (Quantab test)	As specification	Upon trial mix	submission of test results report	in the presence of Consultatnt	
				Temprature of concrete	Thermometer Not exceeding 35℃		Upon trial mix	submission of test results report	in the presence of Consultatnt	
		Mixsing on site	Surface water of fine aggregate		Observation	IS: 383, 2386 Part III and Specification	Upon deliveries After rain	Report	in the presence of Consultant if necessary	
			Gravity of aggregate		Conformity to Specifications	IS:2386 Part III	Any time In case of change of supplyer	Test result report	in the presence of Consultant if necessary	
			Slump		Conformity to Specifications A/S Table 4.1.1 "Slump Limits"	Specifications, IS:456	Upon making cube speciments for compressive strength test	Test result report	in the presence of Consultant if necessary	
			Compressive strength		Compressive strength test 28d: 3 cube specimens	Specifications IS:456 IS:516 IS:1199	Every constraction date Every design strength Per 50㎥ In case of change of materials supplyer	Test result report	in the presence of Consultant if necessary	
			Chloride content		Chloride test (Quantab test)	Specifications, IS:6925	Any time	Test result report	in the presence of Consultant if necessary	
			Tempreture of concrete		Thermometer Not exceeding 35℃		Prior to construction	Test result report	in the presence of Consultant if necessary	
		Measurement	Accuracy of measuring boxes		Static load test	Specifications	Once a day at least After rain etc.	Submission of report together with photographs	in the presence of Consultant if necessary	
		Formwork	Cleanliness		Visual inspection	Specifications	Prior to casting concrete	Record of construction quality control	in the presence of Consultant if necessary	

Criteria for Overall Quality Control

	Work	Material	Item	Method	Standard	Frequency	Record / Report	Notes	
			Wetness of forms	Visual inspection	Specifications	Prior to casting concrete	Record of construction quality control	in the presence of Consultant if necessary	
	Job-mixed concrete work (… cont.)	Casting	Method	Observation	Construction plan for concrete works	Upon casting concrete		in the presence of Consultant if necessary	
		Compaction Vibrator	Intervals: Less than 60㎝ and 10 times of the diameter of the Vibrator	Observation	Specifications	Upon casting concrete		in the presence of Consultant if necessary	
			Time: Until water appears on surface	Observation	Specifications	Upon casting concrete		in the presence of Consultant if necessary	
		Curing	Free from harmoful vibration, schock, damage and so on	Observation	SABS 010Specification, IS:456	During curing period		in the presence of Consultant if necessary	
			Spraying water		Specifications	During curing period		in the presence of Consultant if necessary	
		Removal of formwork	Surface: Honeycomb, cold joint etc.	Visual inspection	Specifications, IS:14687	Upon removal of formwork	Record of construction quality control	in the presence of Consultant if necessary	
			Formwork removal time	Specifications Table 4.5.1 Time can be shorter if the early strength is assessed.	Specifications, IS:14687	Upon removal of formwork		in the presence of Consultant if necessary	
			Removal of slab props	Specifications Table 4.5.1 Time can be shorter if the early strength is assessed.	Specifications, IS:14687	Upon removal of formwork		in the presence of Consultant if necessary	
			Removal of beam props	Specifications Table 4.5.1 Time can be shorter if the early strength is assessed.	Specifications, IS:14687	Upon removal of formwork		in the presence of Consultant if necessary	
		Acceptance criteria for concrete strength	More than design strength (Average of 3 consecutive test results shall exceed the specified strength)	Compressivestrength test	Specifications, IS:14687	During concrete work	submission of test results report	in the presence of Consultant if necessary	
2	Masonry work	Brick	Size Compressive strength	Rolled steel tape Compression equipment Common: min. 5.5MPa Face: min. 9.0MPa	Specificatio, IS:1077, 3495	Upon mUponerial selection Any time of deliveries	Submission of test result report Submission of samples of bricks	in the presence of Consultant	
			Delivery Storage	Inspection at stock yard Comformity to Construction Plan	Specifications	Any time of deliveries	Submission of reports together with photographs		

Criteria for Overall Quality Control

	Work	Material	Item	Method	Standard	Frequency	Record / Report	Notes	
		Stone Blocks	Size Compressive strength	Rolled steel tape Compression equipment Min. 7.0MPa	SABS 1215	Upon material selection Any time of deliveries	Submission of test result report Submission of samples of blocks	in the presence of Consultant	
	Masonry work (… cont.)	Concrete block (… cont.)	Delivery Storage	Inspection at stock yard Comformity to Construction Plan	SABS 1215 Specifications A/S 5.2.7	Any time of deliveries	Submission of reports together with photographs		
		Joint mortar Infill mortar	Cement	Same as description for cement for concrete mentioned-above. Strength >5 MPA	Specification, IS:225	Same as description for cement for concrete mentioned-above	Submission of mortar proportioning plan Submission of material samples		
			Aggregate (Sand)	Same as desription for aggregate for concrete above-mentioned	Same as description in Concrete works.	Any time of deliveries	Submission of samples		
			Water	Same as description for water for concrete above-mentioned	Same as description for water for concrete above-mentioned	Any time of deliveries	Submission of samples		
			Admixtures	Free from harmful affection to strength, adhension and workability of mortar					In case of use of admixture, check and confirm details with the constrauction method to be submitted by the contractor
		Infill concrete	Cement	Same as description for cement for concrete mentioned-above	Same as description for cement for concrete mentioned-above	Same as description for cement for concrete mentioned-above	Submission of concrete proportioning plan Submission of material samples		
			Aggregate	Same as description for concrete above-mentioned Max. size of coarse aggregate: 12 mm	Same as description for aggefate for concrete above-mentioned	Any time of deliveries	Submission of samples		
			Water	Same as description for water for concrete above-mentioned	Same as description for water for concrete above-mentioned	Any time of deliveries	Submission of samples		
3	Steel reinforcing bar work	Material inspection at delivery	Every type	Mill sheets Diameter and length : Rolled steel tape	SABS 920 Specifications A/S 4.2.6	Any time of deliveries	Submission of mill sheets	in the presence of Consultant if necessary	
			Strength	Test result report from the manufacturer Every type and diameter Per 10 ton 3 Tensile tests 3 Cold-bend tests	SABS 920 Specifications A/S 4.2.6	Any time of deliveries	Submission of test results report Submission of samples	in the presence of Consultant if necessary	
		Storage	Storage separated by type, size and length	Visual inspection	Specifications A/S 4.3.1 SABS 1200G	As required	Check sheet		
			In storage or covered by sheets	Visual inspection		Every day	Check sheet		

Criteria for Overall Quality Control

	Work	Material	Item	Method	Standard	Frequency	Record / Report	Notes	
5	Tile work	Materials Accuracy of finishing	Conformity to Specifications Size of materials Accurary of finishing	Visual inspection Rolled steel tape Size: ±5%	Specifications, IS:13620, 15477	Upon material selection Inspection Upon delivery	Submission of samples Submission of inspection report	in the presence of Consultant	
6	Carpentry work	Timber	Conformity to SABS and Specifications	Visual inspection	Specifications, IS:11215, 851, 852	Upon material selection Any time Upon deliveries	Submission of samples Submission of inspection report	in the presence of Consultant	
7	Roofing work	Roofing materials	Conformity to IS/NS and Specifications	Catalogue/Samples/Shop Drawings	Specifications	Upon material selection Any time Upon deliveries	Submission of catalogue and samples	in the presence of Consultant	
8	Meatl works	Metal plates, pipes etc. Welding materials Hardwares	Conformity to Specifications and Shop Drawings	Visual inspection Conformity to approved shop drawings	Specifications, IS: 800, 807, 812, 816, 1161	Any time at deliveries	Submission of inspection report		
9	Plastering work	Cement, sand, watr etc.	Same as cement, sand, water for concrete	Visual inspection, Straight Edge	Specifications, IS:1542, 8112; BS 5492	Any time at deliveries	Submission of report	in the presence of Consultant	
10	Door & window work	Steel door & window	Conformity to Specifications and approved shop drawings Free from distortion, rust	Visual Inspection Stainless steel ruler	Specifications, Approved shop drawingsand SDI 100; SDI A115. SDI 107, 111	Upon material selection Any time at deliveries	Submission of samples Submission of inspection report	in the presence of Consultant	
		Wooden door & window	Conformity to Specifications and approved shop drawings Moisture content	Visual inspection	Specifications, IS:11215; 851, 852 and Approved shop drawings	Upon material selection Any time at deliveries	Submission of samples Submission of inspection report	in the presence of Consultant	
		Glass pane	Conformity to IS:14900 and Specifications	Visual inspection Vernier calipers	Specifications, IS 14900	Any time at deliveries	Submission of samples Submission of inspection report together with photographs	in the presence of Consultant	
11	Painting work	Paint	Conformity to Specifications Checking colour with colour sample	Visual inspection/Factory test report	Specifications NS:112 – Enamel, 165 – Distemper & Acrylic paint.	Upon material selection Any time at deliveries	Submission of samples Submission of inspection report	in the presence of Consultant	
12	Interior work Finishing work	Finishing materials	Conformity to Specifications	Visual inspection	Specifications	Upon material selection Any time at deliveries	Submission of samples Submission of inspection report together with photographs	in the presence of Consultant	
13	Flooring Works	Finishing materials	Conformity to Specifications	Visual inspection, Straight Edge	Specifications, Cement/sand/water as per concrete mentioned above.	Upon material selection Any time at deliveries	Submission of samples Submission of inspection report together with photographs	in the presence of Consultant	

ANNEX-4

Criteria for Quality Control for Site Works (Workmanship)

Criteria for Quality Control for Site Works (Workmanship)

	Work	Item	Method	Frequency	Unit	Record / Report	Tolerance	Notes	Reference Codes	Specifications
1	Temporary work	Sites survey	Theodolite, level etc.	At less than 5m intervals	mm	Survey map	±30mm	in the presence of the Consultant	Relevant IS Codes and NNBC	Div. 1, Clause 8, 18 19, 20
		Setting out Marking lines	Theodolite, level etc.	All center lines of columns	mm	Photograph report	±3mm	Consultant's inspection		
		Benchmark Establishment of levels	Theodolite, level etc.	4 corner points of each building	mm	Actual mesurements shall be indeicated on the survey maps	±3mm	Consultant's inspection		
2	Earth work	Setting out for excavation	Rolled steel tape	All corners and other important points	mm	Actual points and mesurements shall be indicated on the shop drawings for excavation	±20mm	Consultant's inspection	Relevant IS Codes and NNBC	Div. 1(18), Div. 2 – Clearing and Grubbing, Div. 3 – Earth Work
		Bottom of excavation	Level	Bottom of beam foundations: at less than 3m All corners and center points of foundations	mm	Actual points and mesurements shall be indicated on the shop drawings for excavation	±20mm	Consultant's inspection		
		Back filling	Visual inspection	During the work	—	Photograph report	Good quality soil	Consultant's inspection		Div. 3 Section 2 Earthwork in Filling
		Compaction	Visual inspection	Every 300 mm high	mm	Photograph report	—	Consultant's inspection		
3	Stone Soling	Level	Level	Bottom of beam foundations: at less than 3m All corners and center points of foundations	mm	Submission of inspection report	−30mm +15mm	Consultant's inspection		Div. 3, Section 3 Stone Soling under Foundation and Floor
4	Lean Concrete work	Level	Level	Bottom of beam foundations: at less than 3m All corners and center points of foundations	mm	Submission of inspection report	−30mm +15mm	Consultant's inspection	IS:456, 8112, 383	Div. 4 Concrete Works
5	Marking work	Reference line Other marking lines	Theodolite, level, rolled steel tape etc.	All corners of foundation and foudation beams	mm	Submission of inspection report	BS 5606	Consultant's inspection		
6	Form work	Material	Visual inspection Rolled steel tape	Prior to placing in position	—	Photograph report	—	Consultant's inspection		Div. 4 – Clause 2.8 – Formwork Materials
		After assembling forms	Theodolite, level, rolled steel tape, plumb bob etc.	All columns and beams	mm	Submission of inspection report	—	Consultant's inspection		Div. 4 – Clause 3 – Workmanship
		Removal of formwork (Sheetings)		Prior to removal of sheetings			Div. 4 Clause 1.6	Approval from the consultant		Div. 4 – Clause 3.1.8 Striking 0r Removal of Formworks
		Removal of formwork (Props)		Prior to removal of props			Div. 4 Clause 1.6	Approval from the consultant		Div. 4 – Clause 3.1.8 Striking 0r Removal of Formworks
7	Steel reinforcing bar work	Reinforcing bars	Checking of binding, intervals of spacers, alighnment of re-bars and bar supports by visual inspection	All – after assembling	—	Submission of inspection report To attach photographs in case of re-assembling	Conformity to working drawings	Consultant's inspection	IS: 1786, 2505	Div. 4 Clause 3.2 Bending and Placing Reinforcement Bar schedule shall be prepared and submitted for the Engineer's approval.
8	Concrete work	Mix Design	IS 456 and IS 10262 or ACI standard designation ACI-211.1	Prior to start of structural concrete or change of the material source	Mpa	Design and test report	-	Consultant's inspection	IS 456 and IS 10262 or ACI – 211.1	Div. 4, Clause 1.4.2 1.4.2 Design Mix for Controlled Concrete
		Strength	Compressive strength test equipment	Every day of concrete casting Every 10m3	Mpa	Submission of tesut result report	More than design strength	Consultant's inspection	IS; 456, 516, 1199	Div. 4, Clause 1.7 Sampling and Testing

Criteria for Quality Control for Site Works (Workmanship)

	Work	Item	Method	Frequency	Unit	Record / Report	Tolerance	Notes	Reference Codes	Specifications
	Concrete work (… cont.)	Dimension (Wall center lines)	Rolled steel tape	At 3 m intervals	mm	Inspection report	BS 5606	Consultant's inspection	BS 5606	As per working drawing
		Accuracy of section Right angle	Convex Carpenter's squere	Top, Middle, Bottom	mm	Inspection report	Any individual test result is not less than fck – 4 N/mm2 for the concrete of grade M 20 and above	Consultant's inspection	IS:456	Div. 4, Clause 1.7 Samples and Testing
9	Masonry work	Brick	Visual inspection, Rolled steel tape, Plumb bob, Convex	During the work, Upon completion of the work, Every construction group Every part of the work	mm	Inspection report	±5mm	Consultant's inspection	IS:2212	Div. 5, Section 1 Brick Masonry Works
		Stone Masonry	Visual inspection, Rolled steel tape, Plumb bob, Convex	During the work, Upon completion of the work, Every construction group Every part of the work	mm	Inspection report	±5mm	Consultant's inspection	IS:1597	Div. 5, Section 2 Stone Masonry Works
10	Tile work	Straight joint Flat surface Free from floating, flaws and stain etc.	Visual inspection Sounding	During the work Upon completion of the work	—	Submission of inspection report	Free from floating and flaws	Consultant's inspection	IS:13630 Part 1 to 9; IS: 15477	Div. 7, Section 1 Tiling on Floor, Dado and Skirting
11	Carpentory work	Accrancy	Visual inspection, Rolled steel tape, Plumb bob, Convex	During the work Upon completion of the work	mm	Submission of inspection report	Free from cracks, sap-wood and other defects	Consultant's inspection	IS:11215; 851, 852	Div. 10 Section 1 Wooden Doors and Windows; Sub-section 1.5
		Joint, Connection (Bolts, nails and hardwares)	Visual inspection	During the work Upon completion of the work	-	Submission of inspection report		Consultant's inspection		Div. 10 Section 1 Wooden Doors and Windows; Sub-section 1.5
12	Roofing work	Tightning of fastening materials Free from distortion Lap Accurancy, Weld quality and joint details	Visual inspection	Upon completion of the work All bolts	—	Inspection report	Shop drawings ±5mm	Consultant's inspection	IS: 800, 812, 807, 816, 1161	Div. 13 Roofing Works
13	Metal work	Appearance Dimention Curing	Visual inspection Convex , weld joints and quality	During manufacturing and fixing	mm	Submission of inspection report	Shop drawings	Consultant's inspection	IS: 800, 807, 812, 816, 1161	Div. 11 Metal Works
14	Plastering work	Flat surface Free from floating and cracks	Visual inspection Convex Carpenter's square Aluminium ruler (1.5m)	Upon completion of the work	mm	Inspection report	±3mm at 1.80 meter long straight edge	Consultant's inspection	IS:1542, 8112; BS 5492	Div. 12 Plastering Works
15	Door & Window work	Accurancy of fixing, folding of sheets, reinforcing for hardware, glass fixing, hardware quality	Carpenter's square Convex	Upon completion of the work	mm	Shop Drawings; Submission of inspection report	Smooth opening and shutting Less than ±3mm (diagonal)	Consultant's inspection	SDI 100; SDI A115. SDI 107, 111	Div. 10, Section 3 Metal Doors and Windows
16	Painting work	Dry condition of base coats	Hygrometer	Prior to finish coats	%	Submission of measurement report	Less than 12%	Consultant's inspection		Div. 12 Painting Works
		Colour and tone Smooth Free from uneveness	Visual inspection	During the work Upon completion of the work	—	Submission of inspection report	Free from uneveness, stain Approved colour sample	Consultant's inspection		Div. 12 Painting Works
17	Flooring Works	Finish surface Accuracy	Visual inspection, Rolled steel tape, Convex	During progress and upon completion of the work	—	Submission of inspection report	Fine appearance	Consultant's inspection		Div. 7 Flooring Works

ANNEX-5

Sample Formats for Various Submittals

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)

"NAME OF CONTRACT PACKAGE"

VOLUME II General Requirement	DOCUMENT SUBMITTAL	TR Number : TR-DOC-S002 Date Issued : 02/Jul/2016

To the ENGINEER:	From the CONTRACTOR :
NAME OF DISTRICT EDUCATION OFFICE (DLPIU)	NAME OF THE CONTRACTOR

We transmit herewith three (3) sets of the following documents for your review, checking, comments and/or approval.

Reference No.	Title / Contents	Revision No.	Remarks

Received by the Engineer or his Representative :

Date : _____

Signature : _____

Transmitted by the Contractor's Representative :

Date : _____

Signature : _____

FOR USE BY THE ENGINEER

APPROVED

NOT APPROVED

_____ _____

_____ _____

Issued by the Engineer

Date : _____

Signature : _____

Received by the Contractor's Representative :

Date : _____

Signature : _____

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)

"NAME OF CONTRACT PACKAGE"

VOLUME III Concretel Work	SHOP DRAWING SUBMITTAL	TR Number : TR-DWG-001 Date Issued : 02/Jul/2016

To the ENGINEER:
NAME OF DISTRICT EDUCATION OFFICE (DLPIU)

From the CONTRACTOR :
NAME OF THE CONTRACTOR

We transmit herewith three (3) sets of the following shop drawings for your review, checking, comments and/or approval.

Drawing No.	Drawing Title / Sheet Contents	Revision No.	Remarks

Received by the Engineer or his Representative :

Date : _____

Signature : _____

Transmitted by the Contractor's Representative :

Date : _____

Signature : _____

FOR USE BY THE ENGINEER

APPROVED

NOT APPROVED

Issued by the Engineer

Date : _____

Signature : _____

Received by the Contractor's Representative :

Date : _____

Signature : _____

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)

"NAME OF CONTRACT PACKAGE"

VOLUME II Concrete Work	INSPECTION REQUEST	IR Number : IR-OS-001 Date Issued : 02/Jul/2016

To the ENGINEER:
NAME OF DISTRICT EDUCATION OFFICE (DLPIU)

From the CONTRACTOR :
NAME OF THE CONTRACTOR

We hereby kindly request for your attendance to scheduled test and/or inspection for the construction and/or installation works described here-in below.

Work Item	Description of Work	Location	Remarks
Concrete Work			

Received by the Engineer or his Representative :

Date : _____

Signature : _____

Transmitted by the Contractor's Representative :

Date : _____

Signature : _____

FOR USE BY THE ENGINEER

APPROVED

NOT APPROVED

Issued by the Engineer

Date : _____

Signature : _____

Received by the Contractor's Representative :

Date : _____

Signature : _____

DAILY WORK PROGRESS RECORD
OF
CONSTRUCTION OF TPIS-ERP

SITE NAME & LOCATION: ……

Contractor:	Engineer:	Date:
Contractor's Rep:	Contract Time: -- months (--- days) (Contract Date: --)	Day No:
Day Used : (From the Date of Contract)	Weather Condition:	
Employer's Rep:	Other Visitors:	

DAILY LABOURER BY TRADE

S.No.	Trade	Nos.	S.No.	Trade	Nos.	Remarks

WORK COMPLETED

S.No.	Work Location	Progress	Remarks

INSPECTIONS/TESTS

S.No.	Items of Inspection Carried out	Conclusions	Remarks

MAJOR MACHINE/EQUIPMENT USED

S.No.	Items Used	Nos.	Conditions	Operating Hours	Work Location	Remarks

MATERIAL STATUS AT SITE

S.No.	Materials	Unit	Opening Balance	Store in	Store Out	Closing Balance	Remarks

Submitted by: …… Reviewed by: ……

EWES East West Engineering Service Pvt. Ltd.
Consulting Architects, Engineers & Planners

Name of Project:

WORK PACKAGE & DESCRIPTION: **CONSTRUCTION OF SCHOOL BUILDING AT ……**	**NOTICE OF NON-COMPLIANCE NO:** **DATE:**
The Contractor is hereby informed that during our inspections the following items of works were noticed as not being in accordance with the requirement of Contract	The Contractor will note below his intended actions to be taken to rectify the noted deficiencies.
For Consultant. Name: Position: Signed:	For Contractor Name: Position: Signed:
cc:	
Work Rectified: Yes/No Comments:	Inspector's Name: Signed: Date:

REQUEST FOR EXAMINATION (REF)

Contract :

We ……..hereby request for the examination of following works prior to proceed for the subsequent work.

Date : Place :

1. Works request for Examination:

……

2. Location / Work Area:

……

3. Date & Time of Examination:

……..

4. Anticipated Volume of Work:

……

5. Remarks / Notes on Examination:

……
……
……
……
……
……
……

Request By:

Name:

Designation:

Inspected By:

Name:

Designation:

ANNEX-6

Sample Formats for Concrete Test Results

and

Line Chart

CONCRETE TRIAL MIX TEST REPORT

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)

"NAME OF CONTRACT PACKAGE"

DATE :

CONCRETE PRODUCTION METHOD : SITE-MIXED BY BACK MIXER

MIX PROPORTION FOR CLASS 15NT/mm2 CONCRETE				TEST RESULTS	
Trial Mix Proportion (for 100kg concrete)		**Design Mix Proportion** (per m3 of concrete)		Slump Test	
COARSE AGGREGATE	kg	COARSE AGGREGATE	kg	PHOTO	
SAND	kg	SAND	kg		
CEMENT	kg	CEMENT	kg		
WATER	kg	WATER	kg		
CHEMICAL	kg	CHEMICAL	kg		
				Slump Test Result	14.2 cm
				Density Test Result	2,350kg/m3
Batching Equipment PHOTO		Weighing of Materials (1) PHOTO		Weighing of Materials (3) PHOTO	
Concrete Sampling PHOTO		Weighing of Materials (2) PHOTO		Weighing of Materials (4) PHOTO	

REMARKS :

Confirmed by the Employer's Representative :

"NAME OF THE ENGINEER"

(Date : _____)

Confirmed by the Contractor's Representative :

"NAME OF THE CONTRACTOR"

(Date : _____)

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)

"NAME OF CONTRACT PACKAGE"

RECORD OF CONCRETE TEST RESULTS

AS OF 31 JANUARY 2002

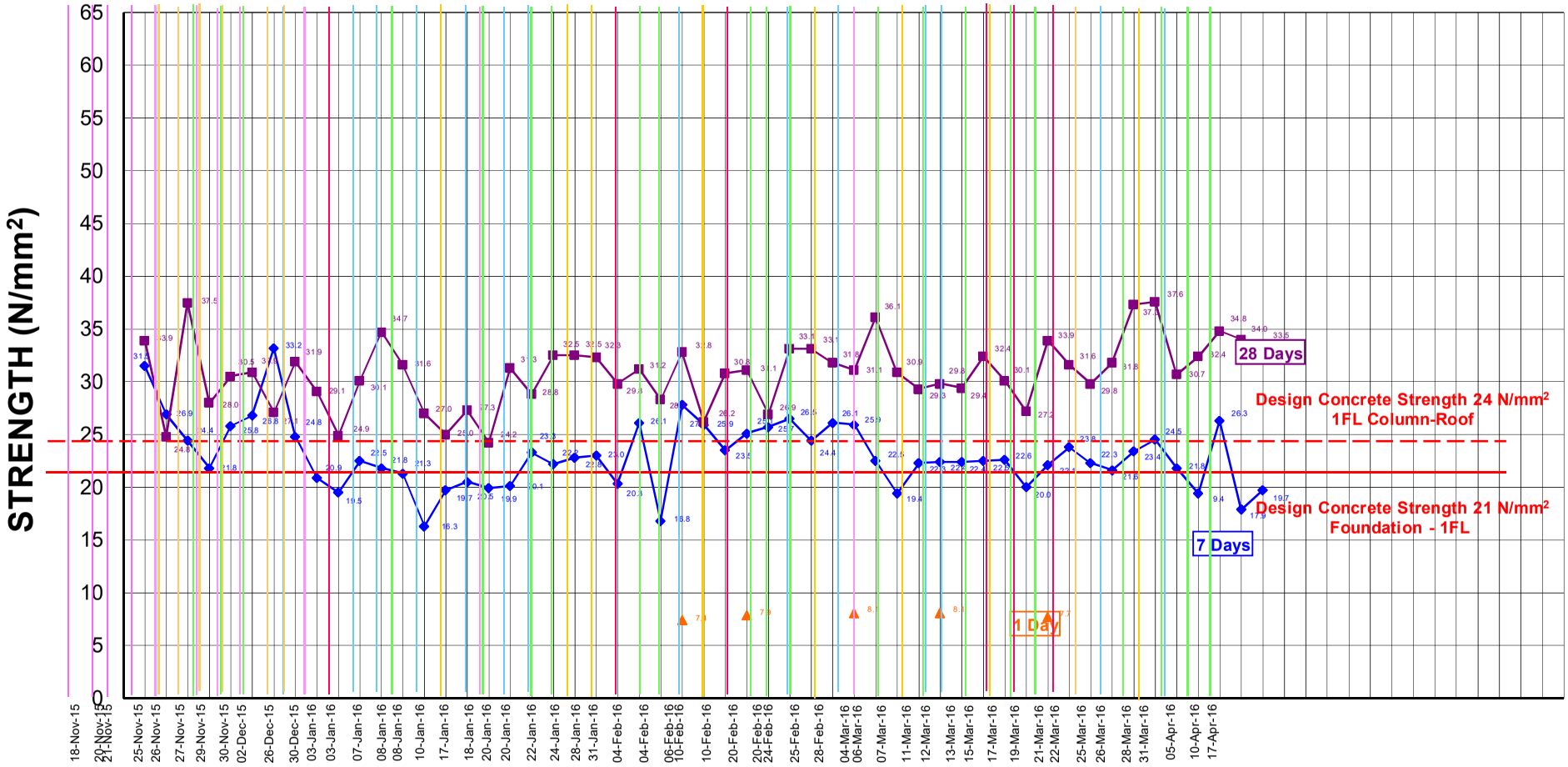
No.	Casting Date	Location	Design Strength (KN/mm2)	Field Test		Laboratory Test Results								Summary	
						7 days				28 days				Converted Strength (KN/mm2)	Pass/ Fail
				Slump (cm)	Temp. (℃)	Testing Date	Sample No.	Test Results (KN/mm2)		Testing Date	Sample No.	Test Results (KN/mm2)			
								Results	Average			Results	Average		
1.	06/07/01	Trial Mix for	15	6.5	16.2	4 days 10/07/01	06-07-01	14.00	14.25	7 days 13/07/01	06-07-03	21.20	21.20	24.03	Pass
		Leveling & Rubble Concrete					06-07-02	14.50							
2.	14/07/01	Building - A	15	7.0	16.9	21/07/01	14-07-01	29.90	30.90	11/08/01	14-07-04	48.80	46.37	39.41	Pass
		Leveling & Rubble Concrete					14-07-02	32.30			14-07-05	51.00			
							14-07-03	30.50			14^07-06	39.30			
3.	19/07/01	Trial Mix for	21	10.0	8.3	26/07/01	19-07-01	29.60	28.80	16/08/01	19-07-04			32.64	Pass
		Foundation (Sub-structure)					19-07-02	29.00			19-07-05				
							19-07-03	27.80			19-07-06				
4.	20/07/01	Trial Mix for	24	10.0	13.0	27/07/01	20-07-01	26.90	27.73	17/08/01	20-07-04	40.60	43.40	36.89	Pass
		Super Structure					20-07-02	28.80			20-07-05	45.50			
							20-07-03	27.50			20-07-06	44.10			
5.	23/07/01	Building - A	21	12.5	19.1	30/07/01	23-07-01	19.70	19.27	20/08/01	23-07-04	43.00	40.93	34.79	Pass
		Column Pads					23-07-02	18.80			23-07-05	36.00			
							23-07-03	19.30			23-07-06	43.80			
6.	24/07/01	Building - A	21	15.0	13.1	31/07/01	24-07-01	37.20	36.13	21/08/01	24-07-04	44.30	47.77	40.60	Pass
		Column Pads					24-07-02	37.10			24-07-05	49.30			
							24-07-03	34.10			24-07-06	49.70			
7.	25/07/01	Building - A	21	8.5	19.1	01/08/01	25-07-01	16.30	18.03	22/08/01	25-07-04	50.40	50.50	42.93	Pass
		Column Pads					25-07-02	16.20			25-07-05	49.80			
							25-07-03	21.60			25-07-06	51.30			
8.	27/07/01	Building - A	21	7.5	20.0	03/08/01	27-07-01	32.80	33.47	24/08/01	27-07-04	40.20	37.10	31.54	Pass
		Column Pads					27-07-02	33.60			27-07-05	36.90			
							27-07-03	34.00			27-07-06	34.20			
9.	01/08/01	Building - A	21	12.5	10.1	08/08/01	01-08-01	19.90	20.40	8 days 09/08/01	01-08-04	21.20	21.80	24.71	Pass
		Column Pads					01-08-02	20.10			01-08-05	21.50			
							01-08-03	21.20			01-08-06	22.70			

NOTE : As for the calculation of the "Converted Strength", conversion rate of 85% is being used i.e. (average compressive strength at 28 days x 85%).

LINE CHART

CONCRETE CASTING RECORDS and TEST RESULTS

Fc-21 (21N/mm²), Slump Max. 150mm



CASTING DATE

ANNEX-7

Sample Format for Minutes of Monthly Coordination Meeting

1st MONTHLY COORDINATION MEETING

FOR

EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)

"NAME OF CONTRACT PACKAGE"

Date & Time	:	** ****** 2016 at **** AM
Place	:	Conference Room of DEO or Site Office
Employer	:	Ministry of Education (CLPIU)
	:	District Education Office (DLPIU)
Consultant	:	"Name of JICA Consultant"
Contractor	:	"Name of the Contractor"

AGENDA OF MEETING

1. Opening by the Engineer or Consultant, whichever is applicable
2. Confirmation of the minutes for last month's meeting (applicable from 2nd Monthly coordination meeting)
3. Discussion of the pending matters, if any
4. Reporting of the work progress to date by the Engineer or Consultant
5. Reporting of the major site activities for next month by the Contractor
6. Discussion of the safety matters
7. Reporting of the inspection results by the Engineer or Consultant
8. Discussion of the other matters, if any

MINUTES FOR THE 1ST MONTHLY COORDINATION MEETING

PROJECT : **EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)**
"NAME OF CONTRACT PACKAGE"

		ATTENDANTS		
DATE	: ** ****** 2016			
PLACE	: Site Office Conference Room	**EMPLOYER**	**JICA CONSULTANT**	**CONTRACTOR**
TIME STARTED	: AT 11:00 A.M.	Name of Attendee	Name of Attendee	Name of Attendee
TIME FINISHED	: AT 13:00 P.M.			
PREPARED BY	: NAME OF THE CONTRACTOR			
CHECKED BY	: ENGINEER (or Consultant)			
NOTED BY	: DEPARTMENT OF EDUCATION (EMPLOYER: CLPIU)			
	: DISTRICT EDUCATION OFFICE (EMPLOYER: DLPIU)			

DISCUSSED MATTERS / RESOLUTION	ACTION BY
1. Introduction of Attendants (by the Engineer or Consultant) The Engineer (or Consultant) introduced all attendants to this Monthly Coordination Meeting. **2. Confirmation of the Minutes for Last Monthly Coordination Meeting** (applicable from 2nd meeting) All parties confirmed and acknowledged the minutes for last Monthly Coordination Meeting. **3. Pending Matters** "Describe all pending matters item by item" **4. Reporting of Work Progress to Date** (by the Engineer or Consultant) **5. Reporting of the Major Site Activities for Next Month**	

MINUTES FOR THE 1ST MONTHLY COORDINATION MEETING (…. CONT.)
PROJECT : EMERGENCY SCHOOL RECONSTRUCTION PROJECT (ESRP)
"NAME OF CONTRACT PACKAGE"

DISCUSSED MATTERS / RESOLUTION	ACTION BY
6. Discussion of the safety matters **7. Reporting of the Inspection Results** (by the Engineer or Consultant) **8. Other Matters**	

CONFIRMED AND ACKNOWLEDGED BY :

EMPLOYER	DLPIU ENGINEER/ JICA CONSULTANT	CONTRACTOR
(Date : _____)	(Date : _____)	(Date : _____)

ANNEX-8

Sample Format for Monthly Progress Report

Monthly Progress Report

for

Name of Contract Package

for

Emergency School Reconstruction Project

(ESRP NE-P11)

< No.1 >

For the Month of July 2016

Prepared by

Name of Contractor

Emergency School Reconstruction Project (ESRP)
"Name of Contract Package for the Project"

MONTHLY REPORT - 1

Date: 5th July 2016
"Name of Engineer"
Resident Engineer

［ **JUNE 2016**］

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1. Summary

"Description of the Engineer's observation as to the progress of Works for the Project as a whole as well as the progress for each school included in this Contract Package, including measures to be taken by the Contractor, and so on."

2. Work Progress

(1) Work Done During This Month

"Description of major works executed with the current work progress by percent for each major work item executed during this month for each school, as well as any event to be noted."

(2) Work to be Done Next Month

"Description of major works planned to be executed for next month for each school, as well as any planned event to be noted."

3. Pending Matters

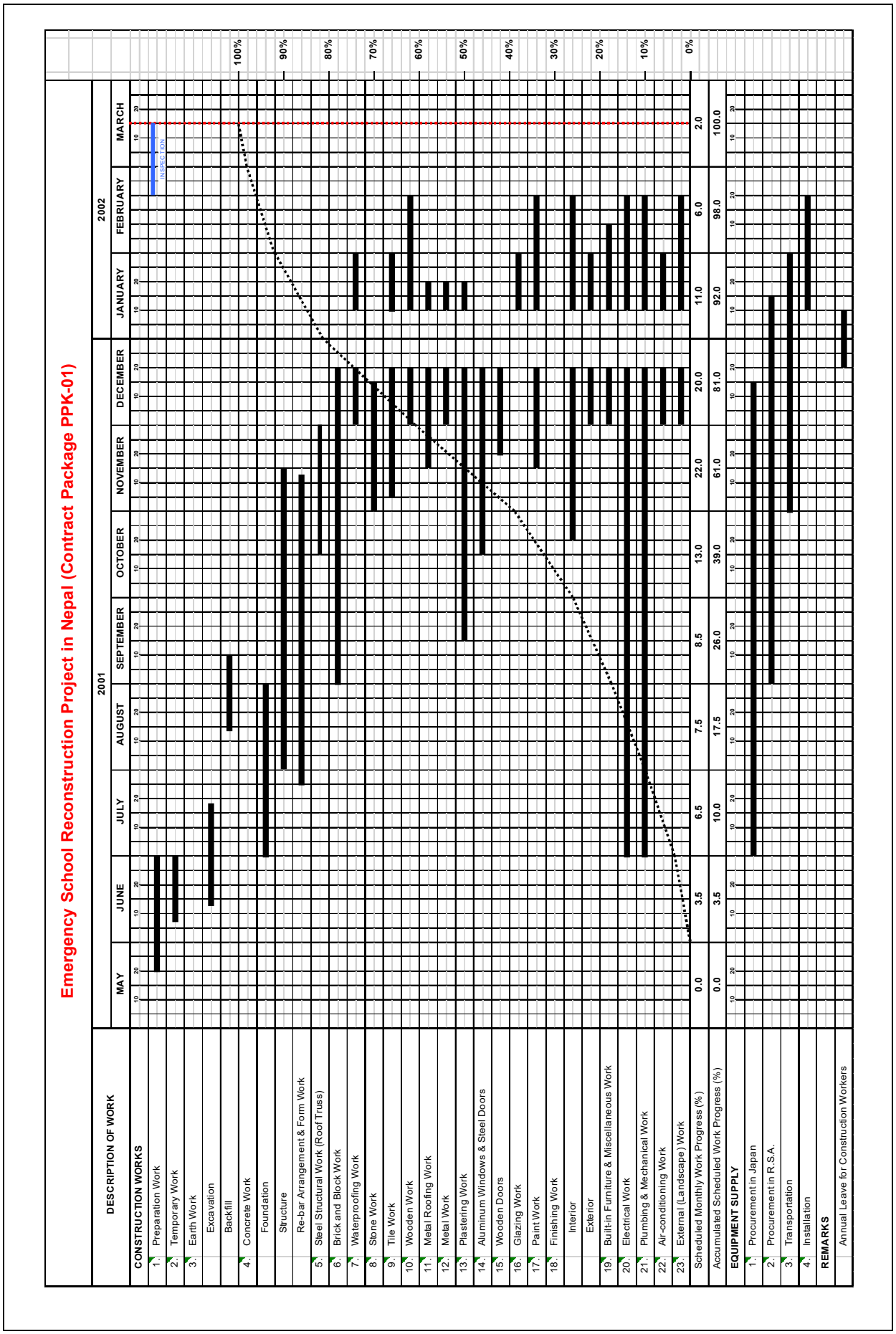
"Description of pending matters and status thereof resolutions and/or countermeasures taken."

CONTENTS

1. Summary of the Project

"Summary of the Project and the components
included in this Contract Package"

2. Overall Construction Schedule



3. Construction Progress

3.1 Summary of Construction Progress

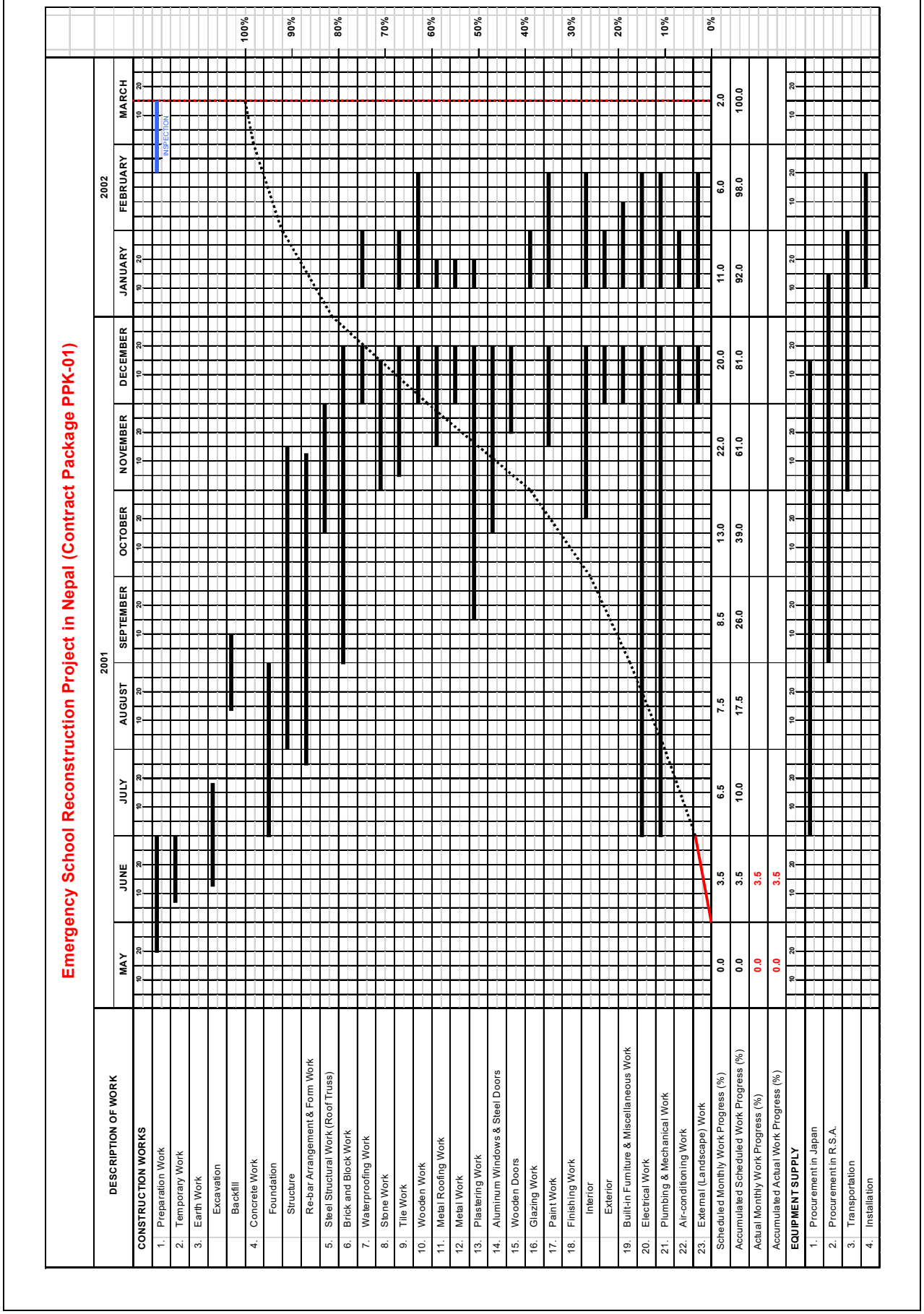
a) Overall Construction Progress

	Description	Schedule	Actual	Variance
JULY 2001	1. Value of Construction Progress up to Last Month	3.5%	3.5%	0.0%
	2. Value of Construction Progress for This Month	6.5%		
	3. Accumulated Value of Construction Progress	10.0%		

b) Construction Progress by Work Item

	Description of Work Item	Ration	Last Month	This Month	Accumulated
A	**CONSTRUCTION WORKS**				
	1. Preliminary Work	2.7%	0.4%		0.4%
	2. Earth Work	4.1%	2.6%		2.6%
	3. Concrete Work	24.1%	0.0%		0.0%
	4. Structural Steel Work	2.7%	0.0%	0.0%	0.0%
	5. Masonry Work	2.3%	0.0%	0.0%	0.0%
	6. Waterproofing Work	0.4%	0.0%	0.0%	0.0%
	7. Stone Work	0.6%	0.0%	0.0%	0.0%
	8. Tile Work	1.5%	0.0%	0.0%	0.0%
	9. Wooden Work	1.4%	0.0%	0.0%	0.0%
	10. Roof Work	2.5%	0.0%	0.0%	0.0%
	11. Metal Work	1.7%	0.0%	0.0%	0.0%
	12. Plaster Work	2.1%	0.0%	0.0%	0.0%
	13. Doors & Windows Work	4.0%	0.0%	0.0%	0.0%
	14. Painting Work	1.1%	0.0%	0.0%	0.0%
	15. Finishing Work	2.7%	0.0%	0.0%	0.0%
	16. Furniture & Miscellaneous Work	3.2%	0.0%	0.0%	0.0%
	17. Electrical Work	10.1%	0.0%		0.0%
	18. Plumbing Work	4.5%	0.0%		0.0%
	19. Air-conditioning & Ventilation Work	2.1%	0.0%	0.0%	0.0%
	20. External (Landscape) Work	2.3%	0.0%	0.0%	0.0%
	21. In-direct Expenses	23.9%	0.5%		0.5%
	TOTAL	100.0%	3.5%	0.0%	3.5%
B	**EQUIPMENT SUPPLY**				0.0%
	1. Procurement	80.6%	0.0%	0.0%	0.0%
	2. Transportation	9.7%	0.0%	0.0%	0.0%
	3. Installation	9.7%	0.0%	0.0%	0.0%
	TOTAL	100.0%	0.0%	0.0%	0.0%

3.2 Actual Construction Progress Chart



DESCRIPTION OF WORK	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH
CONSTRUCTION WORKS											
1. Preparation Work											
2. Temporary Work											
3. Earth Work											
Excavation											
Backfill											
4. Concrete Work											
Foundation											
Structure											
Re-bar Arrangement & Form Work											
5. Steel Structural Work (Roof Truss)											
6. Brick and Block Work											
7. Waterproofing Work											
8. Stone Work											
9. Tile Work											
10. Wooden Work											
11. Metal Roofing Work											
12. Metal Work											
13. Plastering Work											
14. Aluminum Windows & Steel Doors											
15. Wooden Doors											
16. Glazing Work											
17. Paint Work											
18. Finishing Work											
Interior											
Exterior											
19. Built-in Furniture & Miscellaneous Work											
20. Electrical Work											
21. Plumbing & Mechanical Work											
22. Air-conditioning Work											
23. External (Landscape) Work											
Scheduled Monthly Work Progress (%)	0.0	3.5	6.5	7.5	8.5	13.0	22.0	20.0	11.0	6.0	2.0
Accumulated Scheduled Work Progress (%)	0.0	3.5	10.0	17.5	26.0	39.0	61.0	81.0	92.0	98.0	100.0
Actual Monthly Work Progress (%)	0.0	3.5									
Accumulated Actual Work Progress (%)	0.0	3.5									
EQUIPMENT SUPPLY											
1. Procurement in Japan											
2. Procurement in R.S.A.											
3. Transportation											
4. Installation											

4. Pictorial Work Progress

4.1 Ground Floor Plan

"Insert drawing applicable to on-going and completed works
and highlight the areas working on"

4.2 First Floor Plan

"Insert drawing applicable to on-going and completed works
and highlight the areas working on"

5. Pictorial Work Progress

5.1 Working Days and Other Work Records

a) Working Days (June 2016)

JULY 2001	1.	Total Number of Days for This Month	31	days
	2.	Total Number of Sundays and Public Holidays	4	days
	3.	Non-working Days Due to Severe Weather Conditions	0	days
	4.	Total Number of Working Days for This Month (incl. Holiday Work)	27	days
	REMARKS :			

b) Manpower Records

	No.	Occupation	Up to Last Month		This Month		Up to This Month	
			Man Days	Man Hours	Man Days	Man Hours	Man Days	Man Hours
AS OF JULY 2001	1.	Project Manager	57	456	27	216	84	672
	2.	Administrator	57	456	26	208	83	664
	3.	Engineer	57	456	28	224	85	680
	4.	Supervisor (M & E)	47	376	26	208	73	584
	5.	Office Clerk	156	1,248	84	672	240	1,920
	6.	Driver	117	936	53	424	170	1,360
	7.	Local Engineer	39	312	25	200	64	512
	8.	Foreman	75	600	155	1,240	230	1,840
	9.	Surveyor	28	224	25	200	53	424
	10.	Carpenter	145	1,160	872	6,976	1,017	8,136
	11.	Re-bar Worker	126	1,008	315	2,520	441	3,528
	12.	Concrete Worker	104	832	194	1,552	298	2,384
	13.	General Worker	630	5,040	793	6,344	1,423	11,384
	14.	Brick Layer	0	0	0	0	0	0
	15.	Welder	0	0	0	0	0	0
	16.	Door & Window Fixer	0	0	0	0	0	0
	17.	Waterproofing Worker	0	0	0	0	0	0
	18.	Plasterer	0	0	0	0	0	0
	19.	Painter	0	0	0	0	0	0
	20.	Finishing Worker	0	0	0	0	0	0
	21.	Electrician	0	0	0	0	0	0
	22.	Plumber	0	0	45	360	45	360
	23.	Duct Worker	0	0	0	0	0	0
	24.	Furniture Fixer	0	0	0	0	0	0
	25.	Machine Operator	43	344	0	0	43	344
	26.	Cleaner	34	272	34	272	68	544
	27.	Guardman	48	384	31	248	79	632
	Total		**1,763**	**14,104**	**2,733**	**21,864**	**4,496**	**35,968**

c) Safety Report

	Year	Month	Total Man Hours		No. of Accident		No. of Lost Days		Accident Ratio		Remarks
			This Month	Accumulated	This Month	Accumulated	This Month	Accumulated	Ratio (A)	Ratio (B)	
AS OF JULY 2001	2001	JUN	4,240	4,240	0	0	0	0	0	0	
		JUL	9,864	14,104	0	0	0	0	0	0	
		AUG	21,864	35,968	0	0	0	0	0	0	
		SEP									
		OCT									
		NOV									
		DEC									
	2002	JAN									
		FEB									
		MAR									
	Ratio (A) = (No. of Casualities / Accumulated Man Hours) x 1,000,000 Ratio (B) = (No. of Lost Days / Accumulated Man Hours) x 1,000										

5.2 Summary of Major Works Executed in This Month

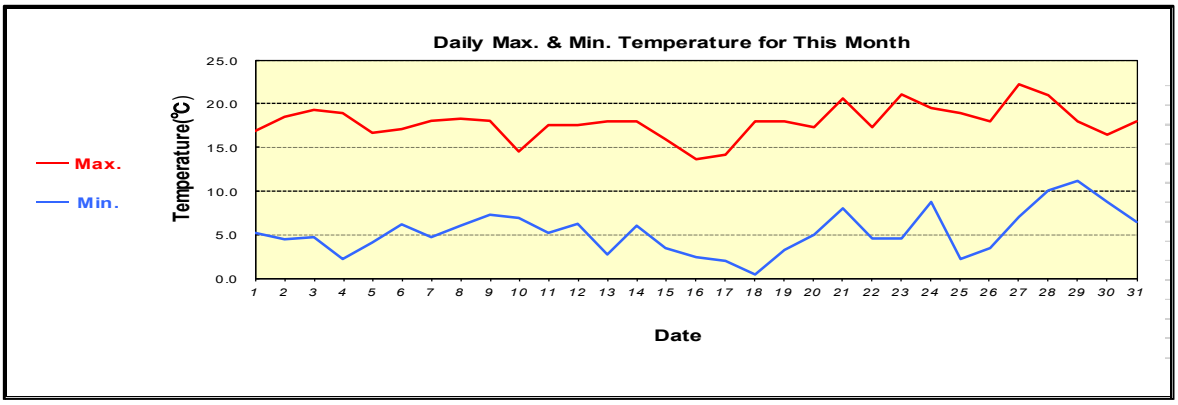
"Describe all works executed during this month for each school"

5.3 Actual Work Schedule for This Month

"Insert monthly schedule for This Month for each school"

5.4 Weather Report for This Month

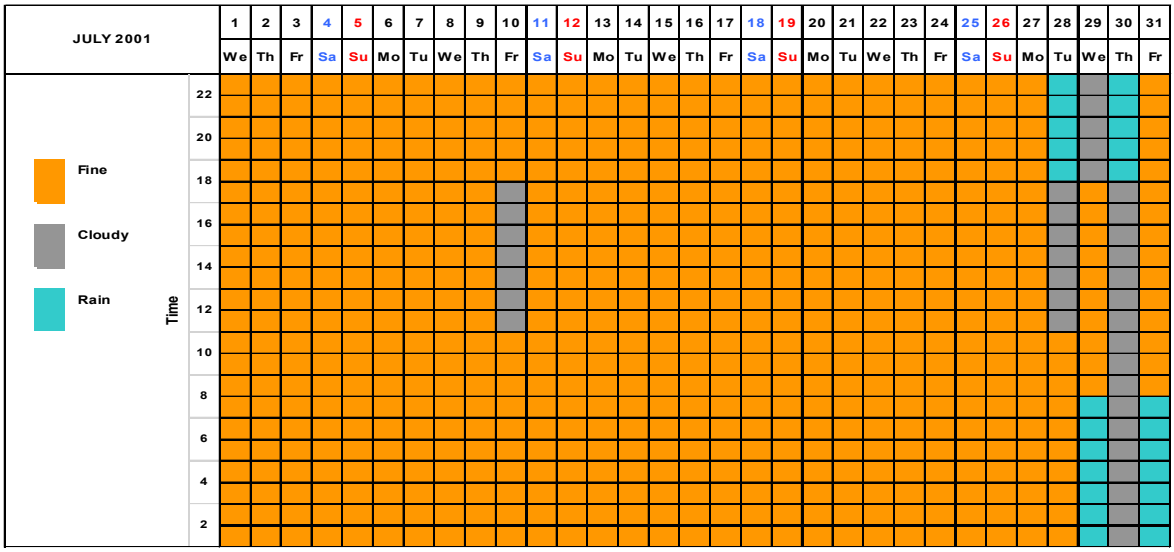
a) Temperature Graph (June 2016)



b) Various Data

JULY 2001	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr
Weather	F	F	F	F	F	F	F	F	F	C	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	R	R	R	R
Max. Temperature	16.8	18.5	19.3	19.0	16.6	17.1	18.1	18.3	18.1	14.5	17.5	17.5	18.0	18.0	16.0	13.6	14.2	18.0	18.0	17.3	20.6	17.3	21.1	19.5	19.0	18.0	22.2	21.0	18.0	16.4	18.0
Min. Temperature	5.3	4.5	4.7	2.2	4.1	6.1	4.7	6.0	7.3	6.9	5.3	6.3	2.7	6.0	3.5	2.5	2.0	0.5	3.2	5.0	8.0	4.6	4.6	8.7	2.2	3.5	7.0	10.0	11.2	8.7	6.5

c) Daily Weather Report



d) Overall Weather Report

Fine Days	"F"	26	Days
Cloudy Days	"C"	1	Days
Rainy Days	"R"	4	Days
Total Calendar Days		31	Days

Max. Temperature	22.2	(℃)
Average Max. Temperature	17.9	(℃)
Min. Temperature	0.5	(℃)
Average Min. Temperature	5.3	(℃)
Overall Monthly Average Temperature	11.6	(℃)

6. Work Schedule for Next Month

6.1 Summary of Major Activities

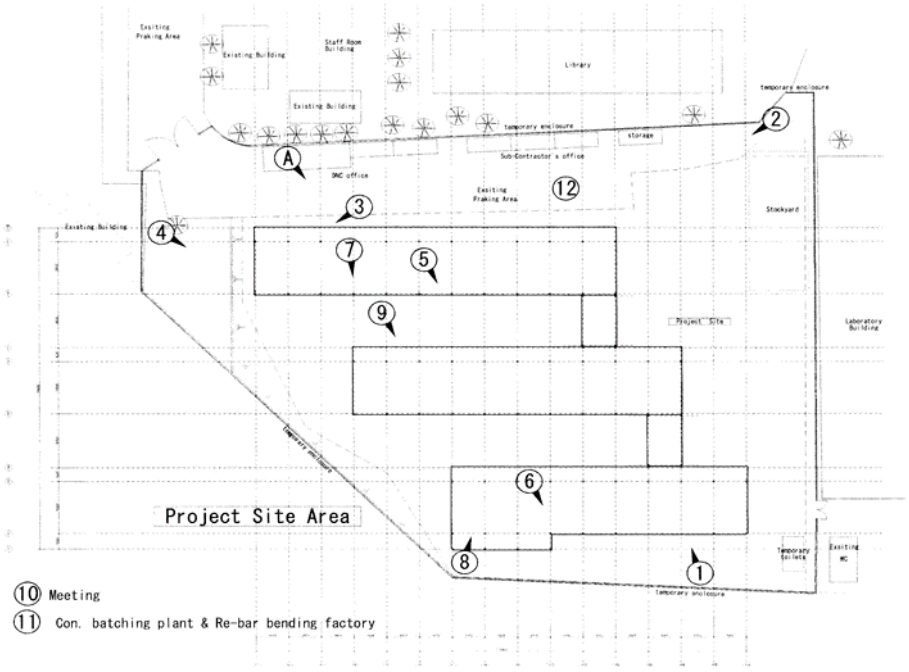
"Describe all works planned to be executed for next month for each school"

6.2 Work Schedule

"Insert monthly schedule for the Next Month for each school"

7. Construction Photographs

7.1 Key Plan for Photograph Points



Key Plan for "Name of School"

"Insert Site Plan"

Key Plan for "Name of School"

7.2 Photographs of the Work Progress (1)

"Insert Overall Photo" **Overall View of "Name of School" from Fixed Point (A)**
"Insert Overall Photo" **Overall View of "Name of School" from Fixed Point (B)**

Photographs of the Work Progress (2)

“Insert Photo”			“Insert Photo”		
No.	Photo taken on 05/07/16	Caption	No.	Photo taken on 05/07/16	Caption
Subject	Concrete Work		Subject	Concrete Work	
“Insert Photo”			“Insert Photo”		
No.	Photo taken on 05/07/16	Caption	No.	Photo taken on 05/07/16	Caption
Subject	Structural Steel Work		Subject	Concrete Work	
“Insert Photo”			“Insert Photo”		
No.	Photo taken on 05/07/16	Caption	No.	Photo taken on 05/07/16	Caption
Subject	Concrete Work		Subject	Concrete Work	

Photographs of the Work Progress (3)

"Insert Photo"			"Insert Photo"		
No.	Photo taken on 05/07/16	Caption	No.	Photo taken on 05/07/16	Caption
Subject	Concrete Work		Subject	Concrete Work	
"Insert Photo"			"Insert Photo"		
No.	Photo taken on 05/07/16	Caption	No.	Photo taken on 05/07/16	Caption
Subject	Concrete Work		Subject	Concrete Work	
"Insert Photo"			"Insert Photo"		
No.	Photo taken on 05/07/16	Caption	No.	Photo taken on 05/07/16	Caption
Subject	Concrete Work		Subject	Concrete Work	