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REPUBLIC OF INDONESIA
MINISTRY OF COMMUNICATIONS
DIRECTORATE GENERAL OF LAND TRANSPORT
AND INLAND WATERWAYS

TENDER DOCUMENTS
FOR
NEW RAILWAY LINE FOR CENGKARENG AIRPORT
CONSTRUCTION PROJECT

PACKAGE II TRACK WORK

PART A INSTRUCTIONS TO BIDDERS
B CONDITIONS OF CONTRACT
C GENERAL SPECIFICATIONS
D TECHNICAL SPECIFICATIONS
E BILL OF QUANTITIES

AUGUST 1984

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)



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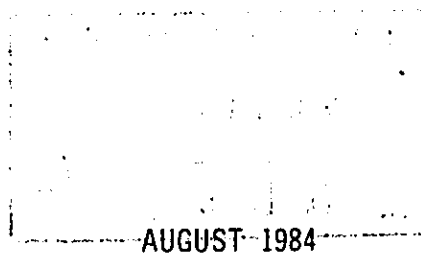
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(JICA)

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PART A

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

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INSTRUCTION TO BIDDERS

Package 2 : Track Works

1. OUTLINE OF THE WORK

A new airport is being constructed in Cengkareng apart approximately 15 km from Jakarta city towards north-western district. The government of Indonesia has planned to construct a single track railway line of a total length of about 20 km to link Jakarta City as a most suitable access means to the proposed air terminal.

The Works under this Contract comprise track laying, approximately 22.6 km in track length and include procurement of rails and accessories, fastenings, prestressed concrete sleepers, wooden sleepers, turnouts, buffer stops, railway crossings and railway signs.

Apart from the works under this Contract, civil and architectural works will be carried out under Package 1 and electrification of the railway, signaling, telecommunications and substation will be provided under Package 3 Contract.

2. COMPOSITION OF BID DOCUMENTS

The Bid Documents shall comprise the following:

- (1) Invitation to Bid
- (2) Instructions to Bidders
- (3) Form of Bid
- (4) Form of Bid Bond
- (5) Conditions of Contract
- (6) General Specifications
- (7) Technical Specifications
- (8) Drawings
- (9) Form of Priced Bill of Quantities
- (10) Further information or notices and conditions contained in Addenda which may be issued to Bidders prior to stipulated delivery date of Bids.

3. GENERAL PROVISIONS

3.1 General Rules

The Bidder shall carefully examine all the documents, drawings, information and data comprising the Bid Documents referred to in Article 2 above, and inform himself fully with respect to any and all conditions which may in any way affect the amount or nature of his Bid, or the performance of this work in the event that he is awarded the Contract.

Failure of the Bidder to so examine and inform himself shall be at his sole risk and no relief for error or omission will be given.

3.2 Clarification of Bid Documents

Should there be any doubt or obscurity as to the meaning of any of the Bid Documents or as to anything to be done or not to be done by the awarded Contractor or as to any other matter or thing relating to the Bid, the Bidder must submit his queries in writing to the employer not later than 20 (twenty) days before the date by which Bids must be delivered. The answer to these and any other outstanding questions will be issued to all Bidders to whom Bid Documents have been issued. Each recipient shall acknowledge receipt of any such Addenda.

The Employer shall not be bound by and the Bidder shall not rely on any oral interpretation or clarification of the Bid Documents or answer given orally to any queries raised by him.

3.3 Inspection of Project Site

The Bidder is urged and expected to inspect the Project site and its surroundings and to satisfy himself as to all general and local conditions that may in any way affect the amount and nature his Bid.

3.4 Partnership or Joint Venture

If the Bidder is a partnership or joint venture, a Power of Attorney signed by each party to the partnership or joint venture appointing and designating one of them as Principal Partner and authorizing him to submit and sign the Bid and to act for and binding the Bidder in all matters relating thereto, shall be provided with his Bid. The Power of Attorney shall be certified by the Competent authorities.

If the Bidder intends to form a partnership or joint venture, he shall in addition to the Power of Attorney referred to above, submit with his Bid an authenticated copy of the agreement of the parties to partnership or joint venture, or an affidavit signed by the parties declaring their intention to form a partnership or joint venture.

The Bidder shall not be entitled to modify the composition of the partnership or joint venture as presented with his Bid, except by written authorization from the Employer.

3.5 Language and Unit

All documents shall be drawn up in English, using the decimal unit, metric and kilogram-ton. All correspondence during the period of bidding shall be in English.

3.6 Reimbursement to Bid Preparation

The Employer will not be responsible for nor pay for any compensation, or any expenses or loss which may be incurred by any Bidder in the preparation of his Bid.

4. PREPARATION AND SUBMISSION OF BID

4.1 Entries on Documents

The Bid Documents referred to in Article 2 shall be completed as required in indelible ink, using the Documents provided or true copy thereof and no alteration or erasure shall be made in any of the Documents. Any comments which the Bidder wishes to make shall not be placed on any of the Documents but must take the form of a separate statement, cross referenced to items, clauses and pages of the Documents.

4.2 Bid Price

Bids are to be priced in Indonesian Rupiah and US Dollars. the Bidder shall convert the US Dollars' element of his Bid to Indonesian Rupiah for the purposes of comparison of Bids. The exchange rate to be used shall be the T/T selling rate of the US Dollars quoted by the Bank Indonesia at close of business on the 30th day prior to the due date for delivery of Bids. Payment under the Contract will be made both in Indonesian Rupiah and US Dollars.

4.3 Sufficiency of Offer

The Bidder shall be responsible for the correctness and sufficiency of his offer for the Works and of the Rates, costs and prices stated in his Bid which shall cover all his responsibilities and obligations under the Contract and all matters and things necessary for the proper execution and completion of the Works.

4.4 Documents Accompanying Bid

The following is a summary of the documents which must be submitted with the Bid and which are described or referred to the following sections.

- (1) Power of Attorney for Partnership)
- (2) Power of Attorney for Joint Venture) Where
- (3) Declaration of Partnership or Joint) Applicable
Venture Agreement)
- (4) List of Constructional Plant
- (5) Price List of Materials Required for the Works
- (6) Wage Rates for Labor
- (7) Detail Price Analysis
- (8) Detail Progress Schedule
- (9) List of Contractor's Staff

(10) Curriculum Vitae of Contractor's Senior Staff

Bids which are not accompanied by all the above documents are liable to be rejected.

4.5 List of Constructional Plant

The Bidder shall submit with his Bid a list of constructional plant which he intends to use for the execution of the Works under the Contract using the form attached to these Instructions, indicating separately equipment he owns, equipment he intends to purchase and equipment he intends to lease.

4.6 Price List of Materials Required for the Works and Wage Rates for Labor

Price List of materials Required for the Works and Wage Rates for Labor shall accompany the Bid, using the form attached to these Instructions to Bidders.

4.7 Detail Price Analysis

The Bidder shall submit with his Bid detail price analysis showing the price component of each pay item listed in the Bill of Quantities using the form attached to these Instructions as a guide. The unit price shall be broken down into various cost elements such as labor, fuel and lubricants, materials, equipment, overhead and profit, and other necessary costs.

4.8 Detail Progress Schedule and List of Contractor's Staff

Detail progress schedule and the list of the Contractor's staff who would be employed for the execution of the Works and who would be actually be present on Site shall accompany the Bid, using the form attached to these Instructions.

4.9 Bid Bond

The Bid must be accompanied by a Bid Bond in the sum of at least 3 (three) percent of the total bid price. The Bid Bond shall consist of a bank guarantee provided by a bank acceptable to the Government of Indonesia in the form attached to these Instructions. The Bid Bond shall remain valid up to 90 (ninety) days after the date when the Bids are opened and will be returned to an unsuccessful Bidder after expiry of the Bond validity period or as soon as possible after a successful Bidder has been awarded the Contract.

4.10 Signatures

The Bid shall be signed by the legal representative of the Bidders. The Bid Documents shall be endorsed on the front page with The words "READ AND ACCEPTED AND GOOD FOR AGREEMENT" and signed and each page initiated by the person signing the Bid. All documents accompanying the Bid, referred in article 4.4, shall be dated and signed by the person signing the Bid.

4.11 Submission of Bid

The Bid Documents and documents accompanying the Bid referred to in Articles 2 and 4.4 shall be divided into groups "A" and "B". Each group of documents shall be enclosed in a sealed envelope separately and marked "A" and "B".

Group "B" shall comprise the Bid, priced Bill of Quantities, List of Constructional Plant, Price List of Materials Required for the Works, Wage Rates for Labor and Detail Price Analysis, all of which must be duly filled in and signed by the Bidder. Group "A" shall comprise all other documents referred to in Articles 2 and 4.4.

The Bid shall be delivered by registered mail or personally by hand against a dated receipt not later than _____ local time on the date stated in the letter of invitation to bid to:

Departmen Perhubungan
Direktorat Jenderal Perhubungan Darat
Jl. Jenderal Sudirman No. P.59-60
Jakarta, Indonesia

Any Bid, or any modification or withdrawal of a Bid which is received after the due date for delivery of Bids will be rejected.

4.12 Modification or Withdrawal of Bid

The Bidder may modify or withdraw his Bid at any time prior to the due date and time for delivery of Bids provided the employer has received a written signed notification of modification or withdrawal before such date and time.

4.13 Alternative Bids

If more than one Bid is submitted by an individual, contractor, partnership or joint venture under the same or different names, these Bids may be rejected.

5. OPENING OF BIDS

The Bids will be opened at the time, date and place advised in the letter of invitation to bid.

Envelope "A" will first be opened and examined by the duly authorized Evaluation Committee of Bids. If the contents of Envelope "A" are not considered satisfactory to the Evaluation Committee the Bid will be rejected immediately and envelope "B" will be returned unopened to the Bidder. Subject to the acceptance of Envelope "A", the Evaluation Committee will then proceed to open Envelop "B".

The Bidder or his authorized representative may attend the opening of the Bids, if he so desires. The amounts of each Bid will be read aloud and recorded.

6. EVALUATION OF BIDS

The Bids will be examined to ascertain that each pay item is moneyed out correctly at the unit price quoted. Should the Employer require any explanations of a Bid, the Bidder shall comply promptly with any notification by the Employer and provide such explanations as may be required.

The Employer does not bind himself to accept the lowest or any Bids, and reserves the right to accept any Bid, to stop the bidding process or to call for new Bids. No reasons will be given for rejecting Bids.

7. VALIDITY OF BID

Bids shall remain valid and binding Bidders for 90 (ninety) days from the date for opening Bids.

If any Bidder withdraws his Bid before the said period expires, without written authorization from the Employer, the amount of the Bid Bond will be forfeited.

8. AWARD OF CONTRACT

8.1 Letter of Intent

A Letter of Intent shall be sent by the Employer to a successful Bidder fixing the date of negotiation determining the unit prices quoted in his Bid, and other contractual matters.

8.2 Determination of Unit Prices

The unit price of each pay item stated in the priced Bill of Quantities shall be determined after adjustment and mutual agreement between the Employer and the successful Bidder.

8.3 Letter of Acceptance

Notification by the Employer to the successful Bidder of the acceptance of his Bid subject to the determination of the unit prices shall be made by a Letter of Acceptance to enter into an agreement awarding the Contract to him.

The Successful Bidder shall be expected within 15 (fifteen) days from the date of such notification to execute the Form of Contract with the Employer. The successful Bidder shall furnish a Performance Bond as specified in the Conditions of Contract. If he does not do so, the Employer shall have the right to cancel the Bid.

8.4 Failure to Sign the Contract by the Successful Bidder

If the successful Bidder refuses or fails to sign the Contract, the Employer may award the Contract the second Bidder. If the second Bidder refuses or fails to sign the Contract, the Employer may award the Contract the third Bidder. In such event the Bidders may be requested to extend the validity of the Bids for such further period as may be agreed upon in writing between the Employer and the Bidders concerned.

In the case of the second or third Bidder, the signing of the Contract shall also take place with 15 (fifteen) days from the date that Bidder has been notified of the award made to him.

8.5 Forfeiture of Bid Bond

If any Bidder refuses or fails to sign the Contract within 15 (fifteen) days after receiving the letter of Acceptance from the Employer and thereby declines the Award of Contract or if he fails to furnish a Performance Bond in accordance with the requirements of Clause 10 of the Conditions of Contract, then the amount of the Bid Bond will be forfeited in conformity with the terms and conditions stated in the Bid Bond.

NEW RAILWAY LINE FOR CENGKARENG AIRPORT
CONSTRUCTION PROJECT

FORM OF BID

Director General
Departmen Perhubungan
Direktorat Jenderal Perhubungan Darat
Jakarta
Indonesia

1. We, the Undersigned, duly authorized representative of _____ after having carefully examined the Instructions to Bidders and all the Bid Documents pertaining to Package 1 of New Railway Line for Cengkareng Airport Construction and having duly studied the site, the nature of the works to be carried out, and all local conditions, offer to execute, complete and maintain the whole of the said Works in conformity with the said Documents and provisions as stipulated therein for the sum of _____
()
or such other sums as may be ascertained in accordance with the said Documents.
2. We Undertake if our Bid is accepted to commence the Works within 30 (thirty) days of receipt of the Engineer's order to commence, and to complete the whole Works comprised in the Contract _____ days calculated from the last day of the aforesaid period in which the Works are to be commenced.
3. If our Bid is accepted we will obtain the guarantee of an Insurance Company or Bank (to be approved by you) to be jointly or severally bound up with us in a sum equivalent to 3 (three) percent of the above named sum for the due performance of the Contract under the terms of a Bond to be approved by you.
4. We are to abide by this Bid for the period of 90 (ninety) days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
5. Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding Contract between us.

6. We understand that you are not bound to accept the lowest or any Bid you may receive.

Date _____

Name of Bidder _____

Signature of the Bidder

Position of the Bidder

Address

Witness _____

PRICE LIST OF MATERIALS REQUIRED FOR THE WORKS

PAY ITEM NO. Unit Price: Rp.

Description : Cost of Material on Site

Item	Unit	Price		
		Foreign	Local	Total
1. CIF Cost at Port from				
2. Handling				
3. Transport to Site Km				
4. Unloading, Storage, etc. :				
Grand Total				

Exchange Rate: US\$ 1 = Rp.

WAGE RATES FOR LABOR

(Unit: Rp.)

Class of Labor	Normal Working Day Hourly Rate	
	Local	Foreign

DETAIL PRICE ANALYSIS

PAY ITEM NO. Unit Price: Rp.

Description:

Item	Unit	Price		
		Foreign	Local	Total
A. Equipment				
Sub-total A				
B. Labor				
Sub-total B				
C. Materials				
Sub-total C				
D. Other Expenses				
Temporary roads for Works				
Temporary office and accomodations for Works				
Sub-total D				
E. Site Expenses				
Sub-total E				
F. Overhead and Profit (..... %)				
Grand Total				

Exchange Rate : US\$ 1 = Rp.

DETAIL PROGRESS SCHEDULE

FORM 6

Works	Comple- tion Time Month	Progress Schedule (Month)											
		1	2	3	4	5	6	7	8	9	10	11	12
1. Manufacture of track materials													
2. Shipping of track materials													
3. Preliminary works at site													
4. Construction of Temporary roads for works													
5. Construction of track works base													
6. Spreading of aggregate subbase													
7. Transportation of sleepers													
8. Transportation of rails and accessories													
9. Track laying													
10. Spreading of top ballast													
11. Tamping, rectification and surfacing													
12. Rail welding													

LIST OF CONTRACTOR'S STAFF

FORM 7

Post to be held	Name	Nationality	Age	Years of Experience

CURRICULUM VITAE OF CONTRACTOR'S SENIOR STAFF

1. Full Name
2. Nationality
3. Date of Birth
4. Education
5. Full Details of Qualification

6. Full Details of Past Experience with Particular Reference to Railway Construction

FORM OF BID BOND

Date: _____

..... (Name of Bank) Situated at
 (Address)
 agree to make a Bid Bond to the Departmen Perhubungan Direktorat
 Jenderal Perhubungan Darat of the Republic of Indonesia
 (hereinafter called the "Government") on the following terms:

1. That the Bid of (Name and Address of Bidder)

 is made in agreement with the Bid Documents issued from the
 Government for the construction of the new Railway Line for
 Cengkareng Airport.

2. In submitting the Bid, the Bidder agrees to furnish a Bid
 Bond through the above named Bank in the sum of

3. The Bank hereto agrees to be a guarantor for the Bid Bond
 for the above sum in the name of the Government.

4. When (Name of Bidder) who has submitted the
 Bid does not abide by the terms and conditions stipulated
 in the bid Documents, the Bank agrees to pay the sum of ...

 to the Government within 7 (seven) days after notification
 to the Bank by the Government of the default of the Bidder.

5. This Bid Bond becomes effective from (Date)
 to (Date)
 (The Bond shall be effective from the date of submission of
 the Bid until 90 (ninety) days after the Opening of the
 Bid.)

IN WITNESS WHEREOF the authorized representative of the Bank has
hereto signed.

Guarantor

Witness

PART B

CONDITIONS OF CONTRACT

CONDITIONS OF CONTRACT

DEFINITIONS AND INTERPRETATION

Definitions.

1. (i) In the Contract, as hereinafter defined, the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

- (a) "Employer" shall be Departmen Perhubungan, Direktorat Jenderal Perhubungan Darat, Republic of Indonesia.
- (b) "Contractor" means the person or persons, firm or company whose tender has been accepted by the Employer and includes the Contractor's personal representatives.
- (c) "Engineer" means the Engineer designated as the Engineer by the Employer, or other the Engineer appointed from time to time by the Employer and notified in writing to the Contractor in place of the Engineer so designated.
- (d) "Engineer's Representative" means any resident engineer or assistant of the Engineer, or any clerk of works appointed from time to time by the Employer or the Engineer to perform the duties set forth in Clause 2 hereof, whose authority shall be notified in writing to the Contractor by the Engineer.
- (e) "Works" shall include both Permanent Works and Temporary Works.
- (f) "Contract" means the Conditions of Contract, Specification, Drawings, priced Bill of Quantities, Bid, Letter of Acceptance and the Contract Agreement.
- (g) "Contract Price" means the sum named in the Letter of Acceptance, subject to such additions thereto or deductions therefrom as may be made under the provisions hereinafter contained.
- (h) "Constructional Plant" means all appliances or things of whatsoever nature required in or about the execution or maintenance of the Works but does not include materials or other things intended to form or forming part of the Permanent Works.
- (i) "Temporary Works" means all temporary works of every kind required in or about the execution or maintenance of the Works.
- (j) "Permanent Works" means the permanent works to be executed and maintained in accordance with the Contract.
- (k) "Specification" means the specification referred to in the Bid and any modification thereof or addition thereto as may from time to time be furnished or approved in writing by the Engineer.
- (l) "Drawings" means the drawings referred to in the Specification and any modification of such drawings approved in writing by the Engineer and such other drawings as may from time to time be furnished or approved in writing by the Engineer.

- (m) "Site" means the land and other places on, under, in or through which the Permanent Works or Temporary Works are to be executed and any other lands and places provided by the Employer for working space or any other purpose as may be specifically designated in the Contract as forming part of the Site.
- (n) "Right-of-Way" means land on which the Permanent Works are to be executed.
- (o) "Approved" means approved in writing, including subsequent written confirmation of previous verbal approval and "approval" means approval in writing, including as aforesaid.

Singular and Plural.

(2) Words importing the singular only also include the plural and vice versa where the context requires.

Headings or Notes.

(3) The headings and marginal notes in these Conditions of Contract shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or of the Contract.

Cost.

(4) The word "cost" shall be deemed to include overhead costs whether on or off the Site.

ENGINEER AND ENGINEER'S REPRESENTATIVE

Duties and Powers of Engineer and Engineer's Representative.

2. (1) The Engineer shall carry out such duties in issuing decisions, certificates and orders as are specified in the Contract.

(2) The Engineer's Representative shall be responsible to the Engineer and his duties are to watch and supervise the Works and to test and examine any materials to be used or workmanship employed in connection with the Works. He shall have no authority to relieve the Contractor of any of his duties or obligations under the Contract nor, except as expressly provided hereunder or elsewhere in the Contract, to order any work involving delay or any extra payment by the Employer, nor to make any variation of or in the Works.

The Engineer may from time to time in writing delegate to the Engineer's Representative any of the powers and authorities vested in the Engineer and shall furnish to the Contractor and to the Employer a copy of all such written delegations of powers and authorities. Any written instruction or approval given by the Engineer's Representative to the Contractor within the terms of such delegation, but not otherwise, shall bind the Contractor and the Employer as though it had been given by the Engineer. Provided always as follows:

- (a) Failure of the Engineer's Representative to disapprove any work or materials shall not prejudice the power of the Engineer thereafter to disapprove such work or materials and to order the pulling down, removal or breaking up thereof.
- (b) If the Contractor shall be dissatisfied by reason of any decision of the Engineer's Representative he shall be entitled to refer the matter to the Engineer, who shall thereupon confirm, reverse or vary such decision.
- (3) Notwithstanding the provisions of sub-clause (1) and (2) of this Clause, if, in the opinion of the Engineer or the Engineer's Representative, an emergency occurs affecting the safety of life or of the Works or of adjoining property, they

direct the Contractor to carry out all such work or to do all such things as may be necessary in the opinion of the Engineer or the Engineer's Representative to abate or reduce the risk. The Contractor shall forthwith comply without appeal with any such direction of the Engineer or the Engineer's Representative.

ASSIGNMENT AND SUB-LETTING

Assignment. 3. The Contractor shall not assign the Contract or any part thereof, or any benefit or interest therein or thereunder, otherwise than by a charge in favor of the Contractor's bankers of any monies due or to become due under this Contract, without the prior written consent of the Employer.

Sub-letting. 4. The Contractor shall not sub-let the whole of the Works. Except where otherwise provided by the Contract, the Contractor shall not sub-let any part of the Works without the prior written consent of the Engineer, which shall not be unreasonably withheld, and such consent, if given, shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any sub-contractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen. Provided always that the provision of labor on a piece work basis shall not be deemed to be a sub-letting under this Clause. It shall be the duty of the Contractor, if so required by the Engineer, to furnish to the Engineer all particulars as to any sub-contractor employed or to be employed on the Works.

CONTRACT DOCUMENTS

Language. 5. (1) The English language shall be the ruling language of the Contract and shall be used in all correspondence and matters relating to the Contract.

Weights and Measures. (2) The metric system of weights and measures shall be used, except as may otherwise be approved in writing by the Engineer.

Law. (3) The Contract is subject to and shall be construed in accordance with the laws of the Republic of Indonesia.

Extent of Contract. (4) The Contract comprises the construction, completion and warranty of the Works and the provision of all labor, materials, Constructional Plant, Temporary Works and everything else, whether of a temporary or permanent nature, required in and for such construction, completion and warranty so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

Documents Mutually Explanatory. (5) Except if and to the extent otherwise provided by the Contract, the provisions of the Conditions of Contract shall prevail over those of any other document forming part of the Contract. Subject to the foregoing, the several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer who shall thereupon issue to the Contractor instructions thereon. Provided always that if, in the opinion of the Engineer, compliance with any such instructions shall involve the Contractor in any cost, which by reason of any such ambiguity or discrepancy could not reasonably have been foreseen by the Contractor, the Engineer shall certify and the Employer shall pay such additional sum as may be reasonable to cover such costs.

- Custody of Drawings. 6. (1) The Drawings shall remain the sole custody of the Engineer, but two copies thereof shall be furnished to the Contractor free of charge. The Contractor shall provide and make at his own expense any further copies required by him. At the completion of the Contract the Contractor shall return to the Engineer all Drawings provided under the Contract.
- One Copy of Drawings to be Kept on Site. (2) One copy of the Drawings, furnished to the Contractor as aforesaid, shall be kept by the Contractor on the Site and the same shall at all reasonable times be available for inspection and use by the Engineer and the Engineer's Representative and by any other person authorized by the Engineer in writing.
- Disruption of Progress. (3) The Contractor shall give written notice to the Engineer whenever planning or progress of the Works is likely to be delayed or disrupted unless any further drawing or order, including a direction, instruction or approval, is issued by the Engineer within a reasonable time. The notice shall include details of the drawing or order required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late.
- Delays and Cost of Delay of Drawings. (4) If, by reason of any failure or inability of the Engineer to issue within a time reasonable in all the circumstances any drawing or order requested by the Contractor in accordance with sub-clause (3) of this Clause, the Contractor suffers delay and/or incurs costs then the Engineer shall take such delay into account in determining any extension of time to which the Contractor is entitled under Clause 44 hereof and the Contractor shall be paid the amount of such cost as shall be reasonable.
- Further Drawings and Instructions. 7. (1) The Engineer shall have full power and authority to supply to the Contractor from time to time, during the progress of the Works, such further drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and maintenance of the Works. The Contractor shall carry out and be bound by the same.
- Working Drawings. (2) The Contractor shall submit in duplicate to the Engineer for approval all Working Drawings which may be required in connection with the Contract, and any change or modification therein which the Engineer shall consider desirable shall be made and the work executed accordingly without entailing extra payment to the Contractor therefor. Three sets of copies of such approved Drawings shall be furnished to the Engineer at an early date after approval if required by the Engineer.
- Temporary Work Drawings. (3) The Contractor shall submit for approval and supply copies of drawings of the Temporary Works as required by the Engineer or by the Engineer's Representative.
- As-Built Drawings. (4) When the Works are completed, the Contractor shall prepare the As-Built Drawings from the Drawings used for executing the Works in accordance with the instructions of the Engineer and submit the original of the As-built Drawings and two copies thereof to the Engineer.
- Alteration After Approval. (5) Should it be found, at any time after approval has been given by the Engineer to any Drawings submitted by the Contractor, that the said Drawings do not comply with the terms and conditions of the Contract or that the details do not agree with any Drawings submitted previously such alterations and additions as may be deemed necessary by the Engineer shall be made therein by the Contractor and the work carried out accordingly without entailing extra payment to the Contractor therefor.

GENERAL OBLIGATIONS

- Contractor's General Responsibilities.** 8. (1) The Contractor shall, subject to the provisions of the Contract, and with due care and diligence, execute and maintain the Works and provide all labor, including the supervision thereof, materials, Constructional Plant and all other things, whether of a temporary or permanent nature, required in and for such execution and maintenance, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.
- (2) The Contractor shall take full responsibility for the adequacy stability and safety of all site operations and methods of construction, provided that the Contractor shall not be responsible, except as may be expressly provided in the Contract, for the design or specification of the Permanent Works, or for the design or specification of any Temporary Works prepared by the Engineer.
- Contract Agreement.** 9. The Contractor shall when called upon so to do enter into and execute a Contract Agreement, to be prepared and completed at the cost of the Employer, in the form annexed with such modification as may be necessary.
- Performance Bond.** 10. The Contractor shall before the signing of the Contract Agreement submit Performance Bond in a sum equal to ten percent of the Contract Price for the due performance of the Contract. The Performance Bond shall consist of a bank guarantee to be made through a bank acceptable to the Government of Indonesia. The terms of the Bond shall be as the form attached hereto and shall be in form and substance and in all other respects satisfactory to the Employer. The obtaining of such guarantee and the cost of the Bond to be so entered into shall be at the expense in all respects of the Contractor. The Bond shall be returned to the Contractor with the Maintenance Certificate to be issued in accordance with Clause 62 hereof.
- The Contractor may, in lieu of the specified bank guarantee substitute one hundred percent Performance Bond in conformity with the Guide Form shown in the Invitation to Bid and issued by a bonding company or companies or other sureties recognized by and acceptable to the Government of Indonesia.
- Inspection of Site.** 11. The Contractor shall be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself, so far as is practicable, before submitting his Bid, as to the form and nature thereof, including the sub-surface conditions, the hydrological and climatic conditions, the extent and nature of work and materials necessary for the completion of the Works, the means of access to the Site and the accommodation he may require and, in general, shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Bid.
- Sufficiency of Bid.** 12. The Contractor shall be deemed to have satisfied himself before bidding as to the correctness and sufficiency of his Bid for the Works and of prices stated in the priced Bill of Quantities which Bid prices shall, except insofar as it is otherwise provided in the Contract, cover all his obligations under the Contract and all matters and things necessary for the proper execution and maintenance of the Works.
- Adverse Physical Conditions and Artificial Obstructions.** If, however, during the execution of the Works the Contractor shall encounter physical conditions could, in his opinion, not have been reasonably foreseen by an experienced contractor, the Contractor shall forthwith give written notice thereof to the Engineer's Representative and if, in the opinion of the Engineer, such conditions or artificial obstructions could not have been reasonably foreseen by an experienced

contractor, then the Engineer shall certify and the Employer shall pay the additional cost to which the Contractor shall have been put by reason of such conditions, including the proper and reasonable cost

- (a) of complying with any instruction which the Engineer may issue to the Contractor in connection therewith, and
- (b) of any proper and reasonable measures approved by the Engineer which the Contractor may take in the absence of specific instructions from the Engineer,

as a result of such conditions obstructions being encountered.

Work to be to the Satisfaction of Engineer.

13. Save insofar as it is legally or physically impossible, the Contractor shall execute and maintain the Works in strict accordance with the Contract to the satisfaction of the Engineer and shall comply with and adhere strictly to the Engineer's instructions and directions on any matter whether mentioned in the Contract or not, touching or concerning the Works. The Contractor shall take instructions and directions only from the Engineer or, subject to the limitations referred to in Clause 2 hereof, from the Engineer's Representative.

Program to be Furnished.

14. (1) The Contractor shall, within fifteen days after the signing of the Contract Agreement, submit to the Engineer for his approval a program showing the order of procedure by CPM-Network in which he proposes to carry out the Works. The Contractor shall whenever required by the Engineer or Engineer's Representative, also provide in writing for his information a general description of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works.

(2) If at any time it should appear to the Engineer that the actual progress of the Works does not conform to the approved program referred to in sub-clause (1) of this Clause, the Contractor shall produce, at the request of the Engineer, a revised program showing the modifications to the approved program necessary to ensure completion of the Works within the time for completion as defined in Clause 43 hereof.

(3) The submission to and approval by the Engineer or Engineer's Representative of such programs or the furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

Contractor's Superintendence.

15. The Contractor shall give or provide all necessary superintendence during the execution of the Works and as long thereafter as the Engineer may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor, or a competent and authorized agent or representative approved of in writing by the Engineer, which approval may at any time be withdrawn, is to be constantly on the Works and shall give his whole time to the superintendence of the same. If such approval shall be withdrawn by the Engineer, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as hereinafter mentioned, after receiving written notice of such withdrawal, remove the agent from the Works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another agent approved by the Engineer. Such authorized agent or representative shall receive, on behalf of the Contractor, directions and instructions from the Engineer or subject to the limitations of Clause 2 hereof, the Engineer's Representative.

Contractor's Employees.

16. (1) The Contractor shall provide and employ on the Site in connection with the execution and maintenance of the Works

(a) only such technical assistant as are skilled and experienced in their respective callings and such sub-agents, foremen and leading hands as are competent to give proper supervision to the work they are required to supervise, and

(b) such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution and maintenance of the Works.

(2) The Engineer shall be at liberty to object to and require the Contractor to remove forthwith from the Works any person employed by the Contractor in or about the execution or maintenance of the Works who, in the opinion of the Engineer, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose employment is otherwise considered by the Engineer to be undesirable and such person shall not be again employed upon the Works without the written permission of the Engineer. Any person so removed from the Works shall be replaced as soon as possible by a competent substitute approved by the Engineer.

Setting-out.

17. The Contractor shall be responsible for the true and proper setting-out of the Works in relation to control point, bench marks, route and profile instructed by the Engineer in writing and for the correctness, subject as above mentioned, of the position, levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labor in connection therewith. If, at any time during the progress of the Works, any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required so to do by the Engineer or the Engineer's Representative, shall, at his own cost, rectify such error to the satisfaction of the Engineer or the Engineer's Representative, unless such error is based on incorrect data supplied in writing by the Engineer or the Engineer's Representative, in which case the expense of rectifying the same shall be borne by the Employer. The checking of any setting-out or of any line or level by the Engineer or the Engineer's Representative shall not in any way relieve the Contractor of his responsibility for the correctness thereof and the Contractor shall carefully protect and preserve all bench-marks, sight-rails, pegs and other things used in setting-out the Works.

**Boreholes and
Exploratory
Excavation.**

18. If, at any time during the execution of the Works, the Engineer shall require the Contractor to make boreholes or to carry out exploratory excavation, such requirement shall be ordered in writing and shall be deemed to be an addition ordered under the provisions of Clause 51 hereof, unless a provisional sum in respect of such anticipated work shall have been included in the Bill of Quantities.

**Watching and
Lighting.**

19. The Contractor shall in connection with the Works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required by the Engineer or the Engineer's Representative, or by any duly constituted authority, for the protection of the works, or for the safety and convenience of the public or others.

Care of Works.

20. (1) From the commencement of the Works until the date stated in the Certificate of Completion for the whole of the Works pursuant to Clause 48 hereof the Contractor shall take full responsibility for the care thereof. Provided that if the Engineer shall issue a Certificate of Completion in respect of any part of the Permanent Works the Contractor shall cease to be liable for the care of that part of the Permanent Works from the date stated in the Certificate of Completion in respect of that part and the responsibility for the care of any outstanding work which he shall have undertaken to finish during the Period of Maintenance until such outstanding work is completed. In case any damage, loss or injury shall happen to the Works, or to any part thereof, from any cause whatsoever, save and except the excepted risks as

defined in sub-clause (2) of this Clause, while the Contractor shall be responsible for the care thereof the Contractor shall, at his own cost, repair and make good the same, so that at completion the Permanent Works shall be in good order and condition and in conformity in every respect with the requirements of the Contract and the Engineer's instructions. In the event of any such damage, loss or injury happening from any of the excepted risks, the Contractor shall, if and to the extent required by the Engineer and subject always to the provisions of Clause 65 hereof, repair and make good the same as aforesaid at the cost of the Employer. The Contractor shall also be liable for any damage to the Works occasioned by him in the course of any operations carried out by him for the purpose of completing any outstanding work or complying with his obligations under Clauses 49 or 50 hereof.

Excepted Risks.

(2) The "excepted risks" are war, hostilities (whether war be declared or not), invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, or unless solely restricted to employees of the Contractor or of his sub-contractors and arising from the conduct of the Works, riot, commotion or disorder, or use or occupation by the Employer of any part of the Permanent Works, or a cause solely due to the Engineer's design of the Works, or ionizing radiations or contamination by radio-activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive, nuclear assembly or nuclear component thereof, pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds, or any such operation of the forces of nature as an experienced contractor could not foresee, or reasonably make provision for or insure against all of which are herein collectively referred to as "the excepted risks".

Insurance of Works, etc.

21. Without limiting his obligations and responsibilities under Clause 20 hereof, the Contractor shall insure in the joint names of the Employer and the Contractor against all loss or damage from whatever cause arising, other than the excepted risks, for which he is responsible under the terms of the Contract and in such manner that the Employer and Contractor are covered for the period stipulated in Clause 20(1) hereof and are also covered during the Period of Maintenance for loss or damage arising from a cause, occurring prior to the commencement of the Period of Maintenance, and for any loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with his obligations under Clause 49 and 50 hereof:

- (a) The Works for the time being executed to the estimated current contract value thereof, together with the materials for incorporation in the Works at their replacement value.
- (b) The Constructional Plant and other things brought on to the Site by the Contractor to the replacement value of such Constructional Plant and other things.

Such insurance shall be effected with an insurer and in terms approved by the Employer, which approval shall not be unreasonably withheld, and the Contractor shall, whenever required, produce to the Engineer or the Engineer's Representative the policy or policies of insurance and the receipts for payment of the current premiums.

Damage to Persons and Property.

22. (1) The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the Employer against all losses and claims in respect of injuries or damage to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance

of the Works and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation or damages for or with respect to:

- (a) The permanent use or occupation of land by the Works or any part thereof.
- (b) The right of the Employer to execute the Works or any part thereof on, over, under, in or through any land.
- (c) Injuries or damage to persons or property which are the unavoidable result of the execution or maintenance of the Works in accordance with the Contract.
- (d) Injuries or damage to persons or property resulting from any act or neglect of the Employer, his agents, servants or other contractors, not being employed by the Contractor, or for or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the Contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the Employer, his servants or agents or other contractors for the damage or injury.

**Indemnity
by Employer.**

(2) The Employer shall indemnify the Contractor against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the proviso to sub-clause (1) of this Clause.

**Third Party
Insurance.**

23. (1) Before commencing the execution of the Works the Contractor, but without limiting his obligations and responsibilities under Clause 22 hereof, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property, including that of the Employer, or to any person, including any employee of the Employer, by or arising out of the execution of the Works or in the carrying out of the Contract, otherwise than due to the matters referred to in the proviso to Clause 22 (1) hereof.

**Minimum
Amount of
Third Party
Insurance.**

(2) Such insurance shall be effected with an insurer and in terms approved by the Employer, which approval shall not be unreasonably withheld, and for at least the amount approved by the Employer. The Contractor shall, whenever required, produce to the Engineer or the Engineer's Representative the policy or policies of insurance and the receipts for payment of the current premiums.

**Provision to
Indemnify
Employer.**

(3) The terms shall include a provision whereby, in the event of any claim in respect of which the Contractor would be entitled to receive indemnity under the policy being brought or made against the Employer, the insurer will indemnify the Employer against such claims and any costs, charges and expenses in respect thereof.

**Accident or
Injury to
Workmen.**

24. (1) The Employer shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or any sub-contractor, save and except an accident or injury resulting from any act or default of the Employer, his agents, or servants. The Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation, save and except as aforesaid, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

Insurance against Accident, etc., to Workmen. (2) The Contractor shall insure against such liability with an insurer approved by the Employer, which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any persons are employed by him on the Works and shall, when required, produce to the Engineer or the Engineer's Representative such policy of insurance and the receipt for payment of the current premium. Provided always that, in respect of any persons employed by any sub-contractor, the Contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy, but the Contractor shall require such sub-contractor to produce to the Engineer or the Engineer's Representative, when required, such policy of insurance and the receipt for the payment of the current premium.

Remedy on Contractor's Failure to Insure. 25. If the Contractor shall fail to effect and keep in force the insurances referred to in Clauses 21, 23 and 24 hereof, or any other insurance which he may be required to effect under the terms of the Contract, then and in any such case the Employer may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the Employer as aforesaid from any monies due or which may become due to the Contractor, or recover the same as a debt due from the Contractor.

Giving of Notices and Payment of Fees. 26. (1) Except for the right-of-way acquisition which will be furnished and paid by the Employer, the Contractor shall give all notices and pay all fees required to be given or paid by any National or State Statute, Ordinance, or other Law, or any regulation, or bye-law of any local or other duly constituted authority in relation to the execution of the Works and by the rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works.

Compliance with Statutes, Regulations, etc. (2) The Contractor shall conform in all respects with the provisions of any such Statute, Ordinance or Law as aforesaid and the regulations or bye-laws of any local or other duly constituted authority which may be applicable to the Works and with such rules and regulations of public bodies and companies as aforesaid and shall keep the Employer indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance or Law, regulation or bye-law.

(3) The Employer will repay or allow to the Contractor all such sums as the Engineer shall certify to have been properly payable and paid by the Contractor in respect of such fees.

Fossils, etc. 27. All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site of the Works shall as between the Employer and the Contractor be deemed to be the absolute property of the Employer. The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing or damaging any such article or thing and shall immediately upon discovery thereof and, before removal, acquaint the Engineer's Representative of such discovery and carry out, at the expense of the Employer, the Engineer's Representative's orders as to the disposal of the same.

Patent Rights and Royalties. 28. The Contractor shall save harmless and indemnify the Employer from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any Constructional Plant, machine work, or material used for or in connection with the Works or any of them and from and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. Except where

otherwise specified, the Contractor shall pay all tonnage and other royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the Works or any of them.

**Interference
With Traffic
and Adjoining
Properties.**

29. All operations necessary for the execution of the Works shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with the convenience of the public, or the access to, use and occupation of public or private roads and footpaths to or of properties whether in the possession of the Employer or of any other person. The Contractor shall conduct his operations so as to offer the least possible obstruction to maintaining flow in irrigation canals, channels and water-courses which must be maintained without interruption. The Contractor shall observe all rules and regulations of appropriate authorities regarding the interruption and maintenance of flow in irrigation canals, channels and water-courses. The Contractor shall conduct his operations, make necessary arrangements, take suitable precaution and perform all required work incidental to the protection of and avoidance of interference with power transmission and other utilities within the areas of his operations in connection with this Contract and the cost therefore shall be borne by the Contractor. The Contractor shall save harmless and indemnify the Employer in respect of all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of, or in relation to, any such matters in so far as the Contractor is responsible therefor.

**Extraordinary
Traffic.**

30. (1) The Contractor shall use very reasonable means to prevent any of the highways or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of his sub-contractors and, in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of plant and material from and to the Site shall be limited, as far as reasonably possible, and so that no unnecessary damage or injury may be occasioned to such highways and bridges.

Special Loads.

(2) Should it be found necessary for the Contractor to move one or more loads of Constructional Plant, machinery or pre-constructed units or parts of units of work over part of a highway or bridge, the moving whereof is likely to damage any highway or bridge unless special protection or strengthening is carried out, then the Contractor shall before moving the load on to such highway or bridge give notice to the Engineer or Engineer's Representative of the weight and other particulars of the load to be moved and his proposals for protecting or strengthening the said highway or bridge. Unless within fourteen days of the receipt of such notice the Engineer shall by counter-notice direct that such protection or strengthening is unnecessary, then the Contractor will carry out such proposals or any modification thereof that the Engineer shall require and, unless there is an item or are items in the Bill of Quantities for pricing by the Contractor of the necessary works for the protection or strengthening aforesaid, the costs thereof shall be paid by the Employer to the Contractor.

**Settlement of
Extraordinary
Traffic Claims.**

(3) If during the execution of the Works or at any time thereafter the Contractor shall receive any claim arising out of the execution of the Works in respect of damage or injury to highways or bridges he shall immediately report the same to the Engineer and thereafter the Employer shall negotiate the settlement of and pay all sums due in respect of such claim and shall indemnify the Contractor in respect thereof and in respect of all claims, proceedings, damages, costs, charges and expenses in relation thereto. Provided always that if and so far as any such claims or part thereof shall in the opinion of the Engineer be due to any failure on

the part of the Contractor to observe and perform his obligations under sub-clause (1) and (2) of this Clause, then the amount certified by the Engineer to be due to such failure shall be paid by the Contractor to the Employer.

Opportunities
for other
Contractors.

31. The Contractor shall, in accordance with the requirements of the Engineer, afford all reasonable opportunities for carrying out their work to any other contractors employed by the Employer and their workmen and to the workmen of the Employer and of any other duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the Works. If, however, the Contractor shall, on the written request of the Engineer or the Engineer's Representative, make available to any such other contractor, or to the Employer or any such authority, any roads or ways for the maintenance of which the Contractor is responsible, or permit the use by any such of the Contractor's scaffolding or other plant on the Site, or provide any other service of whatsoever nature for any such, the Employer shall pay to the Contractor in respect of such use or service such sum or sums as shall, in the opinion of the Engineer, be reasonable.

Contractor
to Keep
Site Clear.

32. During the progress of the Works the Contractor shall keep the Site reasonably free from all unnecessary obstruction and shall store or dispose of any Constructional Plant and surplus materials and clear away and remove from the Site any wreckage, rubbish or Temporary works no longer required.

Clearance of
Site on
Completion.

33. On the completion of the Works the Contractor shall clear away and remove from the Site all Constructional Plant, surplus materials, rubbish and Temporary Works of every kind, and leave the whole of the Site and Works clean and in a workmanlike condition to the satisfaction of the Engineer.

LABOR

Engagement of
Labor.

34. (1) The Contractor shall make his own arrangements for the engagement of all labor, and, according to "Manpower Regulations in Indonesia Guidance for Foreign Investors" (Labor Legislation, Republic of Indonesia - by Juridical Bureau Department of Manpower), for the transport, housing, payment and all other allowance thereof.

Supply of
Water.

(2) The Contractor shall, so far as is reasonably practicable, having regard to local conditions, provide on the Site, to the satisfaction of the Engineer's Representative, an adequate supply of drinking and other water for the use of the Contractor's staff and work people.

Alcoholic Liquor
or Drugs.

(3) The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor, or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his sub-contractors, agents or employees.

Arms and
Ammunition.

(4) The Contractor shall not give, barter or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

Festivals and
Religious
Customs.

(5) The Contractor shall in all dealings with labors in his employment have due regard to all recognized festivals, days of rest and religious or other customs.

Epidemics. (6) In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.

Disorderly Conduct, etc. (7) The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees and for the preservation of peace and protection of persons and property in the neighbourhood of the Works against the same.

Observance by Sub-Contractors. (8) The Contractor shall be responsible for observance by his sub-contractors of the foregoing provisions.

Other Conditions Affecting Labor and Wages. (9) The Contractor shall also take steps to acquaint himself and conform with all the other labor regulations as may be issued from time to time by the Department of Manpower or other authorities concerned.

Returns of Labor, etc. 35. The Contractor shall, if required by the Engineer, deliver to the Engineer's Representative, or at his office, a return in detail in such form and at such intervals as the Engineer may prescribe showing the supervisory staff and the numbers of the several classes of labor from time to time employed by the Contractor on the Site and such information respecting Constructional Plant as the Engineer's Representative may require.

MATERIALS AND WORKMANSHIP

Quality of Materials and Workmanship and Tests. 36. (1) All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with the Engineer's instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places. The Contractor shall provide such assistance, instruments, machines, labor and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used and shall supply samples of materials before incorporation in the Works for testing as may be selected and required by the Engineer.

Cost of Samples. (2) All samples shall be supplied by the Contractor at his own cost if the supply thereof is clearly intended by or provided for in the Contract, but if not, then at the cost of the Employer.

Cost of Tests. (3) The cost of making any test shall be borne by the Contractor if such test is clearly intended by or provided for in the Contract and, in the cases only of a test under load or of a test to ascertain whether the design of any finished or partially finished work is appropriate for the purposes which it was intended to fulfill, is particularized in the Contract in sufficient detail to enable the Contractor to price or allow for the same in his Bid.

Cost of Tests not Provided for, etc. (4) If any test is ordered by the Engineer which is either
(a) not so intended by or provided for, or

- (b) (in the cases above mentioned) is not so particularized, or
- (c) though so intended or provided for is ordered by the Engineer to be carried out by an independent person at any place other than the Site or the place of manufacture or fabrication of the materials tested,

then the cost of such test shall be borne by the Contractor, if the test shows the workmanship or materials not to be in accordance with the provisions of the Contract or the Engineer's instructions, but otherwise by the Employer.

Inspection of Operations.

37. The Engineer and any person authorized by him shall at all times have access to the Works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the Works and the Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

Examination of Work before Covering up.

38. (1) No work shall be covered up or put out of view without the approval of the Engineer or the Engineer's Representative and the Contractor shall afford full opportunity for the Engineer or the Engineer's Representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Contractor shall give due notice to the Engineer's Representative whenever any such work or foundations is or are ready or about to be ready for examination and the Engineer's Representative shall, without unreasonably delay, unless he considers it unnecessary and advise the Contractor accordingly, attend for the purpose of examining and measuring such work or of examining such foundations.

Uncovering and Making Openings.

(2) The Contractor shall uncover any part or parts of the Works or make openings in or through the same as the Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Engineer. If any such part or parts have been covered up or put out of view after compliance with the requirement of sub-clause (1) of this Clause and are found to be executed in accordance with the Contract, the expenses of uncovering, making openings in or through, reinstating and making good the same shall be borne by the Employer, but in any other case all costs shall be borne by the Contractor.

Removal of Improper Work and Materials.

39. (1) The Engineer shall during the progress of the Works have power to order in writing from time to time

- (a) the removal from the Site, within such time or times as may be specified in the order, of any materials which, in the opinion of the Engineer, are not in accordance with the Contract.
- (b) the substitution of proper and suitable materials and
- (c) the removal and proper re-execution, notwithstanding any previous test thereof or interim payment therefor, of any work which in respect of materials or workmanship is not, in the opinion of the Engineer, in accordance with the Contract.

Default of Contractor in Compliance.

(2) In case of default on the part of the Contractor in carrying out such order, the Employer shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any monies due or which may become due to the Contractor.

Suspension
of Work.

40. (1) The Contractor shall, on the written order of the Engineer, suspend the progress of the Works or any part thereof for such time or times and in such manner as the Engineer may consider necessary and shall during such suspension properly protect and secure the work, so far as is necessary in the opinion of the Engineer. The extra cost incurred by the Contractor in giving effect to the Engineer's instructions under this Clause shall be borne and paid by the Employer unless such suspension is

- (a) otherwise provided for in the Contract, or
- (b) necessary by reason of some default on the part of the Contractor, or
- (c) necessary by reason of climatic conditions on the Site, or
- (d) necessary for the proper execution of the Works or for the safety of the Works or any part thereof insofar as such necessity does not arise from any act or default by the Engineer or the Employer or from any of the excepted risks defined in Clause 20 hereof.

Provided that the Contractor shall not be entitled to recover any such extra cost unless he gives written notice of his intention to claim to the Engineer within twenty-eight days of the Engineer's order. The Engineer shall settle and determine such extra payment and/or extension of time under Clause 44 hereof to be made to the Contractor in respect of such claim as shall, in the opinion of the Engineer, be fair and reasonable.

Suspension
Lasting more
Than 90 days.

(2) If the progress of the Works or any part thereof is suspended on the written order of the Engineer and if permission to resume work is not given by the Engineer within a period of ninety days from the date of suspension then, unless such suspension is within paragraph (a), (b), (c) or (d) of sub-clause (1) of this Clause, the Contractor may serve a written notice on the Engineer requiring permission within twenty-eight days from the receipt thereof to proceed with the Works, or that part thereof in regard to which progress is suspended and, if such permission is not granted within that time, the Contractor by a further written notice so served may, but is not bound to, elect or treat the suspension where it affects part only of the Works as an omission of such part under Clause 51 hereof, or where it affects the whole Works, as an abandonment of the Contract by the Employer.

COMMENCEMENT TIME AND DELAYS

Commencement
of Works.

41. The Contractor shall commence the Works on Site within the period named in the Letter of Acceptance after the receipt by him of a written order to this effect from the Engineer and shall proceed with the same with due expedition and without delay, except as may be expressly sanctioned or ordered by the Engineer, or be wholly beyond the Contractor's control.

Possession
of Site.

42. (1) Save insofar as the Contract may prescribe, the extent of portions of the Site of which the Contractor is to be given possession from time to time and the order in which such portions shall be made available to him and, subject to any requirement in the Contract as to the order in which the Works shall be executed, the Employer will, with the Engineer's written order to commence the Works, give to the Contractor possession of so much of the Site as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the program referred to in Clause 14 hereof, and otherwise in accordance with such reasonable proposals of the Contractor as he shall, by written notice to the

Engineer, make and will, from time to time as the Works proceed, give to the Contractor possession of such further portions of the Site as may be required to enable the Contractor to proceed with the execution of the Works with due dispatch in accordance with the said program or proposals, as the case may be. If the Contractor suffers delay or incurs cost from failure on the part of the Employer to give possession in accordance with the terms of this Clause, the Engineer shall grant an extension of time for the completion of the Works and certify such sum as, in his opinion, shall be fair to cover the cost incurred, which sum shall be paid by the Employer.

Wayleaves, etc. (2) The Contractor shall bear all costs and charges for special or temporary wayleaves required by him in connection with access to the Site. The Contractor shall also provide at his own cost any additional accommodation outside the Site required by him for the purpose of the Works.

Furnishing of Right-of-Way and Removal of Obstruction. (3) The Employer will be responsible for obtaining at his own expense all necessary Right-of-Way in advance of construction. Except if and to the extent otherwise provided by the Contract, the Employer will clear away and remove from the Right-of-Way all such unnecessary obstruction as buildings, houses, towers of power transmission lines, telephone and electric poles, lines and cables, gas, water supply and drainage pipes and other utility cables which interfere with the proper execution of the Works prior to giving to the Contractor possession thereof.

If, during the execution of the Works, the Contractor discovers inside the Right-of-Way any such obstruction which shall, in his opinion, be removed and replaced, the Contractor shall forthwith give written notice thereof to the Engineer's Representative and if, in the opinion of the Engineer, such obstruction shall be removed and replaced, then the Engineer shall direct the Contractor or other persons to remove and replace the same at the expense of the Employer.

Times for Completion. 43. Subject to any requirement in the Contract as to completion of any section of the Works before completion of the whole, the whole of the Works shall be completed, in accordance with the provisions of Clause 48 hereof, within the time stated in the Contract calculated from the last day of the period named in the Letter of Acceptance as that within which the Works are to be commenced, or such extended time as may be allowed under Clause 44 hereof.

Extension of Time for Completion. 44. Should the amount of extra or additional work of any kind or any cause of delay referred to in these Conditions, or exceptional adverse climatic conditions, or other special circumstances of any kind whatsoever which may occur, other than through a default of the Contractor, be such as fairly to entitle the Contractor to an extension of time for the completion of the Works, the Engineer shall determine the amount of such extension and shall notify the Employer and the Contractor accordingly. Provided that the Engineer is not bound to take into account any extra or additional work or other special circumstances unless the Contractor has within twenty-eight days after such work has been commenced, or such circumstances have arisen, or as soon thereafter as is practicable, submitted to the Engineer's Representative full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

No Night or Sunday Work. 45. Subject to any provision to the contrary contained in the Contract, none of the Permanent Works shall, save as hereinafter provided, be carried on during the night or on Sundays, if locally recognized as days of rest, or their locally recognized equivalent without the permission in writing of the Engineer's Representative, except when the work is unavoidable or absolutely necessary for the saving of life or

property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer's Representative. Provided always that the provisions of this Clause shall not be applicable in the case of any work which it is customary to carry out by rotary or double shifts.

The Engineer will not withhold permission for night, Sunday or official holiday work provided that he is satisfied with the Contractor's arrangements for compliance with Clauses 19 and 29 of the Conditions of Contract. All work at night shall be carried out without unreasonable noise and disturbance. The Contractor shall indemnify the Employer from and against any liability for damages on account of noise or other disturbance created while or in carrying out the work and from and against all claims, demands, proceedings, costs, charges and expenses whatsoever in regard or in relation to such liability.

Rate of Progress.

46. If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the Works or any section is at any time, in the opinion of the Engineer, too slow to ensure completion by the prescribed time or extended time for completion, the Engineer shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as are necessary and the Engineer may approve to expedite progress so as to complete the Works or such section by the prescribed time or extended time. The Contractor shall not be entitled to any additional payment for taking such steps. If, as a result of any notice given by the Engineer under this Clause, the Contractor shall seek the Engineer's permission to do any work at night or on Sundays, if locally recognized as days of rest, or their locally recognized equivalent, such permission shall not be unreasonably refused.

Liquidated Damages for Delay.

47. (1) If the Contractor shall fail to achieve completion of the Works within the time prescribed by Clause 43 hereof, then the Contractor shall pay to the Employer the sum equivalent to zero point zero three percent of the original Contract Price up to maximum five percent of the same as liquidated damages for such default and not as a penalty for every day or part of a day which shall elapse between the time prescribed by Clause 43 hereof and the date of certified completion of the Works. The Employer may, without prejudice to any other method of recovery, deduct the amount of such damages from any monies in his hands, due or which may become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works, or from any other of his obligations and liabilities under the Contract.

Reduction of Liquidated Damages.

(2) If, before the completion of the whole of the Works any part or section of the works has been certified by the Engineer as completed, pursuant to Clause 48 hereof, and occupied or used by the Employer, the liquidated damages for delay shall, for any period of delay after such certificate and in the absence of alternative provisions in the Contract be reduced in the proportion which the value of the part or section so certified bears to the value of the whole of the Works.

Certification of Completion of Works.

48. (1) When the whole of the Works have been substantially completed and have satisfactorily passed any final test that may be prescribed by the Contract, the Contractor may give a notice to that effect to the Engineer or to the Engineer's Representative accompanied by an undertaking to finish any outstanding work during the Period of Maintenance. Such notice and undertaking shall be in writing and shall be deemed to be a request by the Contractor for the Engineer to issue a Certificate of Completion in respect of the Works. The Engineer shall, within twenty-one days of the date of delivery of such notice either issue to the Contractor, with a copy to the Employer, a Certificate of Completion stating the date on which, in his opinion, the Works were substantially completed in accordance with the Contract or give instructions in writing to the Contractor specifying all the work which, in the

Engineer's opinion, requires to be done by the Contractor before the issue of such Certificate. The Engineer shall also notify the Contractor of any defects in the Works affecting substantial completion that may appear after such instructions and before completion of the works specified therein. The Contractor shall be entitled to receive such Certificate of Completion within twenty-one days of completion to the satisfaction of the Engineer of the works so specified and making good any defects so notified.

**Certification
of Completion
by Stages.**

(2) Similarly, in accordance with the procedure set out in sub-clause (1) of this Clause, the Contractor may request and the Engineer shall issue a Certificate of Completion in respect of:

- (a) any section of the Permanent Works in respect of which a separate time for completion is provided in the Contract and
- (b) any substantial part of the Permanent Works which has been both completed to the satisfaction of the Engineer and occupied or used by the Employer.

(3) If any part of the Permanent Works shall have been substantially completed and shall have satisfactorily passed any final test that may be prescribed by the Contract, the Engineer may issue a Certificate of Completion in respect of that part of the Permanent Works before completion of the whole of the Works and, upon the issue of such Certificate, the Contractor shall be deemed to have undertaken to complete any outstanding work in that part of the Works during the Period of Maintenance.

(4) Provided always that a Certificate of Completion given in respect of any section or part of the Permanent Works before completion of the whole shall not be deemed to certify completion of any ground or surfaces requiring reinstatement, unless such Certificate shall expressly so state.

MAINTENANCE AND DEFECTS

**Definition of
'Period of
Maintenance'.**

49. (1) In these Conditions the expression "Period of Maintenance" shall mean the period of maintenance for one year, calculated from the date of completion of the Works, certified by the Engineer in accordance with Clause 48 hereof, or in the event of more than one certificate having been issued by the Engineer under the said Clause, from the respective dates so certified and in relation to the Period of Maintenance the expression "the Works" shall be construed accordingly.

**Execution of
Work of
Repair, etc.**

(2) To the intent that the Works shall at or as soon as practicable after the expiration of the Period of Maintenance be delivered to the Employer in the condition required by the Contract, fair wear and tear excepted, to the satisfaction of the Engineer, the Contractor shall finish the work, if any, outstanding at the date of completion, as certified under Clause 48 hereof, as soon as practicable and making good defects, imperfections, shrinkages or other faults as may be required of the Contractor in writing by the Engineer during the Period of Maintenance, or within fourteen days after its expiration, as a result of an inspection made by or on behalf of the Engineer prior to its expiration.

**Cost of
Execution of
Repair, etc.**

(3) All such work shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the Engineer, be due to the use of materials or workmanship not in accordance with the Contract, or to neglect or failure on the part of the Contractor to comply with any obligation, expressed or

implied, on the Contractor's part under the Contract. If, in the opinion of the Engineer, such necessity shall be due to any other cause, the value of such work shall be ascertained and paid for as if it were additional work.

Remedy on
Contractor's
Failure to
carry out
Work Required.

(4) If the Contractor shall fail to do any such work as aforesaid required by the Engineer, the Employer shall be entitled to employ and pay other persons to carry out the same and if such work is work which, in the opinion of the Engineer, the Contractor was liable to do at his own expense under the Contract, then all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any monies due or which may become due to the Contractor.

Contractor
to Search.

50. The Contractor shall, if required by the Engineer in writing, search under the directions of the Engineer for the cause of any defect, imperfection or fault appearing during the progress of the Works or in the Period of Maintenance. Unless such defect, imperfection or fault shall be one for which the Contractor is liable under the Contract, the cost of the work carried out by the Contractor in searching as aforesaid shall be borne by the Employer. If such defect, imperfection or fault shall be one for which the Contractor is liable as aforesaid, the cost of the work carried out in searching as aforesaid shall be borne by the Contractor and he shall in such case repair, rectify and make good such defects, imperfection or fault at his own expense in accordance with the provision of Clause 49 hereof.

ALTERATIONS, ADDITIONS AND OMISSIONS

Variations.

51. (1) The Engineer shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion be desirable, he shall have power to order the Contractor to do and the Contractor shall do any of the following:

- (a) increase or decrease the quantity of any work included in the Contract,
- (b) omit any such work,
- (c) change the character or quality or kind of any such work,
- (d) change the levels, lines, position and dimensions of any part of the works,
and
- (e) execute additional work of any kind necessary for the completion of the Works

and no such variation shall in any way vitiate or invalidate the Contract, but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract Price.

Orders for
Variations to
be in Writing.

(2) No such variations shall be made by the Contractor without an order in writing of the Engineer. Provided that no order in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an order given under this Clause, but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities. Provided also that if for any reason the Engineer shall consider it desirable to give any such order verbally, the Contractor shall comply with such order and any confirmation in writing of such verbal order given by the Engineer, whether before or

after the carrying out of the order, shall be deemed to be an order in writing within the meaning of this Clause. Provided further that if the Contractor shall within seven days confirm in writing to the Engineer and such confirmation shall not be contradicted in writing within fourteen days by the Engineer, it shall be deemed to be an order in writing by the Engineer.

Valuation of Variations.

52. (1) All extra or additional work done or work omitted by order of the Engineer shall be valued at the prices set out in the Contract if, in the opinion of the Engineer, the same shall be applicable. If the Contract does not contain any prices applicable to the extra or additional work, then suitable prices shall be agreed upon between the Engineer and the Contractor. In the event of disagreement the Engineer shall fix such prices as shall, in his opinion, be reasonable and proper.

Power of Engineer to Fix Rates.

(2) Provided that if the nature or amount of any omission or addition relative to the nature or amount of the whole of the Works or to any part thereof shall be such that, in the opinion of the Engineer, the price contained in the Contract for any item of the Works is, by reason of such omission or addition, rendered unreasonable or inapplicable, then a suitable prices shall be agreed upon between the Engineer and the Contractor. In the event of disagreement the Engineer shall fix such other price as shall, in his opinion, be reasonable and proper having regard to the circumstances.

Provided also that no increase or decrease under sub-clause (1) of this Clause or variation of price under sub-clause (2) of this Clause shall be made unless, as soon after the date of the order as is practicable and, in the case of extra or additional work, before the commencement of the work or as soon thereafter as is practicable, notice shall have been given in writing:

- (a) by the Contractor to the Engineer of his intention to claim extra payment or a varied price, or
- (b) by the Engineer to the Contractor of his intention to vary a price.

Variations Exceeding 10 per cent

(3) If, on certified completion of the whole of the Works it shall be found that a reduction or increase greater than ten per cent of the sum named in the Letter of Acceptance, excluding all fixed sums, and allowance for dayworks, if any, results from:

- (a) the aggregate effect of all Variation Orders, and
- (b) all adjustments upon measurement of the estimated quantities set out in the Bill of Quantities, excluding all provisional sums, dayworks and adjustments of price made under Clause 70(1) hereof,

but not from any other cause, the amount of the Contract Price shall be adjusted by such sum as may be agreed between the Contractor and the Engineer or, failing agreement, fixed by the Engineer having regard to all material and relevant factors, including the Contractor's site and general overhead costs of the Contract.

Daywork.

(4) The Engineer may, if, in his opinion it is necessary or desirable, order in writing that any additional or substituted work shall be executed on a daywork basis. The Contractor shall then be paid for such work at the prices agreed upon between the Engineer and the Contractor.

The Contractor shall furnish to the Engineer such receipts or other vouchers as may be necessary to prove the amounts paid and, before ordering materials, shall submit to the Engineer quotations for the same for his approval.

In respect of all work executed on a daywork basis, the Contractor shall, during the continuance of such work, deliver each day to the Engineer's Representative an exact list in duplicate of the names, occupation and time of all workmen employed on such work and a statement, also in duplicate, showing the description and quantity of all materials and plant used thereon or therefor. One copy of each list and statement will, if correct, or when agreed, be signed by the Engineer's Representative and returned to the Contractor.

At the end of each month the Contractor shall deliver to the Engineer's Representative a priced statement of the labor, material and plant used and the Contractor shall not be entitled to any payment unless such lists and statements have been fully and punctually rendered. Provided always that if the Engineer shall consider that for any reason the sending of such lists or statements by the Contractor, in accordance with the foregoing provision, was impracticable he shall nevertheless be entitled to authorize payment for such work, either as daywork, on being satisfied as to the time employed and plant and materials used on such work, or at such value therefor as shall, in his opinion, be fair and reasonable.

Claims.

(5) The Contractor shall send to the Engineer's Representative once in every month an account giving particulars, as full and detailed as possible, of all claims for any additional payment to which the contractor may consider himself entitled and of all extra or additional work ordered by the Engineer which he has executed during the preceding month.

No final or interim claim for payment for any such work or expense will be considered which has not been included in such particulars. Provided always that the Engineer shall be entitled to authorize payment to be made for any such work or expense, notwithstanding the Contractor's failure to comply with this condition, if the Contractor has, at the earliest practicable opportunity, notified the Engineer in writing that he intends to make a claim for such work.

PLANT, TEMPORARY WORKS AND MATERIALS

Plant, etc.,
Exclusive Use
for the Works.

53. (1) All Constructional Plant, Temporary Works and materials provided by the Contractor shall, when brought on to the site, be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof, except for the purpose of moving it from one part of the Site to another, without the consent, in writing, of the Engineer, which shall not be unreasonably withheld.

Removal of
Plant, etc.

(2) Upon completion of the Works the Contractor shall remove from the Site all the said Constructional Plant and Temporary Works remaining thereon and any unused materials provided by the Contractor.

Employer not
Liable for
Damage to Plant,
etc.

(3) The Employer shall not at any time be liable for the loss of or damage to any of the said Constructional Plant, Temporary Works or materials save as mentioned in Clauses 20 and 65 hereof.

Re-export of Plant. (4) In respect of any Constructional Plant which the Contractor shall have imported for the purposes of the Works, the Employer will assist the Contractor, where required, in procuring any necessary Government consent to the re-export of such Constructional Plant by the Contractor upon the removal thereof as aforesaid.

Customs Clearance. (5) The Employer will assist the Contractor, where required, in obtaining clearance through the Customs of Constructional Plant, materials and other things required for the Works.

Approval of Materials, etc., not implied. 54. The operation of Clause 53 hereof shall not be deemed to imply any approval by the Engineer of the materials or other matters referred to therein nor shall it prevent the rejection of any such materials at any time by the Engineer.

MEASUREMENT

Quantities. 55. The quantities set out in the Bill of Quantities are the estimated quantities of the work, but they are not to be taken as the actual and correct quantities of the Works to be executed by the Contractor in fulfilment of his obligations under the Contract.

Works to be Measured. 56. All works acceptably completed shall be measured by the Contractor and the measurements shall be checked and approved by the Engineer. The Engineer shall be present and supervise such measurement. The Contractor shall prepare records and drawings of the measurements of the Permanent Work which shall be submitted to the Engineer for approval. If after examination of such records and drawings the Engineer withholds his approval of them, the Engineer and the Contractor shall retake the measurements using the Contractor's equipment and personnel. In the event of further disagreement concerning the measurement the decision of the Engineer shall be final.

Method of Measurement. 57. The measurement of the Works shall be performed on the basis of the Specification, If they exceed the measurements indicated in the Specification and Drawings including the Working Drawings, such excess shall be on the personal account of the Contractor and he shall not be entitled to any compensation therefore. But if they are less than the measurements indicated in the Specification and Drawings including the Working Drawings, then the Works actually executed shall be measured, provided they are technically acceptable and there is no provision to the contrary in any other part of the Contract Documents.

PROVISIONAL SUMS

Definition of "Provisional Sums." 58. (1) "Provisional Sum" means a sum included in the Contract and so designated in the Bill of Quantities for the execution of work or the supply of goods, materials, or services, or for contingencies, which sum may be used, in whole or in part, or not at all, at the direction and discretion of the Engineer. The Contract Price shall include only such amounts in respect of the work, supply or services to which such Provisional Sums relate as the Engineer shall approve or determine in accordance with this Clause.

Use of
Provisional
Sums.

- (2) In respect of every Provisional Sum the Engineer shall have power to order:
- (a) Work to be executed, including goods, materials or services to be supplied by the Contractor. The Contract Price shall include the value of such work executed or such goods, materials or services supplied determined in accordance with Clause 52 hereof
 - (b) Work to be executed or goods, materials or services to be supplied by a nominated Sub-Contractor as hereinafter defined. The sum to be paid to the Contractor therefor shall be determined and paid in accordance with Clause 59 (4) hereof.
 - (c) Goods and materials to be purchased by the Contractor. The sum to be paid to the Contractor therefor shall be determined and paid in accordance with Clause 59(4) hereof.

Production of
Vouchers, etc.

- (3) The Contractor shall, when required by the Engineer, produce all quotations, invoices, vouchers and accounts or receipts in connection with expenditure in respect of Provisional Sums.

NOMINATED SUB-CONTRACTORS

Definition of "Nominated Sub-Contractors." 59. (1) All specialists, merchants, tradesmen and others executing any work or supplying any goods, materials or services for which Provisional Sums are included in the Contract, who may have been or be nominated or selected or approved by the Employer or the Engineer, and all persons to whom by virtue of the provisions of the Contract the Contractor is required to sub-let any work shall, in the execution of such work or the supply of such goods, materials or services, be deemed to be sub-contractors employed by the Contractor and are referred to in this Contract as "nominated Sub-Contractors".

Nominated
Sub-Contractors;
Objection to
Nomination.

- (2) The Contractor shall not be required by the Employer or the Engineer or be deemed to be under any obligation to employ any nominated Sub-Contractor against whom the Contractor may raise reasonable objection, or who shall decline to enter into a sub-contract with the Contractor containing provisions:

- (a) that in respect of the work, goods, materials or services the subject of the sub-contract, the nominated Sub-Contractor will undertake towards the Contractor the like obligations and liabilities as are imposed on the Contractor towards the Employer by the terms of the Contract and will save harmless and indemnify the Contractor from and against the same and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection therewith, or arising out of or in connection with any failure to perform such obligations or to fulfill such liabilities, and
- (b) that the nominated Sub-Contractor will save harmless and indemnify the Contractor from and against any negligence by the nominated Sub-Contractor, his agents, workmen and servants and from and against any misuse by him or them of any Constructional Plant or Temporary Works provided by the Contractor for the purposes of the Contract and from all claims as aforesaid.

Design Requirements to be Expressly Stated.

(3) If in connection with any Provisional Sum the services to be provided include any matter of design or specification of any part of the Permanent Works or of any equipment or plant to be incorporated therein, such requirement shall be expressly stated in the Contract and shall be included in any nominated Sub-Contract. The nominated Sub-Contract shall specify that the nominated Sub-Contractor providing such services will save harmless and indemnify the Contractor from and against the same and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in connection with any failure to perform such obligations or to fulfill such liabilities.

Payments to Nominated Sub-Contractors.

(4) For all work executed or goods, materials, or service supplied by any nominated Sub-Contractor, there shall be included in the Contract Price:

- (a) the actual price paid or due to be paid by the Contractor, on the direction of the Engineer, and in accordance with the Sub-Contract;
- (b) the sum, if any, entered in the Bill of Quantities for labor supplied by the Contractor in connection therewith, or if ordered by the Engineer pursuant to Clause 58 (2) (b) hereof, as may be determined in accordance with Clause 52 hereof;
- (c) in respect of all other charges and profit, a sum being a percentage rate of the actual price paid or due to be paid calculated, where provision has been made in the Bill of Quantities for a rate to be set against the relevant Provisional Sum, at the rate inserted by the Contractor against that item or, where no such provision has been made, at the rate inserted by the Contractor in the Appendix to the Bid and repeated where provision for such is made in a special item provided in the Bill of Quantities for such purpose.

Certification of Payments to Nominated Sub-Contractors.

(5) Before issuing, under Clause 60 hereof, any certificate, which includes any payment in respect of work done or goods, materials or services supplied by any nominated Sub-Contractor, the Engineer shall be entitled to demand from the Contractor reasonable proof that all payments, less retentions, included in previous certificates in respect of the work or goods, materials or services of such nominated Sub-Contractor have been paid or discharged by the Contractor, in default whereof unless the Contractor shall

- (a) inform the Engineer in writing that he has reasonable cause for withholding or refusing to make such payments and
- (b) produce to the Engineer reasonable proof that he has so informed such nominated Sub-Contractor in writing,

the Employer shall be entitled to pay to such nominated Sub-Contractor direct, upon the certificate of the Engineer, all payments, less retentions, provided for in the Sub-Contract, which the Contractor has failed to make to such nominated Sub-Contractor and to deduct by way of set-off the amount so paid by the Employer from any sums due or which may become due from the Employer to the Contractor.

Provided always that, where the Engineer has certified and the Employer has paid direct as aforesaid, the Engineer shall in issuing any further certificate in favor of the Contractor deduct from the amount thereof the amount so paid, direct as aforesaid, but shall not withhold or delay the issue of the certificate itself when due to be issued under the terms of the Contract.

Assignment of
Nominated
Sub-Contractors'
Obligations.

(6) In the event of a nominated Sub-Contractor, as hereinbefore defined, having undertaken towards the Contractor in respect of the work executed, or the goods, materials or services supplied by such nominated Sub-Contractor, any continuing obligation extending for a period exceeding that of the Period of Maintenance under the Contract, the Contractor shall at any time, after the expiration of the Period of Maintenance, assign to the Employer, at the Employer's request and cost, the benefit of such obligation for the unexpired duration thereof.

CERTIFICATES AND PAYMENT

Monthly
Payment.

60. (1) The Employer shall pay to the Contractor the Contract Price named in the Letter of Acceptance at monthly intervals, subject to additions or deductions in accordance with the Contract.

Monthly
Certificate
and Payment.

(2) Based on the approved records and drawings of measurements set forth in Clause 56 hereof, the Engineer shall, at the end of each month, prepare a Monthly Certificate of work completed. The Monthly Certificate which is signed by the Engineer and the Contractor shall be submitted to the Employer for approval within the tenth day of the following month. The employer shall review the Certificate and if the same is found accurate and in compliance with the Contract, then the Employer shall pay to the Contractor ninety-five percent of the approved certificate amount less any amount which the Employer is entitled to deduct therefrom in terms of Contract including taxes and charges pursuant to the laws and regulations of the Republic of Indonesia. Such payment shall be made within sixty days after receipt of the Certificate by the Employer.

Overdue
Interest.

(3) In the event of failure by the Employer to pay to the Contractor the amount due in accordance with the terms of Contract, the Contractor may, from the date after the same shall have become due, charge the Employer interest at the rate of banking interest of the Bank Indonesia.

Payment of
Track Materials.

(4) Rails and accessories, turnouts, fastenings, prestressed concrete and wooden sleepers, ballast, buffer stoppers and railroad signs exclusively intended for the execution of the Works, when already on the Site, shall, on the written request by the Contractor, be included by the Engineer in the Monthly Certificate and be paid accordingly, provided always that the above materials comply with all the conditions of the Contract Documents.

Final
Payment.

(5) Upon issuance by the Engineer of the Certificate of Completion, the Engineer and the Contractor shall together take measurements and make preparation of the Final Certificate of the Works completed. The Final Certificate which is signed by the Engineer and the Contractor shall be submitted to the Employer for approval. The Employer shall, within sixty days of receipt of such Certificate, pay to the Contractor all approved amount remaining due including the aggregate of all amounts retained by the Employer from previous progress payments.

Payment
Currencies
and Percentage
of Foreign
Currency.

(6) All payments to the Contractor shall be made in the Rupiah currency of Indonesia and US dollars in compliance with the Conditions of Contract.

Percentage of the US dollars shall be fixed at the time of Contract, provided that such percentage shall not exceed seventy percent of the Contract Price.

**Advance
Payment.**

(7) As an advance payment of a portion of the Contract Price, the Employer shall pay to the Contractor the amount of twenty percent of the original Contract Price against a bank guarantee through a bank acceptable to the Government of Indonesia. Such payment shall be made within ninety days of issuance of the written order to commence the Works.

The advance payment shall be repaid to the Employer by the Contractor by deducting from each Monthly Certificate twenty five per cent of the net amount otherwise due and payable under the Monthly Certificate, starting from the third Monthly Certificate until the entire amount of the advance has been repaid. Any outstanding amount of advance payment not repaid prior to completion of the Works shall be deducted from the final payment. The Contractor may reduce from time to time his bank guarantee to an amount equal to or exceeding the amount of the advance payment still outstanding as of the last Monthly Certificate paid by the Employer. The advance shall be exempted from the payment of interest.

**Approval only
by Maintenance
Certificate.**

61. No certificate other than the Maintenance Certificate referred to in Clause 62 hereof shall be deemed to constitute approval of the Works.

**Maintenance
Certificate.**

62. (1) The Contract shall not be considered as completed until a Maintenance Certificate shall have been signed by the Engineer and delivered to the Employer stating that the Works have been completed and maintained to his satisfaction. The Maintenance Certificate shall be given by the Engineer within twenty-eight days after the expiration of the Period of Maintenance, or, if different periods of maintenance shall become applicable to different section or parts of the Works, the expiration of the latest such period, or as soon thereafter as any works ordered during such period, pursuant to Clauses 49 and 50 hereof, shall have been completed to the satisfaction of the Engineer and full effect shall be given to this Clause, notwithstanding any previous entry on the Works or the taking possession, working or using thereof or any part thereof by the Employer.

**Cessation of
Employer's
Liability.**

(2) The Employer shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contract or the execution of the Works, unless the Contractor shall have made a claim in writing in respect thereof before the giving of the Maintenance Certificate under this Clause.

**Unfulfilled
Obligations.**

(3) Notwithstanding the issue of the Maintenance Certificate the Contractor and, subject to sub-clause (2) of this Clause, the Employer shall remain liable for the fulfilment of any obligation incurred under the provisions of the Contract prior to the issue of the Maintenance Certificate which remains unperformed at the time such Certificate is issued and, for the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties hereto.

REMEDIES AND POWERS

**Default of
Contractor.**

63. (1) If the Contractor shall become bankrupt, or have a receiving order made against him, or shall present his petition in bankruptcy, or shall make an arrangement with or assignment in favor of his creditors, or shall agree to carry out the Contract under a committee of inspection of his creditors or, being a corporation, shall go into liquidation (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or if the Contractor shall assign the

Contract, without the consent in writing of the Employer first obtained, or shall have an execution levied on his goods, or if the Engineer shall certify in writing to the Employer that in his opinion the Contractor:

- (a) has abandoned the Contract, or
- (b) without reasonable excuse has failed to commence the Works or has suspended the progress of the Works for twenty-eight days after receiving from the Engineer written notice to proceed, or
- (c) has failed to remove materials from the Site or to pull down and replace work for twenty-eight days after receiving from the Engineer written notice that the said materials or work had been condemned and rejected by the Engineer under these conditions, or
- (d) despite previous warnings by the Engineer, in writing, is not executing the Works in accordance with the Contract, or is persistently or flagrantly neglecting to carry out his obligations under the Contract, or
- (e) has, to the detriment of good workmanship, or in defiance of the Engineer's instructions to the contrary, sub-let any part of the Contract

then the Employer may, after giving fourteen days' notice in writing to the Contractor, enter upon the Site and the Works and expel the Contractor therefrom without thereby voiding the Contract, or releasing the Contractor from any of his obligations or liabilities under the Contract, or affecting the rights and powers conferred on the Employer or the Engineer by the Contract, and may himself complete the Works or may employ any other contractor to complete the Works. The Employer or such other contractor may use for such completion so much of the Constructional Plant, Temporary Works and materials, which have been deemed to be reserved exclusively for the execution of the Works, under the provisions of the Contract, as he or they may think proper, and the Employer may, at any time, sell any of the said Constructional Plant, Temporary Works and unused materials and apply the proceeds of sale in or towards the satisfaction of any sums due or which may become due to him from the Contractor under the Contract.

Valuation at
Date of
Forfeiture.

(2) The Engineer shall, as soon as may be practicable after any such entry and expulsion by the Employer, fix and determine ex parte, or by or after reference to the parties, or after such investigation or enquiries as he may think fit to make or institute, and shall certify what amount, if any, had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract and the value of any of the said unused or partially used materials, any Constructional Plant and any Temporary Works.

Payment after
Forfeiture.

(3) If the Employer shall enter and expel the Contractor under this Clause, he shall not be liable to pay to the Contractor any money on account of the Contract until the expiration of the Period of Maintenance and thereafter until the costs of execution and maintenance, damages for delay in completion, if any, and all other expenses incurred by the employer have been ascertained and the amount thereof certified by the Engineer. The Contractor shall then be entitled to receive only such sum or sums, if any, as the Engineer may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Contractor on due completion by

him, then the Contractor shall, upon demand, pay to the Employer the amount of such excess and it shall be deemed a debt due by the Contractor to the Employer and shall be recoverable accordingly.

Urgent
Repairs.

64. If, by reason of any accident, or failure, or other event occurring to in or in connection with the Works, or any part thereof, either during the execution of the Works, or during the Period of Maintenance, any remedial or other work or repair shall, in the opinion of the Engineer or the Engineer's Representative, be urgently necessary for the safety of the Works and the Contractor is unable or unwilling at once to do such work or repair, the Employer may employ and pay other persons to carry out such work or repair as the Engineer or the Engineer's Representative may consider necessary. If the work or repair so done by the Employer is work which, in the opinion of the Engineer, the Contractor was liable to do at his own expense under the Contract, all expenses properly incurred by the Employer in so doing shall be recoverable from the Contractor by the Employer, or may be deducted by the Employer from any monies due or which may become due to the Contractor. Provided always that the Engineer or the Engineer's Representative, as the case may be, shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof in writing.

SPECIAL RISKS

65. Notwithstanding anything in the Contract contained:

No Liability
for War, etc.,
Risks.

(1) The Contractor shall be under no liability whatsoever whether by way of indemnity or otherwise for or in respect of destruction of or damage to the Works, save to work condemned under the provisions of Clause 39 hereof prior to the occurrence of any special risk hereinafter mentioned, or to property whether of the Employer or third parties, or for or in respect of injury or loss of life which is the consequence of any special risk as hereinafter defined. The Employer shall indemnify and save harmless the Contractor against and from the same and against and from all claims, proceedings, damages, costs, charges and expenses whatsoever arising thereout or in connection therewith.

Damage to
Works, etc., by
Special Risks.

(2) If the Works or any materials on or near or in transit to the Site, or any other property of the Contractor used or intended to be used for the purposes of the Works, shall sustain destruction or damage by reason of any of the said special risks the Contractor shall be entitled to payment for:

- (a) any permanent work and for any materials so destroyed or damaged, and, so far as may be required by the Engineer, or as may be necessary for the completion of the Works, on the basis of cost plus such profit as the Engineer may certify to be reasonable;
- (b) replacing or making good any such destruction or damage to the Works;
- (c) replacing or making good such materials or other property of the Contractor used or intended to be used for the purposes of the Works.

Projectile,
Missile, etc.

(3) Destruction, damage, injury or loss of life caused by the explosion or impact whenever and wherever occurring of any mine, bomb, shell, grenade, or other projectile, missile, munition, or explosive of war, shall be deemed to be a consequence of the said special risks.

Increased Costs
arising from
Special Risks.

(4) The Employer shall repay to the Contractor any increased cost of or incidental to the execution of the Works, other than such as may be attributable to the cost of reconstructing work condemned under the provisions of Clause 39 hereof, prior to the occurrence of any special risk, which is howsoever attributable to or consequent on or the result of or in any way whatsoever connected with the said special risks, subject however to the provisions in this Clause hereinafter contained in regard to outbreak of war, but the Contractor shall as soon as any such increase of cost shall come to his knowledge forthwith notify the Engineer thereof in writing.

Special Risks.

(5) The special risks are war, hostilities (whether war be declared or not), invasion, act of foreign enemies, the nuclear and pressurewaves risk described in Clause 20 (2) hereof, or insofar as it relates to the country in which the Works are being or are to be executed or maintained, rebellion, revolution, insurrection, military or usurped power, civil war, or, unless solely restricted to the employees of the Contractor or of his Sub-Contractors and arising from the conduct of the Works, riot, commotion or disorder.

Outbreak of
War.

(6) If, during the currency of the Contract, there shall be an outbreak of war, whether war is declared or not, in any part of the world which, whether financially or otherwise, materially affects the execution of the Works, the Contractor shall, unless and until the Contract is terminated under the provisions of this Clause, continue to use his best endeavours to complete the execution of the Works. Provided always that the Employer shall be entitled at any time after such outbreak of war to terminate the Contract by giving written notice to the Contractor and, upon such notice being given, this Contract shall, except as to the rights of the parties under this Clause and to the operation of Clause 67 hereof, terminate, but without prejudice to the rights of either party in respect of any antecedent breach thereof.

Removal of
Plant on
Termination.

(7) If the Contract shall be terminated under the provisions of the last preceding sub-clause, the Contractor shall, with all reasonable dispatch, remove from the Site all Constructional Plant and shall give similar facilities to his Sub-Contractors to do so.

Payment if
Contract
Terminated.

(8) If the Contract shall be terminated as aforesaid, the Contractor shall be paid by the Employer, insofar as such amounts or items shall not have already been covered by payments on account made to the Contractor, for all work executed prior to the date of termination at the prices provided in the Contract and in addition:

- (a) The amounts payable in respect of any preliminary items, so far as the work or service comprised therein has been carried out or performed, and a proper proportion as certified by the Engineer of any such items, the work or service comprised in which has been partially carried out or performed.
- (b) The cost of materials or goods reasonably ordered for the Works which shall have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery, such materials or goods becoming the property of the Employer upon such payments being made by him.
- (c) A sum to be certified by the Engineer, being the amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the Works insofar as such expenditure shall not have been covered by the payments in this sub-clause before mentioned.
- (d) Any additional sum payable under the provisions of sub-clauses (1), (2) and (4) of this Clause.

- (e) The reasonable cost of removal of Constructional Plant under sub-clause (7) of this Clause and, if required by the Contractor, return thereof to the Contractor's main plant yard in his country of registration or to other destination, at no greater cost.
- (f) The reasonable cost of repatriation of all the Contractor's staff and workmen employed on or in connection with the Works at the time of such termination.

Provided always that against any payments due from the Employer under this sub-clause, the Employer shall be entitled to be credited with any outstanding balances due from the Contractor for advances in respect of Constructional Plant and materials and any other sums which at the date of termination were recoverable by the Employer from the Contractor under terms of the Contract.

FRUSTRATION

Payment in
Event of
Frustration.

66. If a war, or other circumstances outside the control of both parties, arises after the Contract is made so that either party is prevented from fulfilling his contractual obligations, or under the law governing the Contract, the parties are released from further performance, then the sum payable by the Employer to the Contractor in respect of the work executed shall be the same as that which would have been payable under Clause 65 hereof if the Contract had been terminated under the provisions of Clause 65 hereof.

SETTLEMENT OF DISPUTES

Settlement of
Disputes—
Arbitration.

67. If any dispute or difference of any kind whatsoever shall arise between the Employer and the Contractor or the Engineer and the Contractor in connection with, or arising out of the Contract, or the execution of the Works, whether during the progress of the Works or after their completion and whether before or after the termination, abandonment or breach of the Contract, it shall, in the first place, be referred to and settled by the Engineer who shall, within a period of ninety days after being requested by either party to do so, give written notice of his decision to the Employer and the Contractor. Subject to arbitration, as hereinafter provided, such decision in respect of every matter so referred shall be final and binding upon the Employer and the Contractor and shall forthwith be given effect to by the Employer and by the Contractor, who shall proceed with the execution of the Works with all due diligence whether he or the Employer requires arbitration, as hereinafter provided, or not. If the Engineer has given written notice of his decision to the Employer and the Contractor and no claim to arbitration has been communicated to him by either the Employer or the Contractor within a period of ninety days from receipt of such notice, the said decision shall remain final and binding upon the Employer and the Contractor. If the Engineer shall fail to give notice of his decision, as aforesaid, within a period of ninety days after being requested as aforesaid, or if either the Employer or the Contractor be dissatisfied with any such decision, then and in any such case either the Employer or the Contractor may within ninety days after receiving notice of such decision, or within ninety days after the expiration of the first-named period of ninety days, as the case may be, require that the matter or matters in dispute be referred to arbitration as hereinafter provided. All disputes or differences in respect of which the decision, if any, of the Engineer has not become final and binding as aforesaid shall be finally settled under the Rules of Conciliation and Arbitration of the International Chamber of Commerce by one or more arbitrators appointed under such

Rules. The said arbitrator/s shall have full power to open up, revise and review any decision, opinion, direction, certificate or valuation of the Engineer. Neither party shall be limited in the proceedings before such arbitrator/s to the evidence or argument put before the Engineer for the purpose of obtaining his said decision. No decision given by the Engineer in accordance with the foregoing provisions shall disqualify him from being called as a witness and giving evidence before the arbitrator/s on any matter whatsoever relevant to the dispute or difference referred to the arbitrator/s as aforesaid. The reference to arbitration may proceed notwithstanding that the works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the Works.

NOTICES

Service of
Notices on
Contractor.

68. (1) All certificates, notices or written orders to be given by the Employer or by the Engineer to the Contractor under the terms of the Contract shall be served by sending by post to or delivering the same to the Contractor's principal place of business, or such other address as the Contractor shall nominate for this purpose.

Address of the Contractor's Site Office:

Service of
Notices on
Employer or
Engineer.

(2) All notices to be given to the Employer or to the Engineer under the terms of the Contract shall be served by sending by post or delivering the same to the respective address nominated for that purpose hereunder.

(a) To the Employer;

Departmen Perhubungan
Direktorat Jenderal Perhubungan Darat
Jl. Jenderal Sudirman No. P.59-60
Jakarta
Indonesia

(b) To the Engineer;

(Name)
(Address)

Change of
Address.

(3) Either party may change a nominated address to another address in the country where the Works are being executed by prior written notice to the other party and the Engineer may do so by prior written notice to both parties.

DEFAULT OF EMPLOYER

Default of
Employer.

69. (1) In the event of the Employer:

(a) failing to pay to the Contractor the amount due under any certificate of the Engineer within thirty days after the same shall have become due under the terms of the Contract, subject to any deduction that the Employer is entitled to make under the Contract, or

- (b) interfering with or obstructing or refusing any required approval to the issue of any such certificate, or
- (c) giving formal notice to the Contractor that for unforeseen reasons, due to economic dislocation, it is impossible for him to continue to meet his contractual obligations

the Contractor shall be entitled to terminate his employment under the Contract after giving fourteen days' prior written notice to the Employer, with a copy to the Engineer.

(2) Upon the expiry of the fourteen days' notice referred to in sub-clause (1) of this Clause, the Contractor shall, notwithstanding the provisions of Clause 53 (1) hereof, with all reasonable dispatch, remove from the Site all Constructional Plant brought by him thereon.

(3) In the event of such termination the Employer shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions of Clause 65 hereof, but, in addition to the payments specified in Clause 65 (8) hereof, the Employer shall pay to the Contractor the amount of any loss or damage to the Contractor arising out of or in connection with or by consequence of such termination.

CHANGES IN COSTS AND LEGISLATION

Changes in Costs.

70. (1) Adjustments to the unit price for unfinished works as of the end of the month preceding the month for which the adjustment is applied shall be made in respect of the work item for which the execution cost rises or falls significantly due to changes in the costs of labor, materials, fuel or equipment during the execution of the Works. The work items to be adjusted shall be only those specified hereunder.

Formulas to Compute Adjustment Coefficients.

(2) The adjustment shall be made in accordance with the following formulas, rounding the figure to two decimal places for the computation of adjustment coefficients:

New Unit Price = K (Adjustment Coefficient) x Initial Contract Unit Price

Adjustment coefficients shall be calculated by the following formulas:

Formula 1

$K_a = 0.24 + 0.01(L1/L_o) + 0.69(MF1/MF_o) + 0.01 (F1/F_o) + 0.05 (E1/E_o)$

Formula 2

$K_b = 0.24 + 0.14 (L1/L_o) + 0.18 (M1/M_o) + 0.12 (MF1/MF_o) + 0.01 (F1/F_o) + 0.31 (E1/E_o)$

Formula 3

$K_c = 0.24 + 0.04 (L1/L_o) + 0.29(M1/M_o) + 0.04 (F1/F_o) + 0.39 (E1/E_o)$

Formula 4

$$Kd = 0.24 + 0.13 (L1/Lo) + 0.04 (F1/Fo) + 0.59 (E1/Eo)$$

Formula 5

$$Ke = 0.24 + 0.59 (L1/Lo) + 0.02 (F1/Fo) + 0.15 (E1/Eo)$$

Where Ka, Kb, Kc, Kd and Ke are the adjustment coefficients which will be applied to the corresponding unit prices.

Lo, Fo, Mo, MFo and Eo are the indices corresponding to the costs of labor (Lo), fuel and lubricants (Fo), local material (Mo), imported material (MFo) and equipment (Eo) respectively, on the date one hundred eighty days after the date of opening the Bids.

L1, F1, M1, MF1 and E1 are the indices corresponding to the costs of labor (L1), fuel and lubricants (F1), local material (M1), imported material (MF1) and equipment (E1) respectively, as of the date of occurrence of cost.

Sources of Indices.

(3) The values of the indices shown in the formulas 1 through 5 are applicable as follows:

L = consumer price index for Jakarta, subsector general, published in the Indikator Ekonomi.

F = index of cost for high speed diesel fuel as established by the state owned Pertamina Oil Company for the Capital of Province where the largest part of the Works is performed.

E = wholesale price index for imported commodities for the group "fabricated metal products, machinery and equipment" as published in Indikator Ekonomi.

M = wholesale price index for construction materials in Indonesia, using the group most applicable to the item under consideration, as published in Indikator Ekonomi.

Groups to be used for the adjustment of material price are:

Ma = wholesale price index of construction materials (Asphalt)

Mc = wholesale price index of construction materials (Cement)

Mq = wholesale price index of construction materials (Quarrying)

Ms = wholesale price index of construction materials (Iron and Steel Basic Industries)

MF = wholesale price index for imported commodities for the group "Iron & Steel Basic Industries and Others" as published in Indikator Ekonomi.

The "Indikator Ekonomi" is the basic source for all indices except for fuel. This monthly statistical bulletin is published by the Biro Pusat Statistik, Jakarta, Indonesia.

If the method of establishing the indices, or if the basket of materials or items change, the Employer shall, in consultation with the Biro Pusat Statistik, Pertamina or other neutral bodies, establish, select or adjust the new indices to make them compatible with the initial indices.

If indices are not officially published on a daily basis, the indices to be used shall be those available which are closest to the relevant day.

The Employer shall collect all the necessary documents relative to the initial indices and the relevant changes and submit them to a Committee appointed by the Employer.

Application of Adjustment Coefficient and Material Component.

(4) The applicable adjustment coefficient and material component to be applied to the unit price which are subject to price adjustment are as follows:

<u>Adjustment Coefficient</u>	<u>Material Component</u>	<u>Pay Items subject to Price Adjustment</u>
Ka	MFs	1.01 a; 1.06 a, b, c; 1.07 a, b
Kb	Mc, MFs	1.04
Kc	MFq	1.08
Kd	-	3.01 a, b
Ke	-	3.02

Price Adjustment of Variations.

(5) The formulas set forth for the revision of unit prices due to changes in costs shall not subject to any variation under the provisions of Clause 51 and Clause 52 hereof. When appropriate prices during construction are agreed upon, between the Engineer and the Contractor in accordance with Clause 52, the adjustment of unit prices may also be applicable to the new prices if the Engineer decides that this is necessary.

Price Adjustment of Daywork.

(6) Daywork shall be subject to price adjustment in accordance with the procedures as stipulated in this Clause, except that as there shall be no separate adjustment for fuel this shall be considered to be included in the adjustment for equipment.

Price Adjustment for Delay of Works.

(7) If major differences, in the opinion of the Engineer, occur during the Contract Period between the Contractor's work program approved by the Engineer and the real progress of the Works, the Employer reserves the right to use the adjustment coefficients which would have been applied in an on-schedule execution.

If the Contractor shall fail to achieve completion of the Works within the time prescribed in Clause 43 hereof, the value of the revised prices relative to the works to be executed after such time shall not be greater than those adopted at the time of the completion date named in this Contract. Provided always that if the delay of the works is due to default on the part of the Employer the works executed during this period will continue to be subject to price adjustment in accordance with this Clause and the revised unit prices to be applied to the works executed during such period shall not be lower than those at the time of completion date prescribed in the Contract.

Preparation of Payment Revision Certificate.

(8) At the end of each month, using the data provided by the Employer and the Contractor, the Engineer shall prepare, together with the Monthly Certificate mentioned in Clause 60 hereof, a separate Payment Revision Certificate covering exclusively the price adjustments due to the application of the revised unit prices

under the supervision by the Committee appointed by the Employer. The preparation of the Payment Revision Certificate, and the manner and payment thereof, shall be the same as that of the Monthly Certificate.

The "date of occurrence of cost" means the month in which the Contractor is entitled to put the quantities in the Payment Revision Certificate. The Payment Revision Certificate will be considered provisional and the Final Payment Revision Certificate shall be prepared upon issuance by the Engineer of the Certificate of Completion.

The Payment Revision Certificate will be prepared at monthly intervals, however with a maximum delay of six months after occurrence of cost since relevant indices may not be available earlier.

**Subsequent
Legislation.**

(9) IF, after the date thirty days prior to the latest date for submission of bids for the Works there occur in the Republic of Indonesia changes to any National or State Statute, Ordinance, Decree or other Law or any regulation or by-law of any local or other duly constituted authority, or the introduction of any such Statute, Ordinance, Decree, Law, regulation or by-law which causes additional or reduced cost to the Contractor, other than under sub-clause (1) of this Clause, in the execution of the Works, such additional or reduced cost shall be certified by the Engineer and shall be paid by or credited to the Employer and the Contract Price adjusted accordingly.

CURRENCY AND RATES OF EXCHANGE

**Currency
Restrictions.**

71. If, after the date thirty days prior to the latest date for submission of bids for the Works the Government or authorized agency of the Government of Indonesia imposes currency restrictions and/or transfer of currency restrictions in relation to the currency or currencies in which the Contract Price is to be paid, the Employer shall reimburse any loss or damage to the Contractor arising therefrom, without prejudice to the right of the Contractor to exercise any other rights or remedies to which he is entitled in such event.

**Rate of
Exchange.**

72. (1) Any payment of the Contract Price to be made to the Contractor in US dollars in accordance with the provisions of the Contract shall not be subject to variations in the rate of exchange between the said currency and the Rupiah currency of Indonesia.

(2) The exchange rate applicable for calculating the payment in US dollars shall be the I/T selling rate of the Bank Indonesia on the date thirty days prior to the latest date for submission of bids for the Works as provided for in the Bid Documents.

(3) The proportions or amounts to be paid in US dollars in respect of Provisional Sum items shall be determined in accordance with the principles set forth in sub-clause (1) and (2) of this Clause as and when these sums are utilized in whole or in part in accordance with the provisions of Clauses 58 and 59 hereof.

**Income Tax,
etc.**

73. The Contractor and his personnel shall be liable for income tax and such other taxes, duties, contributions and other charges levied on all payments made to them under this Contract in accordance with the laws and regulations of the Republic of Indonesia.

The taxes and other duties and charges as aforesaid for which the Contractor and his personnel shall be liable will be stipulated in the Invitation to Bid or in a separate Addenda and Supplements of the Contract.

A P P E N D I X

FORM OF CONTRACT AGREEMENT

THIS AGREEMENT made the day of 19...
between
..... (hereinafter called "the Employer") of the one part and
..... (hereinafter called "the Contractor")
of the other part

WHEREAS the Employer is desirous that certain Works should be
executed, viz
..... and has accepted a Bid
by the Contractor for the execution, completion and maintenance
of such Works NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings and are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:
 - (a) Bid
 - (b) Conditions of Contract
 - (c) General Specifications
 - (d) Technical Specifications
 - (e) Drawings
 - (f) Priced Bill of Quantities
 - (g) Addenda and Supplements
 - (h) Letter of Acceptance.
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned the Contractor hereby covenants with the Employer to execute complete and maintain the Works in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution, completion and maintenance of the Works the Contract Price at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have affixed their signatures and seals as of the date aforesaid.

CONTRACTOR

GOVERNMENT OF THE REPUBLIC
OF INDONESIA

Name of Contractor

Director General
Departmen Perhubungan
Directorat Jenderal
Perhubungan Darat

Address of Contractor

Witness:

Witness:

FORM OF PERFORMANCE BOND

1. WHEREAS the Departmen Perhubungan, Direktorat Jenderal Perhubungan Darat, Republic of Indonesia (hereinafter called the "Government" has awarded a contract for the New Railway Line for Cengkareng Airport Construction Project, Package 3 to (name and address of Contractor) (hereinafter called the "Contractor").
2. WHEREAS the Contractor is bound by the said Contract to submit to the Government a Performance Bond for a total amount of
3. NOW We, the Undersigned, responsible and representative of the (name of Bank) in (address) (hereinafter called the "Bank") and fully authorized to sign and to incur obligation in the name of the Bank, hereby declare that the Bank will guarantee the Government the full amount of as stated above.
4. After the Contractor has signed the aforementioned contract with the Government the Bank is engaged to pay the aforementioned full amount upon written order from the Government to indemnify the Government for any liability of the Contractor.
5. The Bond is valid for a period of calendar months after the date of signature of the Contract.

IN WITNESS WHEREOF the authorized representative of the Bank has hereunto signed.

Guarantor:

Witness:

GENERAL SPECIFICATION

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PART C

GENERAL SPECIFICATIONS

GENERAL SPECIFICATION

1.0 PROJECT INFORMATION AND DATA

1.01 GENERAL

Information is contained herein on the subjects of environmental considerations and requirements, and safety requirements.

1.02 ENVIRONMENTAL CONSIDERATIONS

The Contractor shall construct the facility, such that none of its work has a detrimental impact upon the environment. This applies to the effect upon the residential community, adjacent industrial facilities and upon the area outside the Engineer Boundary.

Considerations shall be made to the following but not limited to:

- a. Use of clean fuels to minimize air polluting emissions.
- b. Control of sulphur dioxide and other air pollutions.
- c. Segregation of industrial and municipal wastewater.
- d. Reclamation of wastewater.
- e. Recovery and recycling of suitable materials.
- f. Control of vehicle noise.
- g. Control of noise form industrial and commercial facilities.
- h. Limitation of vibrations.
- i. Preservation of natural land to the extent possible.
- j. Preservation of archaeological sites.

1.03 INDUSTRIAL SAFETY

The Contractor shall incorporate in its construction work the Indonesian requirements for industrial safety, where applicable.

Area of interest to Indonesian Departments having jurisdiction include but are not limited to:

- a. Fire resistance of building materials.
- b. Spacing and isolation of high-risk facilities.
- c. Fire fighting systems.
- d. Stand-by fire water systems.
- e. Fire exists from structures.
- f. Electrical wiring and color coding.
- g. Dikes and drainage systems for flammable liquid.
- h. Fire alarm systems within facilities.
- i. Lightning protection system.
- j. Earthquake design criteria.
- k. Industrial safety.
- l. Operating manuals for safety-related systems.
- m. Communication system.
- n. Emergency power system.
- o. Security systems.

1.04 SIGNS

The primary language for Cengkareng Project is Indonesian, while the second language is English. Where both languages are required on a sign, label, instruction, name or other use, it shall be written so that the Indonesian text is above or to the right of the English text. All lettering shall be done in a correct and artistic form.

Both Indonesian and English shall be used for all signs where it is necessary to inform, warn or instruct the public. In addition, both languages shall be used to provide instruction for the operation of equipment necessary for the health, safety or welfare of the population.

Examples of informative bilingual signs are street signs, names of camps, or signs on tanks showing contents.

Examples of warning bilingual signs are signs showing high voltage, inflammable liquids, or warning of dangerous or hazardous driving conditions.

Examples of instructive signs are not marking signs, instructions for operation of fire-fighting equipment, or instructions for making emergency telephone calls.

2.0 REFERENCE CODES AND STANDARDS

GENERAL

Where the abbreviations listed below are used, the abbreviation shall make reference to the code, standard or publication listed herein, or published by the following organizations.

<u>Abbreviation</u>	<u>Code, Standard or Publication</u>
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Corporation
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
AREA	American Railway Engineers Association
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BS	British Standards
IEC	International Electrotechnical Commission
JIS	Japanese Industrial Standards
JEC	Japanese Electrotechnical Committee
JEM	Japanese Electrical Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturer
NFPA	National Fire Protection Association
SII	Standar Industri Indonesia

SPLN	Standar Perum Listrik Negara
UBC	Uniform Building Code
UIC	International Union of Railways (Union Internationale Des Chemin De Fer)
UL	Underwriter's Laboratories, Inc.

3.0 INDONESIAN PRODUCTS

Where applicable, the use of Indonesian products shall be made to the maximum extent provided that they meet basic standards of quality as established by the Engineer. If the Contractor judges the use of the products would be detrimental to the work, he shall report to the Authorized Representative, supported by a complete justification of this judgement, and await further instruction.

4.0 DRAWINGS AND DOCUMENTS

4.01 DRAWINGS

All drawings prepared by the Contractor shall be in compliance with the requirements of the Project.

Construction Contract Package drawings shall be submitted on A-1 size sheets only, unless otherwise expressly approved by the Engineer.

Drawings and specifications prepared by the Contractor shall include complete construction details. The drawings shall include, but not be limited to the following information or details as applicable: construction joints, bar bending details, details for unusual or special items for formwork, special trenching, structural steel detailing, architectural drawings for doors, window, hardware and schedules, piping isometrics and spool sheets, electrical connection schedule and wiring diagrams and bill of materials on drawings. All drawings submitted by Contractor shall be in the metric system.

Generally, the intent shall be that drawings shall be in such detail as to not require additional architecture/engineering to be performed.

Alphabetical revisions (A thru Z) shall be used for drawings until issued for construction. The first issue of a drawing for construction shall be designated as Revision 0 (Zero) and all subsequent revisions shall be designated in numerical order, 1, 2, 3, etc. Specific changes shall be clearly designated on the drawing with the revision number/letter shown in an adjacent triangle.

Review of Constructor's submitted drawings or documents by the Engineer shall not relieve the Contractor of any of its obligations to meet all the requirements of the Contractors nor relieve the Contractor of the responsibility for the correctness of such drawings and documents. The Contractor shall, at its expense, make any changes which are necessary to make the work conform to the provisions and intent of the Contract.

4.02 FABRICATION AND INSTALLATION DRAWINGS

Where drawings are required for fabrication of the Contractor furnished equipment, or installing the Contractor furnished material or equipment, or planning and performance of the work under the Contract, such drawings shall be provided by the Contractor and submitted to the Engineer for review.

These drawings shall include, but not be limited to shop fabrication detail drawings including details of welding match-marks, erection drawing and other details of such as field connections for proper installation, erection of the equipment and performance of the work. Approval of manufacturers detailed specification and catalogs shall be required for all equipment prior to shipment. The drawings of a specific piece of equipment shall identify components with the manufacturer's part number or reference drawing number clearly indicated. If reference drawings are used, the approval data of such drawings shall be included. The drawings shall indicate dimensions, maximum and minimum allowable operating tolerances on all major wear fits, i.e., rotating, reciprocating or intermittent sliding fits between shafts or submission of all drawings shall be such that all information is available for checking each drawing when it is received.

The Contractor shall furnish layout drawings verifying clearances with all piping and structures, prior to concrete placement or structure construction on all the Contractor furnished equipment.

The Contractor shall furnish rebar schedules.

4.03 AS-BUILT DRAWINGS

The Contractor shall supply the Engineer with an accurate set of As-Built Drawings. A set shall consist of two good quality vellum reproducibles and one print of each Drawing. Upon completion of each work, As-Built Drawings shall be prepared on reproducibles and one print each supplied to the Engineer.

As-Built Drawings shall be the Contract Drawings to which has been added actual information from field measurement to accurately represent the final and actual as-built condition of the Work.

The type of information required includes, but is not restricted to the following:

- Property line and centerlines by coordinates or dimensions from baseline.
- Pole numbers on layout drawings.
- Schematics with equipment/device numbers, wire and cable numbers, terminal numbers, special sequencing of logic descriptions.
- Cable routing with box and equipment numbers and location. Connections with trunk identification and assignment.

4.04 OPERATION AND MAINTENANCE MANUALS

The Contractor shall provide operation and maintenance manuals for all equipment and systems supplied or installed by the Contractor. The manuals shall cover the following subjects as applicable:

- a. Technical description of the equipment.
- b. Operation instructions including recommended clearances and tolerances, and sequence of application and type of lubricants.
- c. Step-by-step procedures for dismantling, cleaning, servicing, replacing parts and reassembling.
- d. Parts list with part identification numbers and sources of replacement parts.
- e. Simplified facility drawings for a complete system, to show all components of the system.
- f. Schematic diagrams for each system.

4.05 CERTIFICATE

Where certificates are required, four (4) copies of each such certificates shall be submitted by and at the expense of the Contractor. Such submittal shall be made not less than thirty (30) calendar days prior to the time that the materials represented by such certificates are needed for incorporation into any work. Certificates shall be subject to review and material represented by

such certificates shall not be manufactured, delivered to the site nor incorporated into any work without any such review.

Certificates shall clearly identify the material being certified and shall include but not be limited to providing the following information; item, manufacturer's name and reference to the appropriate drawings, technical specification section and paragraph number, all as applicable.

4.06 CALCULATIONS

Where calculations are required, four (4) copies of each such calculations under manufacturer's letterhead shall be submitted by and at the expense of the Contractor. Such submittal shall be made not less than thirty (30) calendar days prior to the time that the materials represented by such calculations are needed for incorporation into any work. Calculations shall be subject to review and material dependent upon such calculations shall not be manufactured, delivered to the site nor incorporated into any work without any such review.

Calculations shall clearly identify the subject of the calculations and shall include but not be limited to providing the following information; Contractor's name, project name, Contract number, name of the item, manufacturer's name and reference to the appropriate drawing, technical specification section and paragraph number, control register reference all as applicable.

4.07 CATALOG CUTS AND DATA SHEETS

Where catalog cuts are required, four (4) copies of each sub catalog cut shall be submitted by and at the expense of the Contractor. Such submittal shall be made not less than thirty (30) calendar days prior to the time that the materials represented by such catalog cuts are needed for incorporation into any work. Catalog cuts shall be subject to review.

4.08 SUBMITTALS

All drawings and documents shall be submitted for the Engineer review by and at the expense of the Contractor accompanied by approved transmittal form or letter.

Submittals shall be transmitted to:

Perusahaan Jawatan Kereta Api
(Indonesian State Railways)
Bandung, Indonesia

Attn: :
Telephone Number :
Telex Number :
Cable :

5.0 THE ENGINEER SURVEY MONUMENTS

The Contractor shall, in the course of the work, and three weeks prior to the necessary disturbance of any existing survey monuments, notify the Engineer who will arrange suitable repositioning.

The Contractor shall make all reasonable efforts to avoid damage to the Engineer survey monuments. If monuments are accidentally damaged, the Contractor shall immediately notify the Engineer who will arrange replacement as soon as practicable. New coordinate and level values will be given to the Contractor when checked and verified.

6.0 CONSTRUCTION WATER REQUIREMENTS

Water which is from domestic or public supply sources or of equivalent quality and purity may be used for all construction purposes.

Water from each source of supply shall be tested prior to use and the quality of each source identified by way of written analysis reports submitted to the Engineer by the Contractor.

Water supply sources and distribution facilities, including storage tanks, etc. as may be utilized, shall be initially, and thereafter maintained, free from unnecessary or unwanted contamination.

Construction water at points of Contractor's source shall be routinely rechecked at reasonable frequency to assure that the required quality is being maintained.

Raw water may be used for construction of embankments or other work which involves soil materials only, but shall not be used in or over topsoils or other soils which are required to or are being planned to support erosion control plantings or other landscaping under this or other contracts.

7.0 CONSTRUCTION REQUIREMENTS

When construction water is obtained from a domestic or public use source, any piping systems connected thereto shall be equipped with suitable devices which will positively prevent any backflow into the source system.

When construction water is obtained from a source other than domestic or public use, all hydrants, faucets or other points or the Contractor's facilities, including mobile equipment, from which such water is obtainable or accessible shall be clearly identified by securely affixed signs, lettered in Indonesian and English, to the effect that such water is prohibited for purposes of drinking or preparation of foods.

Regardless of other means of supply or distribution facilities provided for the work, at least one self-propelled, pneumatic tired water tank truck or truck and trailer combination, of not less than 4,000 gallon or 16 cubic meter capacity, shall be maintained ready for use at the project premises at all times. This equipment shall be provided with both spray bar and hose connections, each with suitable pressure control for regulating discharge flow.

All outlets for watering equipment or facilities shall be equipped with means of positive shut-off; and all watering equipment and facilities shall be maintained free from leaks. Water shall not be unnecessarily or carelessly wasted. Water for compacting embankment material, subbase, base and surfacing material, and for dust control shall be applied by means of pressure type distributors equipped with a spray system with nozzles that will insure a uniform application of water.

8.0 DUST CONTROL

The Contractor shall be responsible for the control of dust which results from the Contractor's performance of the work and whenever the work in progress is in the vicinity of work camps, rest areas, habitable structures or public roads or other places which are used or occupied by persons other than the contractor's work crews.

The provisions in this subsection 8.0 will not prevent the Contractor from applying water or other approved means of dust control for his own convenience.

The Contractor shall be responsible for determining and providing the means and materials and at the times necessary for control of dust throughout the areas within which work is to be executed under the Contract, including that which may arise from equipment operation or otherwise, and also when conveying dust laden material from place to place.

Water shall comply with requirements specified under section 6.0 CONSTRUCTION WATER REQUIREMES.

Other types of material proposed for dust control shall not be corrosive, toxic or poisonous nor otherwise environmentally unsafe; and shall be only as approved in advance by the Engineer.

9.0 CONTROL OF WATER

The Contractor shall be responsible for the control of water as may be used, developed or otherwise occurring within the work areas from time to time; and whether such water is classified as seepage, underground, rain or storm water, or otherwise.

Control shall mean to include providing pumps or other devices, lines, ditches, dikes, shaping of surfaces or other construction or operations as necessary for the collection and disposal of water; and such as is necessary for the proper execution of the work and protection of all facilities and improvements within or near the work areas.

Water disposal shall not damage any terrain, plants, trees, construction or structures, and shall not lead onto nor across established roads, parking areas, planting areas, or adjacent properties, unless otherwise specifically approved for each case.

The Contractor shall, during the course of the work, maintain the work site free of standing water except at approved decanting ponds. The Contractor shall clean, trim and maintain all drainage ditches from time to time during the work to permit a free flow of water at all times. Damage to the work attributable to wetting through failure to provide such adequate drainage shall be repaired by the Contractor at no cost to the Engineer.

The Contractor shall construct and maintain such temporary dikes, weirs and ditches and until the work requiring such temporary structures is accepted by the Engineer. All such temporary construction structures as are required for construction shall be removed prior to final acceptance of the finished and completed work.

Disposal of surface disposal shall be in such manner as not to damage or inconvenience work or facilities of other Authorities or Contractors, and should be to the approval of the Engineer.

10.0 RIGHT-OF-WAY AND PERMITS

Any agreements or permits required by DKI, Police or local authorities for moving materials and equipment shall be obtained by the Contractor. The Contractor shall make investigations to determine conditions,

restrictions, and difficulties which may be encountered in the transportation of material and equipment to the work site.

For each part of the work, the Contractor shall determine in the field and from drawings the availability of routes for hauling materials, and for routes for disposing of unsuitable material. This shall be coordinated with the Engineer into a Plan of Operation for each phase of work. Plans of Operation must be approved by the Engineer prior to commencement of work.

11.0 ENVIRONMENTAL PROTECTION

The Contractor must be aware of the environmental protection practices and procedures as stipulated by the relevant authorities.

Silts and mud which are classified as waste (unsuitable) material must not be disposed of directly to the nearshore waters. This material will be disposed of on approved landfill sites, and water clarified as stated above.

No separate payment shall be made for environmental protection but all costs thereof shall be included in the contract prices of the payable items.

12.0 REMOVAL AND RESTORATION OF EXISTING PAVEMENT

Any and all existing or newly placed concrete and asphalt concrete pavements shall not be cut into or through; other than at test points as specified, and at certain specific locations as particularly approved in advance by the Engineer.

Prior to any other removal work, the existing pavement shall be accurately and neatly cut to straight lines and regular areas using power equipment which is designed for the purpose and is of adequate capacity for the work required.

All equipment, vehicles and manner and means utilized for the removal and restoration work shall be such as to preclude unnecessary damage to pavements not required or not intended to be removed.

The extent of cutting and removal of existing pavement shall be limited to only that necessary for the work to be installed within such areas. The depth of the initial power cutting shall be such that the pavement to be removed can be readily cut free and removed without unnecessarily damaging the adjacent pavement areas which are to remain in place.

Removal of existing pavement and its underlying substructure shall be carried out such as to preclude damage to the remaining adjacent pavement and substructures. Means shall be provided as necessary to adequately protect the surfaces and edges of the remaining pavement, and the trenching or excavation cuts.

Existing pavement and substructure materials which are removed shall not be temporarily or otherwise placed, stockpiled or permitted to accumulate on the surfaces of the adjacent pavements.

Existing pavement materials shall be removed and disposed of outside the limits of the project, and shall not be incorporated or otherwise reused in the restoration work.

Existing substructure materials may be reused in the restoration work provided that each type of such material complies with the respective requirements of the technical specifications; otherwise, such materials shall be removed and disposed of the same as provided for disposal of surplus material.

When the duct, culvert or other work to be installed is complete, the substructure and pavement shall be completely restored to an acceptable condition.

Restoration shall include replacement of substructures, pavement, seal coat when applicable, pavement marking, roadway markers or other items; and to the appropriate lines, grades, slopes, and extent; all as necessary to make the restored work consistent with the conditions as they existed prior to start of the removal work.

Unless otherwise indicated, specified or approved, restoration materials shall be new, and all work and materials involved in the restoration work shall conform to the respective technical specifications.

When the areas of pavement removal and replacement are of a limited size or extent, such as for small pipes, ducts, culvert, etc., which precludes access for replacement work using normal roadway construction methods and equipment, the pavement substructure shall be reconstructed using Class E concrete in lieu of backfilling using soil materials.

Prior to installation of any replacement paving, the edges of the paving remaining in place shall be cleaned free from dust, dirt, loose particles, etc. Asphalt surfacing edges shall be primed with a coat of hot asphalt just prior to placing the new asphalt concrete. Concrete pavement edges shall be in a thoroughly dampened condition when the new concrete is placed.

The finish surfaces of the pavement shall be flush and free from offsets across the joints between the existing and newly placed pavement.

When complete, all pavement in and about the areas involved in or utilized for the work shall be left in a clean and orderly condition in accordance with Tech. Spec. entitled FINISHING OF THE WORK.

13.0 MANUFACTURER'S INFORMATION

When commercially produced material or equipment are to be utilized for or incorporated into the work, the installation or application instructions of the manufacture of the product shall be submitted for review the same as provided above for drawings and samples.

Maintenance recommendations and/or operating instructions shall also be included to the extent as is applicable to the specific products involved.

Wiring diagrams shall be included for any electrically powered or operated equipment or devices.

14.0 WORK PROGRAM REQUIREMENTS

As soon as practical following award of the Contract, and before commencement of the work, the Contractor shall submit to the Engineer for review comprehensive Contract Work Program which shall:

- outline the procedures proposed to be used for execution of the work.
- identify the number, type, capacity, etc. of all equipment intended to be utilized for carrying out the work.
- identify the name and qualifications of the Contractor's or other key personnel who have prime responsibility for overseeing this work.

15.0 PRODUCT IDENTIFICATION

Pumps, motors, panelboards, assemblies in cabinets and other such equipment shall be identified with a permanently fixed metal product label indicating the manufacturer or trade mark, item name, type number, serial number, rating, capacity, and electrical and performance characteristics - as applicable.

Packaged mass or bulk materials shall be identified with well secured product labels indicating the manufacturer or trade mark, product name and type, production lot or batch numbers, expiration dates or shelf life

limitations, and like standard information; and with precautions and emergency instructions for hazardous or toxic products - as applicable.

Lamps, fuses, lenses or other such accessory items shall be identified with indelible or embossed markings indicating the manufacturer or trade mark, item name, type or part number, rating and like standard information - as applicable.

Crated products shall be delivered to the site as factory crated, and with each crate clearly identifying the contents, use, weight, end destination, and like standard shipping information - as applicable.

Packaged materials shall be delivered to the site in unopened containers as factory packaged, labeled and sealed.

16.0 PRODUCT PROTECTION

Products shall be factory prepared, tropicalized, packaged, crated or otherwise such as to preclude damage during shipping and handling, including and transshipment, or as may result while in transit or storage over an extended period of time.

While in transit or in intermediate storage, electrical equipment and materials shall be maintained in suitable warehouses or otherwise as is appropriate for the items involved. Sensitive materials and electrical devices shall be maintained within the extremes of temperature and humidity as recommended by the respective manufacturers such as to preclude any deterioration or damage due to any adverse ambient conditions.

Packages, wrappings, or other medium shall be water-resistant, and sealed watertight when applied over the products or the products placed therein. Wrappings and containers shall be non-reactive to the products being enclosed.

17.0 PROTECTIVE FINISH

Equipment or assembly enclosures which are to remain exposed to the weather, and are steel or galvanized steel, shall be factory cleaned and finished with a durable high gloss abrasion and corrosion resistant finish system consisting of at least a prime coat and two finish coats for a total dry film thickness of not less than 0.13 mm; or may be a manufacturer's standard system provided that an equivalent degree of protection is achieved. All such finishes shall be subject to approval in advance of the work.

18.0 PROTECTION OF ADJACENT WORK

When any given work operation is to proceed or is in progress, all adjacent existing and newly placed work or improvements shall be suitably protected against damage. Protective materials shall be provided, placed and secured, and work operations shall be carried out, as necessary and appropriate for the various conditions encountered.

Damaged adjacent work shall be replaced or repaired to an acceptable condition and which is equal to the original work in quality and appearance.

19.0 CONSTRUCTION AREAS

Building sites and work areas shall be maintained in a reasonably orderly manner and free from encumbrance as practical to provide best conditions possible for various operations and installations required.

Regularly remove construction waste and debris from the work area, and periodically remove same from the premises and dispose of in a legal manner.

Periodically broom clean slabs, floors, decks and other areas and leave clean and free from dust, shavings, litter, etc., upon completion of each phase of work.

20.0 SPECIAL CLEANING AND PROTECTION

Rooms or spaces in which sensitive signal, electrical or electronic equipment is to be installed, whether under this Contract or separate contracts, shall be positively dust and dirt free when turned over for such installation work.

As Minimum Requirements: Upon completion of all other cleaning required within respective spaces, provide additional vacuuming, additional replacement of filters for respective air conditioning or ventilating systems, temporary seals or dust barriers around or at doors or other openings where dust might enter, and/or other safeguards as may be necessary to maintain said spaces in dust free condition until completion of equipment installations.

In addition, respective air conditioning and/or ventilating systems shall be operated throughout each of not less than 3 work days prior to start of equipment installations, after new replacement filters have been provided as specified.

21.0 WATERTIGHT INTEGRITY

Buildings and exterior equipment enclosures shall be constructed, installed and otherwise treated or equipped such as to preclude entry of water into any interior space or internal surface.

When buildings and exterior enclosures are essentially complete, they shall be tested for leaks by hosing down with generous applications of fresh water, and thereafter the work shall be thoroughly inspected.

Any conditions revealing water leaks shall be corrected as required and retested.

22.0 ABBREVIATIONS

As used under technical specifications, reference abbreviations shall mean as follows:

- TECH. SPEC. : Technical Specification(s).
- SPEC. : Specifications(s).

23.0 WORK SITE TRANSPORTATION

The Contractor shall provide suitable transportation for its employees between camps where its employees reside and the Work Site. The Contractor's equipment used in the performance of the Work shall not be considered suitable for this purpose. The Contractor shall also provide adequate parking areas at the Work Site for all of its construction equipment used in the performance of the Work and for all vehicles used in transporting its personnel and the coverage of its security program.

24.0 PROJECT SIGN BOARDS

The Contractor shall, at its expense, furnish, erect and maintain two (2) project signs in accordance with the Standard Format for Project Signs at each main work area. On completion of such work at a general work area, the Contractor shall, at its expense, remove the signs.

END OF GENERAL SPECIFICATION

PART D

TECHNICAL SPECIFICATIONS

LIST OF TECHNICAL SPECIFICATIONS

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END OF LIST

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201 - R54 RAILS

1 DESCRIPTION

This section covers the furnishing and delivery of flat bottom rails to be provided at track of the Indonesian State Railway (Perusahaan Jawatan Kereta Api) and covers the requirements for quality of the steel, manufacturing, tolerance on dimensions and related technical conditions for the supply of the products as required.

The Contractor shall furnish all labor, materials, tools and equipment to complete the work.

Installation of these materials is not a part of the requirement of this section. Track laying work is covered under Technical Specification Section 209.

2. METHOD OF MANUFACTURE

- 2.01 Rails shall be manufactured from steel ingots or continuous casting blooms (hereinafter referred to C.C. blooms) made either by basic open hearth, electric, or basic Bessemer process or basic oxygen convertor, and shall conform to the requirements as specified in Table 201-1.

Table 201-1 Chemical Composition

Carbon	0.60 - 0.75 %
Manganese	0.80 - 1.20 %
Silicium	0.10 - 0.30 %
Phosphorus	Max. 0.035 %
Sulphur	Max. 0.04 %
Hardness not less than B.H. 235	

- 2.02 The end of blooms and ingots shall be sufficiently cropped so as to ensure the rails to be free from internal defects and slag.
- 2.03 Rails shall be uniform shape throughout the entire length and be free from flaws, twists and other injurious defects.
- 2.04 All rails shall have their ends sawn or machined. The sawed section of the rails shall show no pipes or other injurious internal defects.
- 2.05 Both ends of the rails shall be rectangular to its longitudinal axis. The deviation from square shall not exceed 0.4 mm. All burrs shall be removed. Chamfering of 1.5 mm by machining shall be made to rail ends having fish holes.

2.06 The camber of the rails after cooling shall not exceed 100 mm per 10 mm length and shall be straightened by applying gradual pressure. Chemical composition of rails shall be analyzed by Quant Vac and the results shall conform to the requirements specified in Table 201-1.

2.07 Every two rails out of 4 rails, each one of which is 25 meters in length shall be of preholed at one end for fish bolts.

3. TEMPLATES

The manufacturer shall, unless otherwise specified, supply two sets of templates, internal and external, of approved metal, for each section of the rails ordered or contracted for, and shall submit them for the approval of the Engineer and the rolling of the rails may be commenced after the approval has been obtained from the Engineer.

4. NOTICE OF ROLLING

The manufacturer shall give the Engineer at least seven days notice in writing specifying the date of the proposed rolling of the first lot of rails and at least three days notice of the proposed rolling of any subsequent lot of rails, in order that arrangements can be made for the presence of the Engineer (or his representative) at the rolling. The section of the rail shall be approved by the Engineer at commencement of the rolling.

5. MARKING

5.01 Branding of the process by which the steel has been manufactured, the manufacturer's name, initials or other recognized mark, the year of manufacturing and the initials identifying the railway organization shall be rolled in embossed letters at least 20 mm in a size on one side of the web of each rail in a location not covered by the fish plates. The lettering shall read from the end adjacent to top of the ingot or C.C. bloom, and shall remain legible insofar as the rails are in service.

The following abbreviations are recommended for the purpose as intended:

- OA - Open hearth, Acid
- OB - Open hearth, Basic
- BA - Bessemer, Acid
- BB - Bessemer, Basic
- E - Electric
- LD - Linz Danowits

An arrow, the point of which indicates the direction of the top of the ingot, or the top of the C.C. bloom.

5.02 Cast Identification

In addition to the markings as specified, the following shall be hot-stamped at one end of each rail.

- The number of heat as well as ingot or C.C. bloom from which the rail has been rolled.
- The appropriate letter A.B.C. etc. to indicate the order in which the rails are located relative to the top of the ingot or C.C. bloom.

The figures and letters shall be 10 mm in height.

6. MANUFACTURE

All ingots used in the manufacture of the rails shall have a cross sectional area at the larger end of not less than 25 times that of the rail to be produced.

In case of C.C. bloom, the minimum rolling reduction of cross-sectional area shall be 8 times.

From each end of the rail bar sufficient crop shall be cut ensure that all unsound portions have been removed.

7. CONFORMANCE TO TEMPLATE

Each section of rails shall be rolled to its respective template within the limits of the tolerances as specified in Article 8.

8. WEIGHT AND DIMENSIONS TOLERANCE

The tolerances as shown below shall be allowed provided that the actual weight computed for 1 meter length, by weighing the short rails, each of which not less than 300 mm in length, remain in a range within minus 0.5 % or plus 1 % of the theoretical unit weight.

Length (25 m rail)	:	+ 10.0 mm
Height of Rail	:	+ 0.8 mm, - 0.4 mm
Width of Head	:	+ 0.8 mm, - 0.4 mm
Thickness of Web	:	+ 0.8 mm, - 0.4 mm
Width of Flange	:	+ 0.8 mm

Deviation of the Rail
Head from the Center-
line Perpendicular
to the Base Flange : +0.4 mm

Unevenness of Surface
of Rail Base : 0.4 mm

The rail fishing template shall not stand out from the contour of web by + 1.2 mm or - 0, and clearance at fishing surfaces shall, at any point, not exceed 0.2 mm.

Theoretical
Unit Weight : 54.43 kg/m

The part where the fishplate contacts the rail shall be accurate.

9. TESTING FACILITIES

The manufacturer shall supply all templates and gauges, prepare and supply all test specimens and samples of steel, sample rails and drillings, and supply all labor and apparatus for testing as may be necessary or required by the Engineer for carrying out the tests in accordance with Indonesian Standards, and provide all reasonable assistance in performing such tests and determining the quality of the rails produced before shipment. The manufacturer shall also supply all drillings, test specimens and samples of steel for carrying out the independent chemical analysis and tensile tests provided for in Articles 11 and 15.

10. FACILITIES FOR INSPECTION OF MANUFACTURE

The Engineer shall have an access at all reasonable times to the manufacturer's premises where the work under the Contractor or Order is being performed and shall have liberties to inspect the same and the manufacturer shall provide all reasonable facilities for such an access and inspection before shipment.

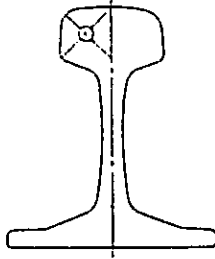
Prior to submittals of the rails to the Engineer for inspection, the manufacturer shall examine the rails and shall stack any non-compliant or defective rails at the location other than the area designated for compliant products.

The Engineer reserves the right to refuse to inspect the rails unless otherwise the rails are orderly classified for the inspection.

11. CHEMICAL ANALYSIS AFTER ROLLING

A chemical or vacuum spectrometer (Qantvac) analysis for the specified elements shall be made from drillings taken either from a hole drilled in a rail selected by the Engineer and from the position as shown in Fig. 201-1 or from the tensile test piece or pieces selected by the Engineer and shall show the chemical composition conforming to the requirements as specified in Table 201-1. The diameter of the drill shall be 25 mm.

Fig. 201-1 Location of Sample for Chemical Analysis



12. NUMBER OF CHEMICAL ANALYSIS AFTER ROLLING

The manufacturer shall make and provide PJKA with one chemical analysis for the specified elements after rolling from each case.

If the analysis of any cast should fail to conform to the provisions of Article 11, the cast represented by the analysis so failed may be rejected if a second chemical analysis does not comply with Article 11.

13. FALLING WEIGHT TEST

13.01 Falling weight test shall be determined by the standard AREA specification drop testing machine, with test specimens 1,500 mm long, cut from the top of the "A" rails from the second, middle and last full ingots of each heat.

In case of C.C. blooms, one specimen for each heat shall be taken from any part of the rail that has been rolled from any bloom.

Temperatures of the test specimens shall not exceed 35 degrees C. The distance between supports shall be 1 meter. The test specimen shall be placed head upwards on the supports and subjected to one blow from the tup of 900 kg from a height of 7,700 mm or 1,000 kg tup from a height of 8,160 mm.

13.02 If all these specimens withstand the above drop test without breaking between the supports, all of the rails of the heat will be accepted subject to final inspection for surface, section and finish.

13.03 If any specimen breaks in a location other than between the supports, the test shall be disregarded and retest shall be made from the top of the rail involved.

13.04 If one of the three specimens fails, subject to the requirement of Article 13.3, all of the "A" rails of the heat shall be rejected. Specimens shall then be cut from

bottom end of the same "A" rails or the top end of the "B" rails of the same ingots and tested subject to Article 13.3. If any of these specimens fails the "B" rails of the heat shall be rejected.

Three additional specimens shall then be taken from the bottom end of the "B" rails or the top end of the "C" rails of the same ingots and tested subject to Article 13.3. If none of these specimens fail, the balance of the heat shall be accepted subject to final inspection for surface, section and finish. If any of these specimens fail, the entire heat shall be rejected.

13.05

- A. In case of C.C. blooms, when test results meet the requirements given above, all rails that have been rolled from blooms of the heat represented by the pertinent specimen shall be accepted. In case test results fail to meet the said requirements, a retest shall be made using two specimens, one taken from a part adjacent to the first specimen and the other taken from any part of the rail that has been rolled from any bloom, produced in another continuous casting strand, of the heat represented by the pertinent specimen.
- B. When results of the retest meet the requirement, all rails that have been rolled from blooms of the heat represented by the pertinent specimen shall be accepted. In case even one specimen fails to meet the requirements, all rails of the represented by the pertinent specimen shall be rejected.

14. INTERIOR CONDITION

A test piece representing the top end of the top rail of each ingot or top C.C. bloom of each strand of each heat rolled, which has passed the drop test requirement of Article 13.3, shall be nicked and broken. If the fracture on any test specimen shows seams, laminations, cavities, evidence of injurious segregation, or interposed foreign matter, the heat number and ingot number shall be recorded and the top end and bolt holes of the finished rail, so recorded, shall be closely examined for those defects. If the finished rail is clear of the above defects when presented for inspection, it shall be accepted. Where the finished rail shows defects, the rail shall be broken or cut back to sound metal and accepted as a short rail.

15. TENSILE TEST

- 15.01 Tensile test shall be performed as specified in the following clauses minimum tensile strength 80 kg/mm² and minimum elongation 10 %. One set of test pieces shall be taken from each heat.

The test specimens shall be taken from the position as shown in the Figure 201-1.

15.02 When the test piece breaks outside of 1/4 the distance from the center of its gauge length and the results do not conform to the requirement, the test shall be discarded and another test shall be made with a second test specimen taken from the same rail as the first piece.

15.03 When the test result meets the requirement in number 1 of this clause, all the rails represented by the test piece shall be accepted and if the results fail to meet the requirement, all A rails of that heat shall be rejected.

When all of the A rails are rejected a second test piece shall be taken from the top and of B rail of the same ingot and if the results of test meet the requirement of number one of this clause all of the B rails and the rest of the rails of that heat shall be accepted, and if the results fail, all B rail shall be rejected.

15.04 One test specimen shall be taken from each heat in case of continuous casting bloom. Test piece shall be checked at top end of top rail from any bloom in case of continuous casting bloom.

16. BRINELL HARDNESS TEST

The test specimen shall be taken from the bottom end crop. On each test piece shall be made one impression on its polished surface as specified in Article 15. The conditions under which the test shall be carried out as follows.

Ball Diameter	:	10 mm
Load	:	3,000 kg
Period of Application	:	15 seconds

One test shall be taken from every cast.

17. RAIL HANDLING

Rails shall be handled carefully to prevent damage.

18. ACCEPTANCE

In order to be accepted, the rails offered shall fulfill all the requirements of this specification.

END OF SECTION

202 - COMPROMISE RAIL

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202 - COMPROMISE RAIL

1. DESCRIPTION

This section covers the furnishing and delivery of compromise rail to be used as one pair on right and left sides to the joint sections between R54 and R3 rails for the track of the Indonesian State Railway (Perusahaan Jawatan Kereta Api) and covers the requirements for quality of the steel, manufacturing, tolerance on dimensions and related technical conditions for the supply of the products as required.

The Contractor shall furnish all labor, materials, tools and equipment to complete the work.

Installation of these materials is not a part of the requirement of this section. Track laying work is covered under Technical Specification Section 209.

2. METHOD OF MANUFACTURE

- 2.01 One end of the R54 rail shall be forged into the shape of R3 rail through gradual deformation as shown on the drawing.
- 2.02 The changed portion of cross-section and the portion of light weight rail shall be made by forging, pressing and machine procedure.
- 2.03 Both ends of the compromise rail shall be cut at a right angle to the longitudinal direction and the burrs on the cut ends shall be removed.
- 2.04 Deviation of the top surface on the rail head shall be finished smoothly along longitudinal direction.

3. SHAPE AND DIMENSION

- 3.01 Shape and dimension of the compromise rail shall be as shown on the drawing.
- 3.02 Dimensional tolerance of compromise rail shall be as shown in Table 202-1 at 20 degrees C.

Table 202-1

Item	mm
	Tolerance
Length	+ 7
Height	+ 1.0
Height of rail head	+ 0.5
Width of rail head and web	+ 1.0 - 0.5
Width of each flange of rail base	+ 1.0
Width of rail base	+ 1.0
Deviation of verticality at rail head to base	1.0
Deviation of right angles by cutting at end	1.0
Diameter of the hole	+ 0.5
Position of the hole	+ 0.8
Clearance between rail and fish-plate when standard fish plate is fixed to rail	to outside 2.0 to inside 1.0
Length of sections of variation	+ 25 - 10
Position of sections of variation	+ 15

4. APPEARANCE

Any compromise rail shall be free from defects such as harmful flows, cambers and twists.

5. MATERIALS

Rails shall be in accordance with R54 rails.

6. MARKING

The compromise rail shall be marked with the following particulars.

- a) The type of the compromise rail,
- b) The initial of manufacturer,
- c) The last two digits of the year of manufacture.

7. PROTECTION

The whole surface area shall be thoroughly covered with a protective coating.

8. PACKING

Three compromise rail shall be bundled with wire.

END OF SECTION

203 - FISHPLATES FOR R54 RAILS

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203 - FISHPLATES FOR R 54 RAILS

1.0 DESCRIPTION

This section covers the furnishing and delivering of fishplates for R54 rails to be provided at the tracks of the Indonesian State Railway (Perusahaan Jawatan Kereta Api, hereinafter referred to PJKA) and covers the requirements for quality of the steel, manufacturing, tolerance on dimensions and related technical conditions for the supply of the products as required.

The materials required shall be manufactured such that upon delivery they are essentially ready for installation and do not require further cutting and fitting for the typical conditions and uses intended.

The Contractor shall be responsible for determining and providing the quantities of materials as are needed to carry out the work required under this Contract as based upon the configurations and extent indicated on the drawings by typical layouts and details, and in accordance with these specifications.

Installation of these materials is not a part of the requirement of this section. Track laying work is covered under Technical Specification Section 209.

2.0 MATERIALS

2.01 Material of fishplate shall be steel and chemical composition shall be in accordance with the following:

- Carbon	:	0.40 - 0.55 %
- Silicium	:	0.040 % max.
- Manganese	:	0.55 - 1.00%
- Phosphorus	:	0.040 % max.
- Sulfur	:	0.045 % max.

2.02 The mechanical properties after heat treatment shall be as follows:

Tensile Strength	:	70 kg/cm ² min.
Elongation	:	12 % min.
Hardness	:	HB 262 - 331

3.0 METHOD OF MANUFACTURE

Fishplates shall be manufactured by either rolling or forging.

Fishplates shall be quenched and tempered for heat treatment.

4.0 SHAPE AND DIMENSIONS

Shape and dimensions of fishplate shall be in accordance with the drawing.

Dimensional and alignment tolerances as follows:

Item	Tolerance
Length	+ 3 mm
Thickness	+ 1, - 0.5
Hole Diameter	+ 1, - 0.5
Distance between Holes	+ 1
Chamber Center upwards	2
Center downwards	0.7
Center outwards to rail	2
Center inwards to rail	2
Clearance between fishplate and rail template	1

5.0 QUALITY

5.01 The fishplate shall be manufactured in accordance with the drawings, shall possess smooth level surfaces, and shall be free from breaks in continuity, repairs, cracks, scratches, deep falws or any other faults, defects or damage. Superficial faults shall be removed by means of buffing until they have completely disappeared. If the deficiency of metal resulting from this operation exceeds the specified dimensional tolerances, the inspector may accept the part provided that, in his opinion, the loss of metal is insufficient to adversely affect its use.

5.02 Fishplate shall have accurate and smooth bolt holes on its web and the bolt holes shall be bevelled as shown by the drawing.

6.0 TEST REQUIREMENTS

The Contractor shall be responsible for determining and providing all necessary supervision, inspection, sampling, testing or otherwise controlling the manufacture such that the materials or items supplied comply with the requirements of these specifications.

Materials or items, individually or in groups where so evaluated not meeting the requirements of these specifications shall be rejected and not used for the work under this Contract.

All materials, parts or pieces to be tested shall be suitably identified in an orderly manner.

6.01 Chemical Analysis

The mill shall provide a certificate giving the chemical composition, on ladle samples, of every cast forming part of the order to be tested.

6.02 Tension Test

One tension test shall be performed on the test piece taken from the center of the head of fishplate selected at random by consideration one heat as one lot of heat treatment. The entire cutting and finishing shall take place when cold by means of machine tools, and without recourse to any hammering operation, cold bending, quenching or reheating. The gauge length for calculating the elongation shall be that recommended by the ISO., i.e. $L_0 = 5.65 S_0$, S_0 being the original section of the gauge length; in the case of a rectangular section, width of the test piece shall be equivalent to three times its thickness.

6.03 Hardness Test

A hardness test shall be carried out at the head and the bottom of fishplate. The test shall be carried out with a Ball.

Ball diameter	:	10 mm
Load	:	3,000 kg
Period of application	:	15 seconds

One test shall be taken from one heat as one lot of heat treatment.

6.04 Appearance

A visual inspection on appearance shall be made to the head, web and bottom of fishplate. Where any irregularities observed, proper tests shall be made for checking.

7.0 MARKING

The following marks shall be shown on the fishplates in very legible characters, derived from manufacture, and on the surface of the web of the fishplate:

- The manufacturer's mark,
- The last two figures of the year of delivery,
- A symbol, if so indicated on the drawing:

Example: "Factory----85----R54" for a fishplate delivered in 1985 and intended for standard profile rails weighing 54 kg/m.

8.0 SHIPPING REQUIREMENTS

Protection: The Fishplates shall be protected against rust during long periods of storage, and by such methods and means as proposed and approved.

Irrespective of the method of protection adopted, the whole surface area, especially the machined sections, shall be covered with a protective coating.

Packing: Packing used for dispatch shall not have been previously used for any purpose which would result in damage to these materials.

The packages shall be sealed as necessary, and each package shall bear the following information as applicable, in clearly indelible characters on label firmly fixed to the package.

- Name or the mark of the supplier.
- Order number.
- Description of parts contained.
- Number and total weight of the parts.

Maximum weight of packing for each shipment shall be limited to approx. two (2) metric tons.

END OF SECTION

204 - FISHBOLTS & NUTS FOR R54 RAILS

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204 - FISHBOLTS & NUTS FOR R54 RAILS

1.0 DESCRIPTION

This section covers the furnishing and delivering of fishbolts and nuts for R54 rails to be provided at the tracks of the Indonesian State Railway (Perusahaan Jawatan Kereta Api hereinafter referred to PJKA) and covers the requirements for quality of the steel, manufacturing, tolerance on dimensions and related technical conditions for the supply of the products as required.

The materials required shall be manufactured such that upon delivery they are essentially ready for installation and do not require further cutting and fitting for the typical conditions and uses intended.

The Contractor shall be responsible for determining and providing the quantities of materials as are needed to carry out the work required under this Contract as based upon the configurations and extent indicated on the drawings by typical layouts and details, and in accordance with these specifications.

Installation of these materials is not a part of the requirement of this section. Track laying work is covered under Technical Specification Section 209.

2.0 MATERIALS

Materials of the fishbolts and nuts shall be steel bar and chemical composition shall conform to the requirements specified below:

	C	Si	Mn	P	S	Cr
Bolt	0.38-0.43	0.15-0.35	0.60-0.85	0.030 max.	0.030 max.	0.90-1.20
Nut	0.37-0.48	0.15-0.35	0.60-0.90	0.030 max.	0.035 max.	-

3.0 MECHANICAL PROPERTIES

The mechanical properties of bolts and nuts after heat treatment shall conform to the requirements as specified below.

Item	Yield Point kg/mm ²	Tensile Strength kg/mm ²	Elongation %	Reduction %	Rockwell Hardness HRC
Bolt	95 min.	110 min.	10 min.	40 min.	32 - 39
Nut	-	-	-	-	27 - 37

4.0 METHOD OF MANUFACTURE

The bolts and nuts shall be quenched and tempered after being formed and processed.

5.0 SHAPE AND DIMENSIONS

5.01 The shape and dimensions shall be in accordance with the drawing.

5.02 The thread of bolts and nuts shall be metric coarse screw threads and the tolerance of the thread shall be 6H and 6g.

6.0 DIMENSIONAL TOLERANCES

The dimensional tolerances shall be as follows.

Item	Tolerance
Bolt Width of Head	+ 1 mm
Height of Head	+ 1
Length under Head	+ 2
Length of Thread Portion	+ 6, - 0
Shank Diameter	+ 0.95, - 0.35
Nut Width Across Flat	+ 1
Height of Nut	+ 1

7.0 TEST REQUIREMENTS

The Contractor shall be responsible for determining and providing all necessary supervision, inspection, sampling, testing or otherwise controlling the manufacture such that the materials or items supplied comply with the requirements of these specifications.

Materials or items, individually or in groups where so evaluated not meeting the requirements of these specifications shall be rejected and not used for the work under this Contract.

All materials, parts or pieces to be tested shall be suitably identified in an orderly manner.

7.01 Chemical Analysis

The mill shall provide a certificate giving the chemical composition, on ladle samples, of every cast forming part of the order to be stated.

7.02 Tension Test

One tension test shall be performed on the test piece taken from the heat-treated bolt selected at random by consideration one heat as one lot of heat treatment. Gauge length for calculating the elongation shall be that recommended by the I.S.O., i.e. $L_0 = 5.65 S_0$, S_0 being the original section of the gauge length.

7.03 Hardness Test

The hardness test shall be performed on the shank of bolt and on the side of nut. One test shall be taken from one heat as one lot of heat treatment.

7.04 Tension Test on Finished Products

The product inspection shall be carried out by fitting the nut to the bolt beyond the height of the nut and pulling the bolt head and nut.

8.0 MARKING

The manufacturer's name or its abbreviation and PJKA shall be clearly marked on the head of the bolts.

9.0 SHIPPING REQUIREMENTS

Protection: The bolts and nuts shall be protected against rust during long periods of storage, and by such methods and means as proposed and approved.

Irrespective of the method of protection adopted, the whole surface area, especially the machined sections, shall be covered with a protective coating.

Packing: Packing used for dispatch shall not have been previously used for any purpose which would result in damage to these materials.

The packages shall be sealed as necessary, and each package shall bear the following information as applicable, in clearly indelible characters on label firmly fixed to the package.

- Name or the mark of the supplier.
- Order number.
- Description of parts contained.
- Number and total weight of the parts.

Maximum weight of packing for each shipment shall be limited to approx. two (2) metric tons.

END OF SECTION

205 - SPRING WASHERS FOR R54 FISHBOLTS & NUTS

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205 - SPRING WASHERS FOR R 54 FISHBOLTS & NUTS

1.0 DESCRIPTION

This section covers the furnishing and delivery of spring steel washers for R54 fishbolts & nuts to be provided at the tracks of the Indonesian State Railway (Perusahaan Jawatan Kereta Api hereinafter referred to PJKA) and covers the requirements for quality of steel, manufacturing, tolerance on dimensions and related technical conditions for the supply of the products as required.

The materials required shall be manufactured such that upon delivery they are essentially ready for installation and do not require further cutting and fitting for the typical conditions and uses intended.

The Contractor shall be responsible for determining and providing the quantities of materials as are needed to carry out the work required under this Contract as based upon the configurations and extent indicated on the drawings by typical layouts and details, and in accordance with these specifications.

Installation of these materials is not a part of the requirements of this Section. Track laying work is covered under Technical Specification Section 209.

2.0 MATERIALS

The spring washers shall be manufactured from spring steel bars. The manufacturing process of the steel shall be at the Contractor's option to propose, subject to approval. Chemical composition of steel shall conform to the requirements specified below or equivalent.

%	C	Si	Mn	P	S
(A)	0.35 - 0.42	1.5 - 1.9	0.6 - 0.9	0.04 max	0.03 max
(B)	0.59 - 0.66	0.15 - 0.35	0.6 - 0.9	0.04 max.	0.04max.

3.0 MECHANICAL PROPERTIES

The mechanical properties after heat treatment shall conform to the requirement specified below.

Rockwell Hardness (HRC)

- (A) 43 - 49
- (B) 40 - 46

4.0 METHOD OF MANUFACTURE

After shaping, the spring washer shall be hardened and tempered. Each spring washer shall be fully compressed to flat by the supplier.

5.0 SHAPE AND DIMENSIONS

The shape and dimensions shall be in accordance with the drawing.

6.0 QUALITY

The spring washer shall be manufactured in accordance with the drawings.

The surface of spring washer shall be regular and clean, and free from superficial cracks, flaws, burrs, deficiency in metal, folds or any other defect likely to affect the use for which the part is intended. The spring washer shall be free from harmful warp at the part where it contacts the connected components when installed.

7.0 DIMENSIONAL TOLERANCES

The dimensional tolerances shall be as follows.

Item	Tolerance
Internal Diameter	+1, -0 mm
Diameter	+ 0.5
Height	min 14, max 23

8.0 TEST REQUIREMENTS

The Contractor shall be responsible for determining and providing all necessary supervision, inspection, sampling, testing or otherwise controlling the manufacture such that the materials or items supplied comply with the requirement of these specifications.

Materials or items, individually or in groups where so evaluated, not meeting the requirements of these specifications shall be rejected and not used for the work under this Contract.

All parts or pieces to be tested shall be suitably identified in an orderly manner.

8.01 Chemical Analysis

The mill shall provide a certificate giving the chemical composition, on ladle samples, of every cast forming part of the order to be stated.

8.2 Hardness Test

The hardness test shall be performed on the surface of spring washer after grinding. One test shall be taken from one heat as one lot of heat treatment.

8.3 Compression Test

Each spring washer shall be completely flattened for a period of 100 seconds between two parallel plates. After release, the decrease in height shall not exceed an average of 0.5 mm. Each part is then completely flattened ten times consecutively. After this operation, the decrease in height shall not exceed an average of 0.1 mm. Three tests shall be taken from one heat as one lot of heat treatment.

9.0 MARKING

The following shall be stamped on each washer by means of a blunt-edged punch, in sufficiently legible characters and at the point as required

- Supplier's mark.
- Last two figures of the year of delivery.

10.0 SHIPPING REQUIREMENTS

Protection: The spring washers shall be protected against rust during long periods of storage, and by such methods and means as proposed and approved.

Irrespective of the method of protection adopted, the whole surface area, especially the machined sections, shall be covered with a protective coating.

Packing: Packing used for dispatch shall not have been previously used for any purpose which would result in damage to these materials.

The packages shall be sealed as necessary, and each package shall bear the following information as applicable, in clearly indelible characters on label firmly fixed to the package.

- Name or the mark of the supplier.
- Order number.
- Description of parts contained.
- Number and total weight of the parts.

Maximum weight of packing for each shipment shall be limited to approx. two (2) metric tons.

END OF SECTION

206 - RAIL FASTENING DEVICES

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206 - RAIL FASTENING DEVICES

PART 1: GENERAL

1.01 DESCRIPTION

This section covers the furnishing and delivering of rail fastening devices for prestressed concrete sleepers to be provided for the track of the Indonesian State Railway, Perusahaan Jawatan Kereta Api, hereinafter referred to (PJKA) at the locations as required.

The materials required shall be manufactured such that upon delivery they are essentially ready for installation and do not require further cutting and fitting for the typical conditions and uses intended.

Rail fastening devices as required for wooden sleepers shall be in accordance with those as used in the existing track of PJKA unless otherwise particularly directed by the Engineer.

Installation of these materials is not a part of the requirements of this Section.

1.02 TECHNICAL REQUIREMENT

A. RAIL

Applicable rails shall be R54.

B. WHEEL LOAD

Design wheel load shall be 8t.

C. RAIL ELEVATION

Rail elevation shall be 1:40 slope to the gauge side.

D. TYPE

Fastening devices shall be resilient type.

E. DESIGN

Fastening devices shall be composed of the least number of parts for simple assembly, disassembly, and maintenance; all parts other than embedded inserts shall be replaceable without disturbing the sleeper.

1.03 SUBMITTALS

The Contractor shall submit to the Engineer the following items for review and approval:

- Manufacturer's drawings and specifications.
- Certificates of compliance stating that the material used and construction of the fastening devices conform to all requirements of this specification.
- Certificate of testing including test data to show that all tests specified have been performed and all requirements have been met.
- Catalog data showing illustrations and schedule of parts to facilitate assembly and disassembly of the fastening devices and ordering of replacement parts.
- The Contractor shall submit 5 copies of manuals describing maintenance and inspection method.

1.04 PRODUCT HANDLING

Inspection shall be made to the fastening devices at time of delivery for shipment damage and for compliance with specifications.

When damaged fastening devices that will require repair or replacement, or part that do not comply with specification is found, immediate action shall be taken to repair or replacement of parts, so that the projects performance and schedule are not impaired.

PART 2: PRODUCTS

2.01 GENERAL

Products to be furnished and installed under this specification shall be unused first grade commercial quality standard products of reputable manufacturer regularly engaged in the production of such devices and shall be the manufacturer's latest standard design that complies with the specification requirements.

2.02 MATERIAL

Materials and manufacturing methods shall be as follows:

A. SPRING

The material of springs shall be in accordance with JIS G 4801 SUP-6 or SUP-9 or equivalent standards. Springs shall be heated for molding and subsequently be quenched and tempered. Rockwell hardness shall be 40-47.

B. TIE PLATE

Tie plates shall be in accordance with JIS G 3101 SS 41 or JIS 5502 FCD 40 and or shall be manufactured by rolling and forging or casting.

C. BOLTS AND ANCHORS

Bolts and anchors shall be in accordance with JIS G 3101 SS 41 by forging or roll threading.

D. PADS

Pads shall be fabricated from either natural or synthetic rubber by molding.

E. INSULATOR

Insulator shall be fabricated from either nylon resin or polyester resin with reinforced fiber material.

2.03 GENERAL TEST REQUIREMENTS

General:

The Contractor shall be responsible for determining and providing all necessary supervision, inspection, sampling, testing or otherwise controlling the manufacture such that the materials or items supplied comply with the requirements of these specifications.

Materials or items, individually or in groups where so evaluated, not meeting the requirements of these specifications shall be rejected and not used for the work under this Contract.

All parts or pieces to be tested shall be suitably identified in an orderly manner.

A. OBLIQUE PRESSURE TEST

Secure the rail on the sleepers on a 30 degrees lateral pressure test table and apply loads to the head by 1 t at each time up to maximum 10 t to measure the displacement at the bottom and head of the rail under a load of 10 t applied. Displacement shall be less than 6 mm.

B. CREEP RESISTANCE TEST

On a creep resistance table, secure short ties fitted with a rail and apply loads in an axial direction in 100 KG steps to record displacements and maximum load P max.

The standard value shall be more than 900 KG per fastener.

C. UPLIFT TEST

Secure rail-fitted ties on an uplift jig and apply loads to the rail. Record the load that causes the pad to leave the rail or the ties.

Remove the load and apply another load to check for any defect of sleeper and fastening devices.

- D. Electrical Resistance Test for PC sleepers (excluding wood sleepers)

Secure two rails on PC sleepers with fasteners and immerse them in water for more than 6 hours.

Within 1 hour after taking out of water, apply a voltage of 10 V AC 50 Hz to the rails for 15 min. and read the resistance.

The resistance shall be not less than 20,000 ohm.

- E. RAIL FASTENING FORCE TEST

Fasten the rail on a fastening force test jig and measure the fastening force by using a load cell. The standard value shall be approximately 1100 KG per fastener.

- F. REPEATED LOADING TEST

On a 20 degree lateral pressure test table, secure short sleepers fitted with a rail and apply 7 t repeated load 3 million times to the rail head. A rate of applying the load shall be 300 times per minute and there shall be no defect under the condition.

- G. ANCHOR DRAW OUT TEST

Fit the PC sleeper anchors with a jig and apply drawing forces of 500 KG by use of a hydraulic jack at each time up to 6 t and secure for more than 3 minutes and measure the degree of displacement with a dial gauge and also measure the stress by use of a strain gauge at the time of load applied, and at the sametime examine anchors and sleepers for any defect.

The same test shall be repeated following the test specimen and test devices have been heated to 60 degrees C by use of a heating device to verify the resistance force of the anchor at the same temperature.

2.04 TEST FOR INDIVIDUAL COMPONENT

Tests for individual fastener components shall be as follows:

- A. Test for lateral spring constant of springs
B. Test for tip spring constant of springs

- C. Compression deformation test for pads and insulators
- D. Hardness test for pads and insulators
- E. Dielectric resistance test for pads and insulators
- F. Strength test for anchors
- G. Loading test for PC sleepers

2.05 TOLERANCES

Dimensional tolerances for tie plates and springs shall be as follows:

A. Tie Plates

Thickness		+ 1.0
Width		+ 3.0
Length		+ 4.0
Distance between shoulders		+ 1.5
		- 0.5
Bottom camber	Below	1.0
Deviation of hole		
center lines	below	1.0
Hole diameter (back)		+ 0.5
Distance between holes		+ 1.0

B. Springs

Width	+ 0.5
Thickness or diameter	+ 0.5
	- 0.2
Longer hole diameter	+ 1.0
Shorter hole diameter	+ 0.5
Location of holes	+ 1.0

2.06 SPRING

Springs are intended to soften and attenuate shocks caused to tracks by passing trains in their function of elastic fastening in combination with pads.

Likewise, in order to control the creeping of rails, the standard fastening force shall be 550 KG per spring.

2.07 PADS

- A. Pads are intended not only to support rails elastically but also effect insulation between the rails and the sleepers. Thus, they shall have a sufficient dielectric resistance.
- B. Through the quality test under JIS K 6301, pads shall meet the following:

1) JIS A Spring hardness over 92

Tensile Strength :	Before aging	100 KG/cm ²
	After aging	Over 90 (70-150% of the level before aging)
Elongation :	Before aging	
	After aging	below 30%
Bending :	No cracks shall occur	
Electric Resistance :	Normal	Over 300 M ohm
	After immersion	ditto
Load Resistance :	No cracks shall be caused in load tests.	
Water Resistance :	No mass increase may exceed 0.3 g.	

2) JIS A Spring Hardness below 92

Tensile Strength :	Before aging	Over 120 KG/cm ²
	After aging	Over 100 over 70% of the level before aging.
Elongation :	Before aging	250%
	After aging	Over 180 and over 60% of the level before aging.
Modulus of Elasticity :	Before aging	Over 30 KG/cm ² below 50 KG/cm ²
	After aging	60-140% of before aging level.
Permanent Compression Strain :	below 30%	
Electric :	Normal	Over 3000 M ohm
	After immersion	ditto
Compression Deformation :	No cracks shall be caused in compression deformation tests.	

END OF SECTION

207 - PRESTRESSED CONCRETE SLEEPER
(PRETENSIONING TYPE)

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207 - PRESTRESSED CONCRETE SLEEPER
(PRETENSIONING TYPE)

PART 1: GENERAL

1.01 DESCRIPTION

This section covers the furnishing and delivery of PC sleeper (Prestressed Concrete Sleeper hereinafter referred to as sleeper) to be provided at the locations as required by the Engineer.

The Contractor shall furnish all labor, materials, tools and equipment to complete the work.

1.02 APPLICABLE CODES AND STANDARDS

The following codes and standards are intended to provide an acceptable level of quality for materials and products. The Contractor may propose alternate codes and standards provided they give an equivalent degree of quality as the referenced codes and standards and are submitted for the Engineer's review and approval in advance of their use.

- A. Standard Specification for Prestressed Concrete (Japanese Civil Engineering Association)
- B. Standard Specification for Plain and Reinforced Concrete (Japanese Civil Engineering Association)

1.03 REFERENCES

Related Work in Other Section

Section 209 TRACK LAYING WORK

1.04 SUBMITTALS

The Contractor shall submit to the Engineer for review the items listed herein. Submittals shall meet the requirements and be in quantities specified in the referenced documents. When not otherwise indicated, each submittal item shall be in duplicate copies or sets:

- The Manufacturer's drawings and specifications.
- Certificate of compliance stating that the material used for fabrication of PC sleepers conform to all requirements of this specification.
- Certificate of testing including test data to show that all tests specified have been performed and all requirements have been met.

1.04 PRODUCT HANDLING

- A. Inspect PC sleepers at time of delivery for compliance with specifications.
- B. When damaged products that will require replacement, that does not comply with specification is found, immediate action shall be taken to replace products, so that the project performance and schedule are not impaired.
- C. Store and handle PC sleepers at the construction site in a manner to prevent damage and deterioration.

PART 2: PRODUCTS

2.01 GENERAL

All goods and products covered by this specification shall be procured, when available, from a domestic manufacturer. Procurement of the products manufactured out-of-country shall be approved by the Engineer in advance.

2.02 TYPE OF SLEEPERS

PC sleepers shall be of types in accordance with Table 207-1.

Table 207-1

Type	Location to be Used
1	Straight Track
2	Curved Track

2.03 MATERIAL

A. CONCRETE

- 1) Cement: Cement shall be in accordance with high early strength Portland cement as specified under JIS R 5210 (Portland Cement) or equivalent standards.
- 2) Aggregate: Aggregate shall be clean, hard, durable and shall have adequate gradation, and be free from dirt, mud, organic materials detrimental to the aggregate.

Maximum size of aggregate material shall be limited to 25 mm, and beach sand shall not be used in general.

3) Water: Water to be used for cooling and/or washing aggregates and for mixing and curing concrete shall be clean and free from injurious amounts of oil, acid, salt, alkali, organic matter or other deleterious substances.

4) Concrete Strength

Standard design strength of concrete shall be 500 kg/cm².

B. TENDONS

1) Tendons shall be of deformed steel wire and shall comply with the requirements as specified under JIS G 3502 or equivalent standard. Tendons shall be treated with patenting, cold-worked, and blowing shall be performed to eliminate residual stress (internal stress) at final process stage. The finished quality shall be in accordance with Table 207-2.

Except as specified hereunder, tendons shall be in accordance with JIS G 3536 (Tendons) or equivalent standards.

Table 207-2

Designation (mm)	Standard Diameter (mm)	Tensile Load (kg)	Load Against 0.2% Permanent Elongation (kg)	Elongation (%)	Relaxation (%)
2.9 x 3	2.9	over 3,900	over 3,450	over 3.5	under 3.5

C. STEEL WIRES

Steel wires shall be of ordinary steel wires as specified under JIS G 3532 (Steel Wires) or equivalent standards.

PART 3: EXECUTION

3.01 MANUFACTURING REQUIREMENT

A. RELATIVE POSITION OF MOLD AND TENDONS:

Deviation in relative position of mold and tendons shall be less than 2 mm.

B. PREPARATORY TENSIONING OF TENDONS:

Preparatory tensioning with tensile force of 3,200 kg plus minus 950 kg shall be made to the tendons.

C. TENSIONING FORCE OF TENDONS:

Following both ends of tendons have been firmly anchored, tensile force to be imparted to tendons shall be 2,930 plus 50 kg and 3,155 plus 50 kg per each piece of wire where atmospheric curing and high pressure steam curing are respectively taken place. However, where steam curing is made with the device under which the tensile force of tendons is not adversely affected by the curing temperature, tensile force to be used for atmospheric curing shall be used.

D. CURING:

When high pressure steam curing is made, steam with sufficient moisture content shall be used, and heating shall not start until at least 3 hours have elapsed after concrete mixing work. Change in temperature shall be limited to less than 15 degrees C per hour, and maximum temperature shall be less than tensioned tendon's temperature plus 40 degrees C and be less than 60 degrees C.

E. CONCRETE COMPRESSIVE STRENGTH WHERE PRESTRESS PERMISSIBLE:

Concrete compressive strength shall be not less than 400 kg/cm² where prestress is permissible.

F. TREATMENT TO SLEEPER ENDS:

Sleeper ends shall be true to the line such that part of tendons will not protrude from the face of ends, and be treated with adequate corrosion resistant materials.

G. FINISH:

PC sleepers shall be free from deflection, torsion, bending, unevenness of the rail-seat, aggregate materials exposed to weather, air voids above the surface and damage to the solid angles.

Embedded materials shall be securely placed in the concrete and there shall be no spalling, segregation or other defects.

3.02 TESTING

A. CONCRETE COMPRESSIVE STRENGTH TEST:

Cylindrical test specimen, size of which 10 x 20 cm shall be used for the test, and compaction of concrete shall be made in the same conditions as applicable to the sleepers.

Curing of the test specimen shall be standard curing when design standard strength is verified and curing under the same conditions as sleepers when testing is made to verify the timing where prestress permissible to the concrete.

B. TESTING OF SLEEPERS:

1) Bending Guaranteed Strength Test

The test shall be performed in accordance with Fig. 207-1, and load as specified in Table 207-3 shall gradually be applied.

Table 207-3

Type	Rail-Seat, Cross-Section Lower Edge	Center, Cross-Section Upper Edge	Lower Edge
1	8.2	5.5	4.3
2	7.9	6.4	5.0

2) Bending Destruction Strength Test

The test shall be performed in accordance with Fig. 207-1.

Bending destruction load shall exceed the value as below:

Position Span Type (mm)	Rail-Seat Cross-Section Lower Edge (ton)	Center Cross-Section Upper Edge (ton)
1 600	13.9	9.6
2 600	12.7	11.2

3.03 INSPECTION

A. CONCRETE COMPRESSIVE STRENGTH

1) Compressive Strength shall be in accordance with the following:

- a. Where verifying the standard strength, inspection shall be performed more than once in every 4 hours for concrete mixing work, unless otherwise the proportion of concrete mixture is modified.

Inspection shall be performed whenever the proportion of concrete mixture is modified.

- b. Where verifying the concrete compressive strength where prestress permissible, inspections shall be performed more than once for each group of sleepers to be tensioned.

2) Determination of Acceptance

Where the minimum compressive strength of 3 test specimens meet the requirements as specified in Section 2.03, 3) and 2.04 E, the whole of lot represented by the 3 test specimens shall be considered to be acceptable.

B. SLEEPER BENDING GUARANTEED STRENGTH

Inspection for the above strength shall be made to one unit selected from a lot consisting of prestressed sleepers simultaneously. Whenever the selected unit met the requirement as specified in Section 3.02,B,2) the whole of the lot represented by the selected unit shall be considered to be acceptable.

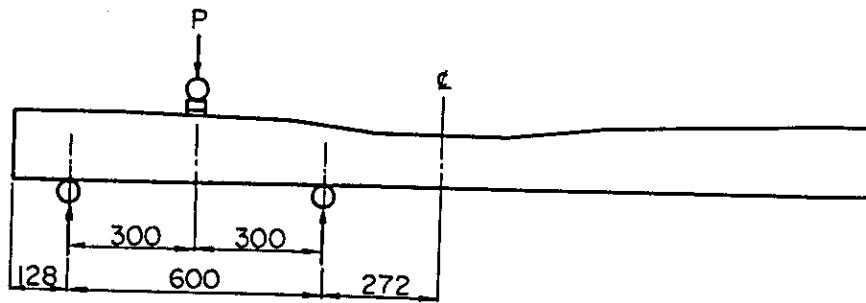
C. SLEEPER BENDING DESTRUCTION STRENGTH

Inspection for the above strength shall be made to one unit selected from a lot consisting of 1,000 units of sleepers manufactured in a sequence, and when the selected unit met the requirements as specified in Section 3.2, the whole of the lot represented by the selected unit shall be considered to be acceptable.

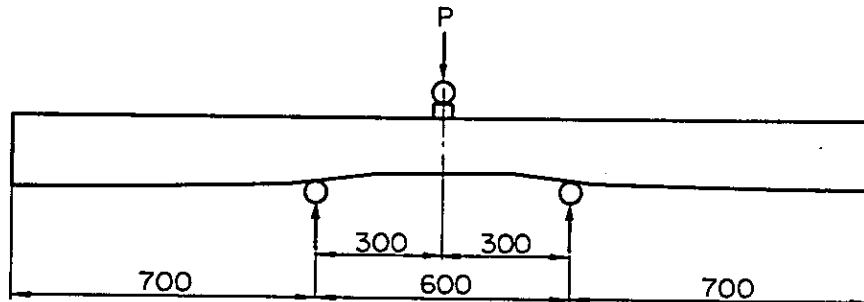
END OF SECTION

FIGURE # 1

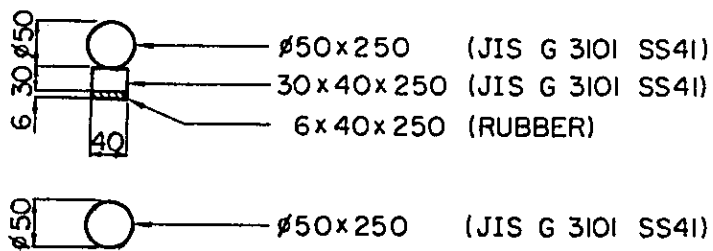
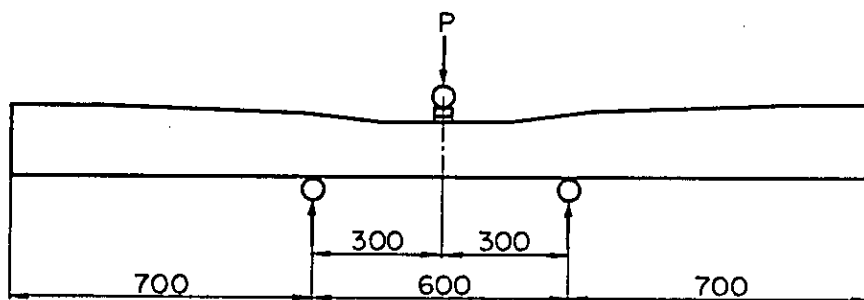
(i) RAIL-SEAT CROSS-SECTION LOWER EDGE TEST



(ii) CENTER CROSS-SECTION UPPER EDGE TEST



(iii) CENTER CROSS-SECTION LOWER EDGE TEST



208 - BALLAST

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208 - BALLAST

PART 1: GENERAL

1.01 DESCRIPTION

This specification covers the furnishing and delivering of railroad ballast materials to be provided for laying the track at the locations as specified, and other significant physical properties of railroad ballast.

1.02 APPLICABLE CODES AND STANDARDS

The following codes and standards are intended to provide an acceptable level of quality for materials and products. The Contractor may propose alternate codes and standards provided they given an equivalent degree of quality as the referenced codes and standards and are submitted for the Engineer review and approval in advance of their use.

ASTM - American Society for Testing and Materials

- | | |
|--------------------|---|
| C 29-78 | Unit Weight and Voids in Aggregates, Test for. |
| C 88-76 | Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate, Test for. |
| C 117-76 | Materials Finer Than No. 1200(76-um) sieve in Mineral Aggregate by Washing, Test for. |
| C 131-76 | Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine, Test for. |
| C 136-76 | Sieve or Screen Analysis of Fine and Coarse Aggregates, Test for. |
| C 142-78 | Clay Lumps and Friable Particles in Aggregates, Aggregates, Test for. |
| C 535-69
(1975) | Resistance to Abrasion of Large Size Coarse Aggregates by Use of the Los Angeles Machine, Test for. |
| C 851-76 | Scratch, Hardness of Coarse Aggregate Particles, Rec. Practice for Estimating. |
| D 75-71
(1978) | Aggregates, Sampling. |

E 11-70 Wire-Cloth Sieves for Testing Purposes,
(1977) Spec. for.

1.03 REFERENCE

Related Work in Other Section

Section 209 TRACK LAYING WORK

PART 2: PRODUCTS

2.01 GENERAL

Products required under these specifications shall be, where available, procured from a domestic manufacturer or supplier. Products proposed for this work shall be determined by the Contractor to be in compliance with these specifications, and by way of his submittals.

Proposed products are subject to approval by the Engineer.

2.02 MATERIAL

Prepared ballast shall be crushed stone, composed of hard, strong and durable particles, free from injurious amounts of deleterious substances and conforming to the requirements of these specifications.

2.03 QUALITY REQUIREMENTS

A. Deleterious substances shall not be present in prepared ballast in excess of the following amounts:

- Soft and friable pieces 5 percent
- Material finer than 0.075 (No. 200) sieve 1 percent
- Clay lumps 0.5 percent

B. The percentage of wear of prepared ballast, tested in the Los Angeles machine, shall not be greater than 28 percent except as otherwise specified by the Engineer.

2.04 GRADING REQUIREMENTS

A. The grading of prepared ballast shall be determined by test with laboratory sieves having square openings and conforming with ASTM E 11.

B. Crushed stone for prepared ballast shall conform to the following requirements for grading:

Amounts Finer Than Each Sieve
(Square Opening Laboratory Sieves)

Percents by Weights

mm	63	509	38	25	19	12.5	9.5	4.8
(inch)	<u>(2 1/2)</u>	<u>(2)</u>	<u>(1 1/2)</u>	<u>(1)</u>	<u>(3/4)</u>	<u>(1/2)</u>	<u>0-10</u>	<u>0-5</u>
	100	95-100	60-90	22-55	10-40	5-20		

2.05 HANDLING

Prepared Ballast shall be handled at the producing plant in such a manner that it is kept clean and free from segregation. It shall be loaded only into cars which are in good order, tight enough to prevent leakage and waste of material, and which are clean and free from rubbish or any substance which would fould or damage the ballast.

2.06 INSPECTION

If material loaded, or being loaded, does not conform with these specifications, the Contractor shall stop further loading until the fault has been corrected and shall dispose of all defective material outside the limits of the project.

2.07 TESTING

Determinations of deleterious substances, resistance to abrasion and soundness shall be made at an approved testing laboratory, and visual inspection and gradation tests shall be made at the place of production prior to shipment as often as considered necessary.

Samples of the finished product for gradation and other required tests shall be taken from each 200 tons of prepared ballast, unless otherwise approved.

Each sample shall be representative and shall weigh not less than 50 kg.

2.08 METHOD OF TEST FOR BALLAST

- A. Samples shall be secured in accordance with ASTM D 75.
- B. Sieve analysis shall be made in accordance with ASTM C 136.
- C. Material finer than the 0.075 mm (No. 200) sieve shall be determined in accordance with ASTM C 117.
- D. The percentage of soft particles shall be determined in accordance with ASTM C 851.
- E. The percentage of clay lumps shall be determined in accordance with ASTM C 142.

- F. The resistance to abrasion shall be determined in accordance with ASTM C 131 or C 535, using the standard grading most nearly representative of the size of ballast specified.
- G. Soundness tests shall be made in accordance with ASTM C 88.
- H. The weight per cubic foot shall be determined in accordance with ASTM C 29.

END OF SECTION

209 - TRACK LAYING WORK

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209 - TRACK LAYING WORK

PART 1: GENERAL

1.01 DESCRIPTION

This section covers the requirements for installation of track materials, i.e. rails, prestressed concrete sleepers, wood sleepers, ballast and related rail accessories.

Track laying work shall include all field surveys and measurements necessary to lay out the work; and other incidental operations necessary to complete the required track work.

Prior to commencement of the work, the Contractor shall prepare a well-planned work schedule.

The Contractor shall supply and transport all required track materials to the jobsite, and materials not approved by the Engineer shall not be used in the work.

The base for track laying work shall be provided at the location as shown on Fig. 209-1, and layout of the base shall be approved by the Engineer in advance.

The Contractor shall submit to the Engineer for approval a transportation plan for the track materials in advance. The route of transportation of the materials is as shown on Fig. 209-2.

The Contractor shall provide all labor, tools and equipment necessary for the work.

Tools and equipment as used for the work shall be handed-over to PJKA after completion of the work.

The Contractor shall be responsible for the quality of the work at all times.

The Contractor shall furnish competent and well qualified engineer(s) and/or supervisor(s) for the work to meet the requirements of this specification.

No track shall be laid, and no track materials shall be placed on the subballast unless otherwise they are in the conditions as required.

1.02 PREPARATION FOR LAYING RAILS

- A. Sleepers and track panel shall be placed on the lower ballast in centers in main tracks, sidings, and yard tracks. The sleepers shall be laid at right angles to the rails with the ends lined uniformly as are specified.

Upon unloading of the sleepers from the carriers, care shall be exercised such that the sleepers will not be damaged.

- B. The wood sleepers shall have been properly adzed as necessary prior to treating such as to give the tie plates full bearing when the rail is placed at proper gauge.
- C. The bottom of the rail, tie plates and bearing surface of the sleeper shall be cleaned before rail is laid.

All newly adzed surface of wood sleepers shall be coated with approved preservative materials prior to laying the rail and rail accessories.

PART 2: PRODUCTS

(Not applicable)

PART 3: EXECUTION

3.01 LAYING RAILS

Tie plates shall be applied to the rail in a workmanlike manner and shall be placed such that the shoulder is in contact with the base of rail for the entire length of the shoulder, and shall be centered on the sleeper.

Wooden sleepers shall be drilled and tie plates shall be fastened with four (4) sleeper screws for each rail.

At the tracks at sidings, rails shall be fastened with the wood sleepers directly by two (2) track bolts.

All sleeper screws shall be driven vertically and square with the rail. In no case shall the sleeper screws be overdriven, or less-driven.

Removal of sleeper screws once driven shall be avoided whenever possible. When sleeper screws are removed, the holes shall be plugged with treated tie plugs of proper size to completely and securely fill the hole.

Approved expansion shims shall be used to provide the proper opening between rails, and a rail thermometer shall be used to determine the thickness of shims in accordance with Diagram of Joint Gap attached herewith in Appendix 1.

Necessary gauging shall be done at the time of laying the rails is laid and, unless otherwise provided, the gauge shall be 1,067 mm between points 16 mm below the top of rail on the two inside edges of the rails.

Cutting of rails shall be done by sawing and the end surface of rail shall be right angled to the longitudinal axis of rail. No holes shall be burned in rail under any circumstances. When drilling is necessary all chips and burrs shall be removed before applying joints.

Rails to be laid on curved track shall be properly bent in advance.

All joints shall be fully bolted and fitted with approved spring washers.

Upon fastening the rail joints, grease coating shall be made on the web of the rail where fishplate contacts, and bolt holes of the fishplate shall be coated by lubricating oil.

All joints shall be tightened in such a manner that surface of the rail will become flat and smooth.

Insulated joints shall be installed as required and approved.

Joints in opposite rails shall be squared. In laying rails on curves care shall be taken to put in short rails of proper length in the inner rail to maintain the joint square. The tolerance shall be less than 100 mm apart.

Joints in opposite rails on curved tracks or other special places may be staggered if necessary, not less than 4 m apart, except as closer joints may be required at insulated joints or turnouts.

Insofar as possible all joints should be kept out of street and road crossings.

On curves, the outer rail shall be given superelevation in accordance with the drawings. The superelevation shall be decreased gradually over the length of transition curve.

Turnouts and crossovers shall be located as indicated. Frog, switch, and guard-rail assemblies shall be complete. Stock rails shall be accurately bent. Except where directed otherwise, switch machines shall be on the closed-point side when the switch is set in normal position. Switches shall be adjusted properly. Turnout fixtures shall be swabbed with oil.

3.02 WELDING OF RAILS

Welding of rails shall be performed by thermit welding. The welded parts shall be made flat and smooth by hot scarfing and grinding as required.

Length of Rails: Standard length of rails is 100 m (4 x 25 m, welded) formed together. When necessary, short rails not less than 5 m may be used.

3.03 APPLICATION OF BALLAST

- A. Ballast distribution: shall be to the depth indicated and may be either from automotive equipment or railroad cars. Care shall be taken when distributing ballast from automated equipment to prevent forming of ruts that would impair proper roadway drainage.
- B. Preliminary surfacing: The preliminary alignment and surfacing gangs shall follow the unloading of the ballast. The track, after being aligned, shall be brought to grade and surface in lifts not exceeding 150 mm each. After each lift, the ballast shall be tamped. When using jacks, they shall be placed close enough together to prevent undue bending of rail or stress of rail and joint. Both rails shall be raised uniformly except where superelevation is required.

Ballast shall be power tamped under both sides of cross ties from each end to a point 380 mm inside each rail. The center shall be filled with ballast, but tamping shall not be permitted in the center between the above stated limits. Both ends of the cross ties shall be tamped simultaneously and tamping inside and outside of the rail will be done at the same time. Regardless of the kind of ballast or the kind of power tamper used, tamping tools shall be worked opposite each other on the same tie. Ballast under switch ties shall be tamped to the entire length of each switch tie. After tamping has been completed and the jacks removed, all ties pulled loose shall be re-bolted.

- C. Final surfacing: After preliminary surfacing has been completed, grade and line stakes shall be checked and the track aligned. Track shall be brought to grade and the ballast retamped in the manner described for preliminary surfacing except that the tamping distance inside the rail shall be decreased from 380 to 330 mm. The track shall be given a final lining conforming to the established track centers. The ballast shall then be dressed to the section indicated and the subgrade shoulders brought to line and surface.

3.04 TRACK IRREGULARITIES

When the Track is handed over to the Engineer, any track irregularities at unloaded condition shall be within the tolerance as follows:

-	Gauge	:	1064 mm - 1068 mm
-	Cross Level	:	6 mm
-	Twist	:	6 mm/5 m
-	Longitudinal Level	:	8 mm/10 m
-	Alignment	:	6 mm/10 m

3.05 DEVIATION FROM STANDARD STAKE

The deviation of the track center and the rail level from the permanent fixed stake shall be within the tolerance as follows:

Track Center	:	+ 4 mm
Rail Level	:	+ 5 mm

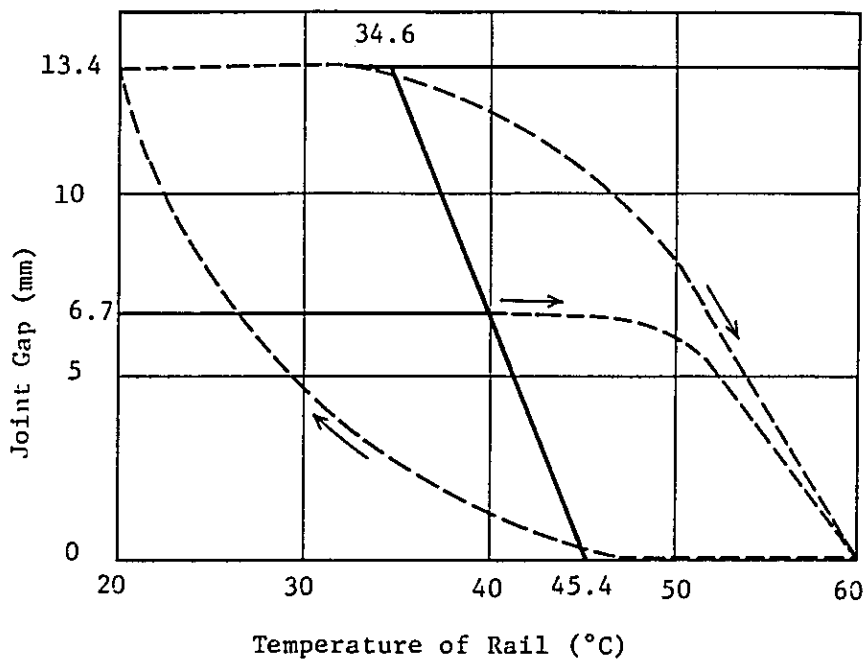
3.06 GUARANTEE

The contractor shall guarantee the track condition for the period of one year after its completion, covering the defects of materials, the deformation of track and the excessive track irregularities.

As to the rail welding, the defect shall be guaranteed for the period of two years. These defects shall be repaired and rectified at the contractor's own expense.

END OF SECTION

APPENDIX 1



————— Recommended Gap
- - - - - Retarded Contraction/Expansion

DIAGRAM OF JOINT GAP

210 - INSULATED RAIL JOINT

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210 - INSULATED RAIL JOINT

PART 1: GENERAL

1.01 DESCRIPTION

- A. Work Included: This section covers the furnishing, delivering and installation of insulated rail joints to be provided at the track in the locations as shown on the drawings or as specified. The Contractor shall furnish all labor, materials, tools and equipment to complete the work.
- B. Related Work in Other Section
Section 209 TRACK LAYING WORK

1.02 SUBMITTALS

The Contractor shall submit to the Engineer the following items for review and approval:

- A. Manufacturer's drawings and specifications.
- B. Certificate of compliance stating that the material used and construction of the insulated rail joint conform to all requirements of this specification.
- C. Certificate of testing including test data to show that all tests specified have been performed and all requirements have been met.
- D. Catalogue data showing illustrations and schedule of parts to facilitate assembly and disassembly of the insulated rail joint assemblies and ordering of replacement parts.

1.03 PRODUCT HANDLING

- A. Provide packaging as required for shipment of insulated rail joint assemblies to the installation site.
- B. Inspect insulated rail joint at time of delivery for shipment damage and for compliance with specifications.
- C. When damaged equipment that will require repair or replacement, or equipment that does not comply with specification is found, immediate action shall be taken to repair or replace equipment, so that the project's performance and schedule are not impaired.
- D. Store and handle insulated rail joint assemblies at the construction site in a manner to prevent damage and deterioration.

PART 2: PRODUCTS

2.01 GENERAL

- A. All goods and products covered by this specification shall be, when available, procured from a domestic manufacturer or supplier. Procurement of all goods and products manufactured out-of-country shall be approved by the Engineer.

2.02 MATERIALS

- A. The materials required shall be manufactured such that upon delivery they are essentially ready for installation and do not require further conditions and uses intended.

The Contractor shall be responsible for providing the quantities of materials as are needed to carry out the work required under this Contract as based upon the configurations and extent indicated on the Contract drawings.

- B. Components: Insulated rail joint assemblies shall consist of the following:

Insulator: End Post
 Plates (left and Right)
 Tube with Flange

Metallic Part: Fishplate
 Bolt & Nut
 Plain Washer
 Spring Washer

- C. Materials of insulator shall be as follows:

- 1) End post shall be made of plastic laminated fiber (PLF).
- 2) Plates (left & right) shall be made of polyamide resin.
- 3) Tube shall be made of reinforced poly-carbonate (RPC).
- 4) Flange shall be made of epoxy resin glassfiber (EPG).

- D. Properties of insulated portion shall conform to the Table 210-1.

T a b l e 210 - 1

Properties	Conditions and Treatment	Unit	Performance			
			P.L.F. below 5	Polyamide Resin below 3	R.P.C. below 1	E.P.G. below 1
Coefficient of water absorption	24 h immersion	%	over 15	over 15	over 15	over 20
Volume resistivity	After water absorption test	M cm	Over 6	over 5	over 6	over 25
Tensile strength	Room temp. and humidity After 24 h immersion After heating to 60 degree C, After cooling to -30 degree C	Kgf/cm ²	over 4 over 4 over 5 over 3	over 220 over 240 over 210 over 150	over 40 over 40 over 60 over 20	
Elongation	Room temp. and humidity After 24 h immersion After heating to 60 degree C, After cooling to -30 degree C	%	over 35	over 35	over 35	over 50
Pressure durability	Room temp. and humidity After heating to 60 degree C, After cooling to -30 degree C	Kgf/cm ²	20 - 40	50 - 65	40 - 60	
Compressibility	Room temp. and humidity After heating to 60 degree C, After cooling to -30 degree C	%	over 50			over 70
Charpy impact strength	Room temp. and humidity After cooling to -30 degree C	Kgfc/cm ²	85 - 105	60 - 90	70 - 90	over 40
Hardness	HB (1) HRM (2) HRR (3)		No significant appearance changes (cracks, blisters, etc.)			
Heat and cold resistance	60 degree to - 30 degree C					

E. Properties of Metallic Components

- 1) The mechanical properties of fishplate shall conform to Table 210-2.

Table 210 - 2

Part	Yield Point Kgf/cm2	Tensile Strength kgf/cm2	Bending Test			
			Elongation %	Bending Angle	Inner Radius mm	Surface Hardness HB
Fishplate	over 31	52 - 65	over 23	180 Degree	16	150-200

- 2) The mechanical properties of bolts and nuts after heat treatment rails shall conform to Table 210-3.

For R54 rails, bolts shall be in accordance with JIS G4104 (Hex Bolts) and nuts shall be in accordance with JIS G4051 (Hex Nuts).

Table 210 - 3

Parts	Yield Point Kgf/cm2	Tensile strength kgf/cm2	Elongation %	Contraction %	Hardness	
					HB	HRC(4)
Bolt	over 95	over 110	over 10	over 40		32-39
Nut					262-341	27-37
Plain Washer						35-45

- 3) The mechanical properties of spring washers shall conform to Table 210-4.

Table 210 - 4

Parts	Setting Load Kgf/cm2	Test Load Kgf/cm2	Deflection cm	Hardness HRC
Spring Washer	16,000	9,550	over 0.4	40-50

2.03 FABRICATION

All parts shall conform to the required dimensions and shall be free from defects that will prevent proper functioning of the insulated joint.

The surfaces of parts shall be smooth and free of burrs, flaws, cracks, strains spallings and warps.

The surfaces of the spring washers shall be smooth and free of heavy decarburization, roughing and burr.

2.04 TECHNICAL REQUIREMENTS

- A. Rails shall be plastic laminated products made from natural or artificial fibers, thermally pressure molded with thermosetting and thermoplastic resins.
- B. The polyamide resin for plates shall be made of caprolactam humidity-conditioned after molding.
- C. R.P.C. shall be a polycarbonate resin having a molecular weight of over 30,000 and reinforced to an opaque tincture with approximately 1 % polyethylene resin.
- D. E.P.G. shall be a plastic laminated type based on plain-woven glass cloth laminated with epoxy resin and thermally molded under pressure.
- E. Tubes shall be heat treated after molding.
- F. Ends and inner and outer diameter edges of natural and flanged tubes shall be chamfered.
- G. For flanged tubes, the flange shall be made of E.P.G. and the tube of R.P.C. both secured together by insertion molding. Washers shall be made of E.P.G.
- H. Fishplate shall be normalized after forging.
- I. Nuts shall be hex nut (Whitworth threaded), of JIS 0210 Class 3 (nuts), and seat and top surface roughness shall be 25-S of JIS B 0601 (surface roughness).
- J. Bolts shall be hex bolt (Whitworth threaded), JIS 0206 Class 3 (bolts).
- K. Bolts and nuts for 54 kg rails shall be quenched and tempered after molding.
- L. Plain and spring washers shall be quenched and tempered after molding.
- M. Bolt holes in fishplate shall be chamfered.
- N. Inner and outer edges of plain washers shall be chamfered.
- O. Cut faces, holes, threads, etc. of metal components shall be cleared of burrs formed by machining and the surfaces to be in contact with insulators shall be finished properly.

2.05 TEST METHODS

Test methods shall conform to JIS K 6911.

2.06 MARKING

Insulated joint bars, rails and plates shall be marked with type, year of manufacture and name of manufacturer or trademark, bolts with year of manufacture and name of manufacturer or trademark and tubes with type and name of manufacturer or trademark. For other smaller parts, markings may be omitted.

The plates having different right and left sides shall be provided with a red mark on the right and blue mark on the left.

Spring washers shall be provided with a white mark on the surface (convex side).

PART 3: EXECUTION

3.01 INSPECTION

- A. The Contractor shall inspect insulated rail joint assemblies prior to installation to verify that materials are in conformance to this specification.
- B. The Contractor shall check and correct all defects before proceeding with installation of insulated rail joint assemblies.

3.02 INSTALLATION

The insulated rail joint assemblies shall be capable of assembly in a workshop or directly in the railway track. The Contractor shall install the required units in accordance with the reviewed manufacturer's written installation instructions and reviewed shop drawings.

3.03 TESTING

When the assembly is completed electrical insulation between the rail ends shall be tested.

3.04 WORKMANSHIP

Materials, products and equipment furnished by the Contractor, shall be installed and all work shall be performed in a first-class workmanlike manner, in conformity with the best trade practices and the printed directions of the applicable manufacturer's by skilled workers equipped to produce satisfactory results; in a safe, substantial manner so as to avoid undue stresses, rigid enough to prevent undue movement, so as not to interfere

with work of other trades and so as to present a neat, orderly appearance and to facilitate operating, servicing, maintaining and repairing.

END OF SECTION

211 - TRACK BLOCKS

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211 - TRACK BLOCKS

PART 1: GENERAL

1.01 DESCRIPTION

A. This section covers the furnishing, delivering and installation of precast Portland Cement concrete track blocks of the types and in the quantity required for level crossings at the locations as specified. The Contractor shall furnish all labor, materials, tools and equipment required to complete the work.

B Related Work in Other Sections

Section 014 ASPHALT CONCRETE CONSTRUCTION

Section 019 CONCRETE REINFORCEMENT

Section 021 PORTLAND CEMENT CONCRETE

1.02 SUBMITTALS

The Contractor shall submit to the Engineer the following items for review and approval:

A. The manufacturer's drawings and specifications.

B. Certificate of compliance stating that the material used and construction of the track blocks conform to all requirements of this specification.

C. Certificate of testing including test data to show that all tests specified have been performed and all requirements have been met.

D. Catalog data showing illustrations and schedule of parts to facilitate assembly and disassembly of the track blocks and ordering of replacement units.

1.03 PRODUCT HANDLING

A. Provide packaging as required for shipment of track blocks to the installation site.

B. Inspect track blocks at time of delivery for shipment damage and for compliance with specifications.

C. When damaged piece that will require repair or replacement, or unit that does not comply with specification is found, immediate action shall be taken to repair or replace units, so that the project's performance and schedule are not impaired.

- D. Store and handle track blocks at the construction site in a manner to prevent damage and deterioration.

PART 2: PRODUCTS

2.01 GENERAL

- A. All goods and products covered by these specifications shall be, when available, procured from a domestic manufacturer or supplier.

Procurement of all products manufactured out-of-country shall be approved by the Engineer.

- B. Track blocks for installation of level crossing consist of reinforced concrete blocks, pre-assembled fastening devices and other pertinent accessories as shown on the drawing.

2.02 TYPE OF TRACK BLOCKS

- A. Type of track blocks are classified as follows:

- End Block
- Middle Block
- Joint Block

- B. Shape and dimensions of the track blocks shall be in accordance with the drawings.

- C. Prestressing members shall consist of the following components:

- Prestressing steel bars of 23 mm in diameter
- Fixtures
- Coupler

- D. Fastener for R54 rails shall consist of the following components:

- Tie Plate
- Rail Pad and Tie Pad
- Clip
- Bolt and Nut
- Chock
- Coil Spring and V Spring
- Plain Washer
- Plug

2.03 MATERIALS

- A. Materials to be used for track blocks shall be as follows:

- 1) Cement and coarse aggregate shall refer to Section 021, Portland Cement Concrete.

- 2) Steel reinforcing bar shall refer to Section 019, Concrete Reinforcement.
- 3) Uncoated high-strength steel bar for prestressing concrete shall be in accordance with ASTM A722.
- 4) Duct and inlet shall be ferrous metal, galvanized and cast into the precast concrete block segments.

B. Materials to be used for accessories shall be as follows:

- 1) Tie pad and rail pad shall be made of mainly natural rubber or synthetic rubber of good quality, and shall be moulded by vulcanization. Tie pad shall have tensile strength of more than 120 kg/cm² and elongation of 250%.² Rail pad shall have tensile strength of 100 kg/cm² and elongation of 30%.
- 2) Bolt and nut shall be in accordance with ASTM A6 entitled "GENERAL REQUIREMENT FOR ROLLED STEEL PLATES, SHAPES SHEET PILING AND BARS FOR STRUCTURAL USE".
- 3) Coil spring shall be in accordance with ASTM A682 entitled "STEEL, HIGH-CARBON, STRIP, COLD ROLLED SPRING QUALITY, GENERAL REQUIREMENTS".
- 4) Clip and tieplate shall be in accordance with ASTM A220.
- 5) The detail of other materials for accessories shall be in accordance with manufacturer's specification.

2.04 FABRICATION

The track blocks and related accessories shall be manufactured in compliance with the manufacturers' specifications and drawings. Finished products shall have correct dimension and smooth surface without twist, detrimental crack and defects.

PART 3: EXECUTION

3.01 INSPECTION

The Contractor shall inspect track blocks prior to installation to verify that the materials are in conformance with this specification. The Contractor shall check and correct all defects before proceeding with installation of track blocks.

3.02 INSTALLATION

- A. The Contractor shall install the required materials in accordance with the following unless otherwise specified in manufacturer's installation instructions.

- 1) Backfill material and pre-installed concrete blocks shall be removed in the course of excavation operations.
- 2) An asphalt concrete bed of 100 mm depth shall be placed on the subbase, and shall be well compacted. The elevation of the surface shall be confirmed.
- 3) Each piece of the track blocks shall be carefully handled by a crane in a manner to preclude any damage to the track blocks.
- 4) Position, alignment and elevation shall be strictly confirmed.
- 5) Prestressing steel bars shall be placed through 5 holes in the track blocks. In the event the P.C. bars of more than 7,050 mm length used, the bars shall be connected with couplers.
- 6) After placing of the track blocks in proper positions as required, preliminary tension of approximately 5 tons per each bar shall be applied to the track blocks, and final tension of 20 tons per each bar shall be applied after fastening of the rails has been completed.
- 7) Asphalt concrete mixture shall be placed on previously installed asphalt concrete base and filled in an each space in both sides of the track blocks, tamped and finished using hand tools unless otherwise machine spreading is not possible.

3.03 WORKMANSHIP

Materials, products and equipment furnished by the Contractor, shall be installed and all work shall be performed in a first-class workmanlike manner, in conformity with the best trade practices and the printed directions of the applicable manufacturers' by skilled workers equipped to produce satisfactory results; in a safe, substantial manner so as to avoid undue stresses, rigid enough to prevent undue movement, so as not to interfere with work of other trades and so as to present a neat, orderly appearance and to facilitate operating, servicing, maintaining and repairing.

END OF SECTION

212 - TURNOUTS FOR R54 RAILS

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212 - TURNOUTS FOR R54 RAILS

PART 1: GENERAL

1.01 DESCRIPTION

A. This section covers the furnishing and installation of railroad turnout materials of the types and in the quantities necessary to complete the required track work in the locations and quantities shown on the drawings. The work shall include rail turnout assemblies, ballast, crossing timbers, fastening devices, and related work. The Contractor shall furnish all labor, materials, tools, and equipment required to complete the work. The general plan of turnouts are as shown on the Contract Drawings.

B. Related Work in Other Section

Section 209 TRACK LAYING WORK

1.02 SUBMITTALS

The Contractor shall submit to the Engineer the following items for review and approval:

- A. Manufacturer's drawings and specifications.
- B. Certificate of compliance stating that the material used and construction of the turnouts conform to all requirements of this specification.
- C. Certificate of testing including test data to show that all tests specified have been performed and all requirements have been met.
- D. Catalogue data showing illustrations and schedule of parts to facilitate assembly and disassembly of the turnouts and ordering of replacement parts.

1.03 PRODUCT HANDLING

- A. Provide packaging as required for shipment of turnouts to the installation site.
- B. Inspect turnouts at time of delivery for shipment damage and for compliance with specifications.
- C. When damaged equipment that will require repair or replacement, or equipment that does not comply with specification is found, immediate action shall be taken to repair or replace equipment, so that the project's performance and schedule are not impaired.
- D. Store and handle turnouts at the construction site in a manner to prevent damage and deterioration.

PART 2: PRODUCTS

2.01 GENERAL

All products covered by these specifications shall be, when available procured from a domestic manufacturer or supplier. Procurement of all products manufactured out-of-country shall be approved by the Engineer.

B. Type of turnouts shall be as follows:

- No. 12 turnouts shall be used for main tracks.
- No. 10 turnouts shall be used for sidings and branch lines.

2.02 COMPONENT

Turnouts comprise the following components:

- Switch Assembly (including switch rail, stock rail, slide plate and rigid brace)
- Frogs
- Closure Rails
- Accessories (including bolts, nuts, spring washers, joint bars, tie plates and fillers.)

2.03 MATERIALS

A. Materials to be used for switch rail and stock rail shall be in accordance with requirements in Section R54 rails.

B. Materials to be used for frogs shall be high manganese steel casting conforming to the requirements as specified below:

Tensile Strength	:	80 kg/mm ² min.
Elongation	:	40% min.
Bending Property	:	180 degrees (inside radius 25 mm)
Brinell Hardness	:	170 - 223 HB
Chemical Composition	:	Carbon: 0.90 - 1.20%
		Mangan: 11.0 - 14.0 %
		Silicon: 0.3 - 0.8 %
		Phosphorus: 0.05 % max
		Sulfur: 0.035 % max

C. Materials to be used for closure rails shall be in accordance with requirements in Section R54 rails.

D. Materials to be used for bolts and nuts shall be in accordance with ASTM A6 - ROLLED STEEL FOR GENERAL STRUCTURES.

- E. Materials to be used for spring washers shall be in accordance with ASTM A682 - PRING STEEL BARS.
- F. Materials to be used for joint bars shall be in accordance with ASTM A6 - ROLLED STEEL FOR GENERAL STRUCTURE.
- G. Materials to be used for tie plates shall be in accordance with ASTM A6 - ROLLED STEEL FOR GENERAL STRUCTURE.
- H. Materials to be used for fillers shall be in accordance with ASTM A6 - ROLLED STEEL FOR GENERAL STRUCTURE.

2.04 FABRICATION

- A. All foundry and machine work shall be in accordance with good practice for the class of work involved.
- B. All parts shall conform to the required dimensions and shall be free from defects that will prevent proper functioning of the turnout.
- C. All like parts of turnouts produced by the same manufacturer shall be interchangeable.
- D. Tongue rail for switch shall be made from special section rails of Section A, UIC 861-20 and be elastic type. The heel ends of tongue rails shall be shaped so as to ensure smooth connection with lead rails. Full consideration shall be made to ensure that the part were special machining for elasticity is required shall have sufficient strength.
- E. Frog shall be monoblock type.

2.05 FINISHING

- A. All castings shall be carefully cleaned of sand, fins, detachable oxide and shall be free from casting holes, gates and shrinkage heads. They shall be free of such defects as pipes, scales, blisters and shrinkage cracks which could affect adversely their suitability for use of their solidity. They shall present clean surface; any irregularities, traces of joints, casting fins, etc., being carefully ground off.

The running surfaces and their connecting fillets, fishing tables and all surfaces which make contact on assembly shall be to correct profile and gauge. If the Wnfinwwe so requires, the running edges and fishing tables shall be ground by machine.

Fishing holes shall be drilled and chamfered to 1 mm at the ends. Holes for sleeper screws and for elctrical connections may be cast undersize and then opened out to correct size.

2.06 DESIGN CONDITIONS

Train speed

	Main Line	Branch Line
1:12 Simple turnout	120 km/h max.	45 km/h max.
1:10 Simple turnout	"	30 km/h max.
1:12 Curved track turnout for inner direction	75 km/h max.	40 km/h max.
1:10 run-over type turnout	120 km/h max.	30 km/h max.

Maximum axle load: 16 tons.

Track gauge: 1,067 mm

2.07 ASSEMBLY AND INSPECTION

All turnouts shall be pre-assembled in a mill, and checked of conformity to permissible variation as specified below. Then they shall be marked as specified. After that they shall be knocked down and packed.

Permissible variation in an pre-assembled condition shall be as follows.

Item	Main Line	Branch Line	Remarks
Gauge	+ 1 mm	+ 2 mm	
Alignment	+ 1 mm	+ 2 mm	per 10 m in length
Cross Level	+ 2 mm	+ 2 mm	
Longitudinal Level	+2 mm	+ 2 mm	

2.08 SHIPPING REQUIREMENTS

Protection: The metal parts shall be protected against rust during long periods of storage, and by such methods and means as proposed and approved.

Irrespective of the method of protection adopted, the whole surface area, especially the machined sections, shall be covered with a protective coating.

Packing: Packing used for dispatch shall not have been previously used for any purpose which would result in damage to these materials.

The packages shall be sealed as necessary, and each package shall bear the following information as applicable, in clearly indelible characters on label firmly fixed to the package.

- Name or the mark of the supplier.
- Order number.
- Description of parts contained.
- Number and total weight of the parts.

2.09 MARKINGS

Each casting shall bear in relief, so as to be readily visible:

- The manufacturer's mark,
- the month of manufacture in Roman numerals and the last two figures of the year of manufacture,
- reference number (order number or such other symbol as the Engineer may require),
- the symbol of the rail profile and angle of crossing, or simply the crossing type symbol,
- the serial number by crossing type and an arrow showing the direction of pouring the metal.

These marks shall be cast in relief and shall be located as shown on the drawings submitted for approval by the Contractor; they shall be between 20 and 40 mm high.

PART 3: EXECUTION

3.01 INSPECTION

- A. The Contractor shall inspect turnouts prior to installation to verify that materials are in conformance to this specification.
- B. The Contractor shall check and correct all defects before proceeding with installation of turnouts.

3.02 INSTALLATION

- A. The Contractor shall install the required units in accordance with the reviewed manufacturer's written installation instructions and reviewed shop drawings.
- B. Two pieces of wood sleepers of 4 metre length shall be used where switching device is installed.

All the sleepers shall be drilled in a diameter of 16 mm and to a depth of 120 mm except for the sleepers required for installation of switch stands.

- C. The space between the sleepers shall be adjusted to a range of 600 mm.

- D. The space between the sleepers to be positioned in the center of lead rails shall be 420 mm.

3.03 WORKMANSHIP

Materials, products and equipment furnished by the Contractor, shall be installed and all work shall be performed in a first-class workmanlike manner, in conformity with the best trade practices and the printed directions of the applicable manufacturer's by skilled workers equipped to produce satisfactory results; in a safe, substantial manner so as to avoid undue stresses, rigid enough to prevent undue movement, so as not to interfere with work of other trades and so as to present a neat, orderly appearance and to facilitate operating, servicing, maintaining and repairing.

END OF SECTION

213 - RAILROAD SIGNS

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213 - RAILROAD SIGNS

PART 1: GENERAL

1.01 DESCRIPTION

Work Included: This section covers the furnishing, delivery and installation of various types of railroad signs to be provided at the locations as indicated to identify characteristic points along the track. The Contractor shall furnish all labor, materials, tools and equipment required to complete the work.

1.02 TYPE OF RAILROAD SIGNS

Railroad signs mainly comprise, but not be limited to the following:

- Distance Post (Kilometer Post)
- Grade Post
- Curve Post
- Station Post
- Bridge Post
- Speed Restriction Board
- Whistle Board
- Level Crossing Warning Sign

Where required, additional type or types of railroad signs shall be provided meeting requirements by the Engineer.

1.03 LOCATION OF SIGNS

Respective locations for installation of various types of railroad signs shall be in accordance with the existing rules and practice unless otherwise specifically directed by the Engineer.

1.04 DESIGN, SHAPE AND DIMENSIONS

Design, shape and dimensions of various types of railroad signs as required shall be in accordance with the existing signs as used in PJKA system.

1.05 SUBMITTALS

The Contractor shall submit to the Engineer the drawings and manufacturer's specification for the items and products as required for review and approval by the Engineer.

1.06 PRODUCT HANDLING

Provide appropriate packaging for various types of railroad signs as required for shipment to the installation site.

Inspect each railroad sign at time of delivery for shipment damage and for compliance with specification.

When damaged products that will require replacement, that does not comply with specification is found, immediate action shall be taken to replace products, so that the project's performance and schedule are not impaired.

Store and handle railroad signs at the installation site in a manner to prevent damage and deterioration.

PART 2: PRODUCT

2.01 GENERAL

All products as proposed shall be, when available, procured from a domestic manufacturer or supplier. Procurement of all products manufactured out-of-country must be approved by the Engineer.

2.02 MATERIALS

Concrete Foundation: Concrete shall be Concrete Class "F" as specified in Section "Portland Cement Concrete".

All necessary materials i.e. steel, wood, paint, etc. other than concrete as stated, for fabrication of the railroad signs shall be in accordance with the existing railroad signs in service.

PART 3. EXECUTION

3.01 FABRICATION

Fabrication shall be commenced after the approval has been obtained by the Engineer for the drawings and manufacturer's specifications previously submitted for review.

3.02 INSTALLATION

- A. Steel: Steel work shall be in accordance with Section, "STRUCTURAL STEEL".
- B. All other miscellaneous metal work shall be in accordance with Section, "METAL FABRICATION".
- C. Concrete work shall be in accordance with Section, "CAST-IN-PLACE CONCRETE".
- D. Painting work shall be in accordance with Section, "PAINTING".

3.03 WORKMANSHIP

Materials, products and equipment furnished by the Contractor, shall be installed and all work shall be performed in a first-class workmanlike manner, in conformity with the best trade practices and the printed directions of the applicable manufacturer's by skilled workers equipped to produce satisfactory results in a safe, substantial manner so as to avoid undue stresses, rigid enough to prevent undue movement, so as not to interfere with work of other trades and so as to present a neat, orderly appearance and to facilitate operating, servicing, maintaining and repairing.

END OF SECTION

214 - HYDRAULIC TRAIN STOPPER

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214 - HYDRAULIC TRAIN STOPPER

PART 1: GENERAL

1.01 DESCRIPTION

This section covers the furnishing, delivering and installation of Hydraulic Train Stopper to be provided at the location as specified. The Hydraulic Train Stopper shall mainly consist of stopper frame, stopper base, hydraulic damper, guide rails and other appurtenant accessories. The Hydraulic Train Stopper shall be of the manufacturer's standard type as shown on the drawing and as proven in the countries in the similar climatic conditions meeting the requirements in this specification.

The Contractor shall furnish all labor, materials, equipment and tools required to complete the work.

1.02 SUBMITTAL

The Contractor shall submit to the Engineer the following items for review:

- Certificates of compliance stating that the material used and construction of the Hydraulic Train Stopper conform to all requirements of this specification.
- Certificate of testing including test data to show that all tests specified have been performed and all requirements have been met.
- Catalog data showing illustrations and schedule of parts to facilitate assembly and disassembly of the Stopper and ordering of replacement parts.
- The manufacturer shall submit two complete sets of as-made drawings and reproducible original papers.
- The Contractor shall submit 5 copies of manuals describing maintenance and inspection method.
- The Contractor shall submit the tool list for routine maintenance provided for the Stopper.

1.03 PRODUCT HANDLING

Inspection shall be made to the stopper at time of delivery for shipment damage and for compliance with specifications.

When damaged stopper that will require repair or replacement, or equipment that does not comply with specification is found, immediate action shall be taken to repair or replacement equipment, so that the projects performance and schedule are not impaired.

PART 2: PRODUCTS

2.01 GENERAL

Products as required under this specification, shall be, when available, procured from a domestic manufacturer or supplier. Procurement of products out-of-country shall be approved by the Engineer.

Products to be furnished and installed under this specification shall be unused first grade commercial quality standard products of reputable manufacturer regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design that complies with the specification requirements.

2.02 DESIGN AND CONSTRUCTION

Design shall be made to meet the performance characteristics based on the design calculation as specified elsewhere in the Contract Documents. Construction of the proposed product shall be rigid steel structure and durable under environmental conditions similar to the locality.

2.03 PERFORMANCE CHARACTERISTICS

Proposed products shall conform to the performance characteristics as follows:

1. Maximum Train Weight: 464 tf
2. Train Speed (upon impact): Approx. 11 km/h
3. Braking Force: Force Equivalent to 2.88 km/h/s
4. Buffing Force: 50 tf
5. Buffing Stroke: 2.5 m

Size and dimensions shall be as shown on the drawing.

2.04 STOPPER BASE

Stopper base shall be constructed to withstand the forces as follows:

1. Compressive Force at Rear End: Approx. 53 ton
2. Resultant Upward Force at Front End: Approx. 0.25 ton
3. Horizontal Force on Rails: Approx. p=200 ton

* Horizontal Force p=200 shall mean to be maximum load considered for the emergency case to prevent train stopper and related structures from the damage when the impact was given by the train exceeding the specified conditions under which rolling stock will be damaged.

PART 3: EXECUTION

3.01 INSPECTION AT SITE

The Contractor shall inspect each stopper prior to installation to verify that they are in conformance with the specifications. Where any defects or damages found, the Contractor shall correct all defects before proceeding with installation.

3.02 ENGINEER(S) AT SITE

The Contractor shall dispatch competent engineer(s) to the required site where the engineer(s) shall be present upon re-assembly and installation of the stopper. The engineer(s) shall stay in the required location and/or site at least for two weeks until completion of the works as required.

END OF SECTION

215 - TRACK MOTOR CAR

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215 - TRACK MOTOR CAR

PART 1: GENERAL

1.01 DESCRIPTION

This section sets forth general requirements for track motor car to be provided for track laying work and maintenance of the track as specified elsewhere under the Contract documents.

The Contractor shall furnish all labor and materials to develop, furnish and deliver the track motor car to the locations as required.

The track motor car shall mean to include and cover hard and soft items and consumable materials at the case or cases require.

1.02 SUBMITTALS

The Manufacturer or Supplier shall submit to the Engineer for review the items listed herein. Submittals shall meet the requirements and be in quantities specified in the referenced documents. When not otherwise indicated, each submittal item shall be in duplicate copies or sets.

- Certificate of compliance stating that the material used and construction of the track motor car conform to all requirements of this specification.
- Certificate of testing including test data to show that all tests specified have been performed and all requirements have been met.
- Catalogue data showing illustrations and schedule of parts to facilitate assembly and disassembly of the track motor car and ordering of replacement parts.
- The Contractor shall submit 5 copies of manual describing maintenance and inspection method.
- The Contractor shall submit the tool list for routine maintenance provided in the track motor car, and for heavy repairing including special tools provided in the workshop separately.

1.03 INTERCHANGEABILITY

All components and parts having the same part number shall be functionally and dimensionally interchangeable, and shall be identical with respect to assembly, performance and quality.

1.04 WORKMANSHIP

Materials, products and equipment furnished by the Contractor, shall be installed and all work shall be performed in a first-class workmanlike manner, in conformity with the best trade practices and the printed directions of the applicable manufacturer's by skilled workers equipped to produce satisfactory results; in a safe, substantial manner so as to avoid undue stresses, rigid enough to prevent undue movement, so as not to interfere with work of other trades and so as to present a neat, orderly appearance and to facilitate operating, servicing, maintaining and repairing.

1.05 INSPECTION

The motor car will be finally inspected by the Engineer's authorized Representative during the testing stage and prior to packing and shipment. Such testing may be carried out independently or jointly with Contractor's factory inspectors or if applicable, in the factory of the Contractor's subcontractor.

1.06 WARRANTIES

The motor car shall be guaranteed for good performance for a period of 12 months after acceptance by the Engineer or 24 months from the date of Bill of Lading whichever comes first.

1.07 PRODUCT HANDLING

- A. Provide due protection as required for shipment of the motor car to the operation site.
- B. Inspect the motor car at time of delivery for shipment damage and for compliance with specifications.
- C. When damaged equipment that will require repair or replacement, or equipment that does not comply with specification is found, immediate action shall be taken such that performance and schedule are not impaired.
- D. Store and handle the motor car at the operation site in a manner to prevent damage and deterioration.

PART 2: PRODUCTS

2.01 GENERAL

Products to be furnished under this specification shall be unused first grade commercial quality standard products of reputable manufacturer regularly engaged in the production of such equipment and shall be the manufacturer's latest standards design that complies with the specification requirements.

2.02 PRINCIPAL PARTICULARS

A. The track motor car shall have the characteristics, configuration and vehicle performance as listed below.

The Contractor shall submit detailed information, specifications and drawings to demonstrate that the proposed vehicle meets these specifications.

B. Vehicle Configuration and Characteristics:

- Track Gauge : 1,067 mm
- Width : 2,700 mm approx.
- Height : 3,000 mm approx.
- Length : 7,350 mm approx.
- Wheel Base : 3,500 mm approx.
- Wheel Diameter: 760 mm approx.
- Tare Weight : 15 ton approx.
- Wheel Base : 3,500 mm approx.
- Driving : 2 Axles driven

<u>Track Grade</u>	<u>Traction Load</u>	<u>Speed</u>
Level	200 tons	Over 20 km/h
10/1,000	110 tons	8 km/h
20/1,000	85 tons	5 km/h
30/1,000	60 tons	8 km/h
50/1,000	23 tons	5 km/h
Speed without towing		50 km/h

Braking equipment

- Basic Braking Equipment : 1-wheel 1-cylinder link combination
- Manual Braking Equipment : Screw type rear-wheel braking
- Pneumatic Braking Equipment : Automatic continuous type

Operation control

- Cross Operation : (EA control system)

Driving System

Double propelling shaft driving system

Engine

Diesel Engine : 6-cylinder water cooled
Max. Output : 200 PS/2,200 rpm Approx.
Max. Torque : 78.5 kgm/1,400 rpm
Total Displacement : 12000 cc

Torque Converter

Working Pressure : 3 kg/cm²
Stall Torque ratio : approx. 2.8
Working Method : Wet multi-disc clutch system
Transfer Method : With electromagnetic valve
(forward/reverse, high/low)

Compressor

V-belt driven normally running type

Traction Equipment

Two-stage pin link coupler

Electrical

Charging Generator : 24V - 850W
Battery : 12V - 100 AH 4 pcs
Illumination : 1 set

Hydraulic Equipment

Hydraulic Pump : Gear type
Transfer Valve Type : Solenoid valve type

Turntable

Lift Capacity : 16 tons (Stroke 230 mm)

Freight Car Coupler

Height : 775 mm + 10 mm - 15 mm

Accessories

Engine Parts : 1 set

C. Control

The track motor car shall have a single operating control station located in the left side of the operator's cab facing forward. The following controls shall be grouped and equipped within easy reach of the operator:

1. Master control handle with throttle and reversing lever with interlock to prevent reversal while power is being transmitted to the driving gear.
2. Engine start pushbotton.
3. Engine stop switch.
4. Brake, bellringer, horn, and window wiper valves.
5. Emergency fuel shutoff.
6. Light switches, inside and outside operator's cab.
7. Headlight switch for each direction.

D. Painting

Painting shall be performed in accordance with currently approved painting procedures applicable to similar type vehicle. Recommended dry film thickness for each coating shall be not less than 25 microns.

The Contractor shall submit detail painting procedure including paint materials to the Engineer for approval prior to painting work.

E. Marking

The Contractor shall select most suitable color scheme and marking for signifying the motor car and submit to the Engineer for approval.

F. Special Tools

The Contractor shall provide one set of special tools in a tool box on board.

G. Accessories

The track motor car shall be equipped with necessary accessories such as warning horns, flashing light on roof and lights on both ends of the car for safety operations.

H. Human Factor Engineering

All controls required for the operation shall be within easy reach of the operator seated in his seat.

The operator shall have a clear view of the track (to front and rear).

I. Maintainability

All major assemblies and installed attachments shall be accessible for maintenance, repair or replacement. Covers or plates must be readily and easily removed for component adjustment, replacement or maintenance.

2.03 SHIPPING AND PACKAGING

Track motor car shall be fully erected prior to shipping and shipped in a manner such that rolling stock can be unloaded directly and placed on the track at the quay of the port of unloading. Where the units are loaded on the ship with the bogies, the bogies shall be stowed such that they can be unloaded before unloading of the main unit upon arrival. Other parts previously removed for shipping, and required for assembly at the quay shall be stowed such that they can be readily available as required. Component parts removed from the motor car should be shipped with the main unit of the motor car.

A method of packaging shall be furnished by the Contractor after the order has been placed by the Engineer.

The Contractor shall be fully responsible for safe and undamaged delivery of all articles to the Engineer.

PART 3: EXECUTION

3.01 INSPECTION AT SITE

- A. The Contractor shall inspect track motor car prior to hand-over to verify that they are in conformance with the specifications.
- B. The Contractor shall check and correct all defects before proceeding with hand-over of track motor car to the Engineer.

3.02 ENGINEER(S) AT SITE

The Contractor shall dispatch competent engineer(s) to the required site where the engineer(s) shall be present upon unloading, re-assembly, and preparation for inspection of rolling stock. The engineer(s) shall stay in the required location and/or site at least for six months after the arrival of rolling stock in the Republic of Indonesia.

END OF SECTION

216 - WOOD SLEEPER

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216 - WOOD SLEEPER

PART 1: GENERAL

1.01 DESCRIPTION

- A. Work included: This section covers the furnishing and delivering of wood sleepers to be provided at the track of the Indonesian State Railway (Perusahaan Jawatan Kereta Api, hereinafter referred to PJKA) and covers the requirement for quality of the wood material, manufacturing, tolerance on dimensions and related technical conditions for the supply of the products as required.

The Contractor shall furnish all labor, materials, tools and equipment to complete the work.

- B. Related Work in Other Section:

Section 209 Track Laying Work

1.02 APPLICABLE CODES AND STANDARDS

The following codes and standards are intended to provide an acceptable level of quality for materials and products. The Contractor may propose alternate codes and standards provided they give an equivalent degree of quality as the referenced codes and standards and are submitted for the Engineer review and approval in advance of their use.

UIC - International Union of Railways

- 863 0 Technical specification for the supply of non-treated track supports (wooden sleepers for standard and broad gauge track and crossing timbers)

AREA - American Railway Engineering Association

- Chapter 3 Ties and Wood Preservation

1.03 PRODUCT HANDLING

- A. Provide packaging as required for shipment of wood sleepers to the installation site.
- B. Inspect wood sleepers at time of delivery for shipment damage and for compliance with specifications.
- C. When damaged products that will require replacement, that does not comply with specification is found, immediate action shall be taken to replace products, so that the project's performance and schedule are not impaired.
- D. Store and handle wood sleepers at the construction site in a manner to prevent damage and deterioration.

PART 2: PRODUCTS

2.01 GENERAL

All products covered by these specifications shall be when available, procured from a domestic manufacturer or supplier. Procurement of all products manufactured out-of-country shall be approved by the Engineer.

2.02 MATERIALS

The wooden sleepers and turnout sleepers shall be of hardwood types similar to those as used in the existing track of PJKA or materials equivalent to the following unless otherwise directed by the Engineer:

Bangkirei	(Shorea Lacnifolia Eudsrt)
Kempas	(Koompassia malaconsia)
Keruing	(Dipterocarpus spp.)
Tualang	(Koompassia excelsa)
Kapur	(Dryobalanooops spp.)
Kulim	(Scorodocarps borneensis)
Mengkulang	(Heritiera spp.)

2.03 QUALITY AND CONDITION OF MANUFACTURE

The sleeper and turnout sleepers shall be properly formed, and free from injurious decay, pith and punky heart. Wood sleepers shall also be free from such shakes, splits, hollow knots, compression failure or other defects which, in the opinion of the inspector.

A. Ordinary Sleepers

The sleepers shall be of regular form and straight. The inner surface of the sleeper shall be trimmed by saw; however trimming with an axe may be permitted as long as the trimmed surface is sufficiently flat. The lateral surface, where these exist, and the upper surface, may be trimmed with an axe. Trimming of a surface shall extend for the complete length of this surface.

The lateral surface shall follow the grain of the wood and they shall meet the lower surfaces at approximately right angles.

The lower surface shall have a reasonably uniform width and sharp edges. Wane shall be tolerated on the upper surface provided that the width for the bored portion for the placing of the rail support is not less than that stipulated for the corresponding profile; the support surface shall extend for a length of 50 cm at distance of 50 cm on either side from the center to the sleeper.

Sleepers showing the horizontal plane, a single regular curve, the deflection of which does not exceed 8 cm, measured longitudinally, shall be accepted. Also accepted up to a maximum of 10 % of the total supply are:

- Single curve sleepers in which the deflection is between 8 and 10 cm;
- Sleepers presenting a double curve in the horizontal plane of which no deflection exceeds 5 cm.

Curvature in the vertical direction shall be cause for refusal if the deflection exceeds 0.5 cm.

Depth of a cup (curvature across the width) shall not be more than 0.6 cm.

Twist measured by string stretched diagonally on either side face shall not be more than 0.6 cm.

Both rail seats shall be free from knots of 2.5 cm diameter or over. One tight sound knot of less than 2.5 cm diameter may be permitted at the rail seat. Tight sound knots up to 7 cm diameter may be permitted away from the rail seats (rail support).

The ends shall be sawn reasonably perpendicular to the longitudinal axis of the sleeper; and a maximum obliquity of 2 cm shall be tolerated.

B. Joint Sleepers

Same as ordinary sleepers except that no deflection of curve in horizontal plane shall be allowed in joint sleepers.

C. Turnout Sleepers

Turnout sleepers shall be straight and of regular form. The upper and lower faces of the sleepers shall be trimmed by sawing; these surfaces shall be parallel.

The lateral surfaces may be trimmed with an axe so long as the surfaces are sufficiently regular and flat; these surfaces shall meet the lower surfaces approximately at right angles.

Wane shall not be tolerated on the lower surfaces. It is permitted on the upper surface so long as the minimum required bored section is maintained in the center section of the timbers at least up to 25 cm from each of the end surfaces.

Turnout sleepers showing in the horizontal plane a single regular curve whose deflection does not exceed 1.5% of the length, with a maximum of 5 cm may be accepted.

Curvature in the vertical direction shall be cause of irrevocable refusal if the deflection exceeds 0.5 cm.

Tolerances of cup and twist shall be 0.6 cm.

Both rail seats shall be free from knots of 2.5 cm diameter or over. One tight sound knot of less than 2.5 cm diameter may be permitted at the rail seat. Tight sound knots up to 7 cm diameter may be permitted away from the rail seats (rail support).

The ends shall be sawn approximately perpendicular to the longitudinal axis of the timber; an obliquity of 2 cm shall be tolerated.

2.04 ACCEPTABLE STANDARDS

Sleepers with a fissure which extends more than 25 cm on either side from one top surface, shall be rejected.

Sleeper with one or several fissures of a maximum length of 25 cm shall be accepted insofar as these cracks are or can be suitably closed in.

The suppliers shall, in due time, and at their own cost, fill in those sleepers showing fissures. For this purpose they shall use bolts, S-shaped hooks, hoops or gang nails. The equipment for closing in the sleepers shall be that adopted by the Railway of the manufacturing country. Before closing in, the timber shall be, if necessary, clamped under a press.

Any possible notches shall not be in the section for the rail supports and their depth shall not cause a reduction of more than 1/15 in the transversal section of the sleeper, and 1/5 of the height.

Notches shall only be permitted in the turnout sleepers if the bored section does not fall below the minimum prescribed.

2.05 FORMS AND DIMENSIONS

The dimensions shall be applicable to timber in the state in which it is found during acceptance by the Contractor's inspector.

The forms of sleeper cross-sections shall be in accordance with UIC 863-0.

2.06 PRESERVATIONS

Turnout sleepers shall be impregnated with preservatives.

A. Incising

Surface of four sides of turnout sleepers are subject to incising.

B. Impregnation

Impregnation process for turnout sleepers shall be made under the operating conditions.

The preservative used is a mixture of creosote and fuel oil, the ratio of creosote to fuel oil shall be at least 50:50 or richer.

2.07 MARKING NAILS

Marking nails shall be driven near the center of upper surface of the sleepers.

The nails shall be made of iron or steel, galvanized with a zinc coating.

The year of manufacture in two digits shall be indicated on the head of the marking nails

PART 3: EXECUTION

3.01 INSPECTION

The Contractor shall inspect each wood sleeper prior to installation to verify that the wood sleepers are in conformance with this specification.

3.02 INSTALLATION

Wood sleepers shall be installed in strict conformance with Tech. Spec. Section 209 "Track Laying Work".

END OF SECTION

217 - TRACK SPIKES

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217 - TRACK SPIKE

1.0 DESCRIPTION

Work Included: This section covers the furnishing and delivering of track spikes to be provided for track laying work as required at the locations of the Indonesian State Railway, Perusahaan Jawatan Kereta Api (hereinafter referred to as PJKA) and covers the requirement for quality of steel, manufacturing, tolerance on dimensions and related technical conditions for the supply of the products as required.

The materials required shall be manufactured such that upon delivery they are essentially ready for installation and do not require further cutting and fitting for the typical conditions and uses intended.

The Contractor shall be responsible for determining and providing the quantities of materials as are needed to carry out the work required under this Contract as based upon the configurations and extent indicated on the drawings by typical layouts and details, and in accordance with these specifications.

Installation of these materials is not a part of the requirements of this Section. Track laying work is covered under Technical Specification Section 209.

2.0 MATERIAL

Material of track spikes shall be rolled steel in accordance with JIS G 3101 or ASTM A36.

3.0 SHAPE AND DIMENSION

Shape and dimensions of track spike shall be in accordance with the drawing.

4.0 QUALITY

The track spikes shall be manufactured from rolled steel bar and the surface of track spike shall be smooth and free from defects such as harmful furrows, cracks, and fins.

Any bend or twist shall not exist in the shank, and the head and point shall be correctly formed.

5.0 FINISH

All finished spikes shall be straight, with well formed heads, sharp points and be free from injurious defects and shall be finished in a workmanlike manner.

Underside of the head of the spike shall stand being bent backwards to an angle of 115 degree without crack on the exterior of the bent portion.

6.0 DIMENSIONAL TOLERANCES

The dimensional tolerances shall be as follows:

Item	Tolerance	unit mm
Cross Section	+ or - 0.5	
Head	+ 2.5 or - 1.0	
Length under head to point	+ or - 3	
Length between top of head and under head	+ 2.0 or - 1.0	
Angle, under side of head	1 degree	

7.0 TEST REQUIREMENTS

The Contractor shall be responsible for determining and providing all necessary supervision, inspection, sampling, testing or otherwise controlling the manufacture such that the materials or items supplied comply with the requirements of these specifications.

Materials, or items, individually or in groups where so evaluated, not meeting the requirements of these specifications shall be rejected and not used for the work under this Contract.

All parts or pieces to be tested shall be suitably identified in an orderly manner.

8.0 MARKING

A letter or brand indicating the manufacturer shall be pressed on the head of each spike while it is being formed. When copper is specified, the letters "CU" shall be added.

9.0 SHIPPING REQUIREMENTS

Protection: The track spikes shall be protected against rust during long periods of storage, and by such methods and means as proposed and approved.

Irrespective of the method of protection adopted, the whole surface area, especially the machines sections, shall be covered with a protective coating.

Packing: Packing used for dispatch shall not have been previously used for any purpose which would result in damage to these materials.

The package shall be sealed as necessary, and each package shall bear the following information as applicable, in clearly indelible characters on label firmly fixed to the package.

- Name or the mark of the supplier.
- Order number.
- Description of parts contained.
- Number and total weight of the parts.

Maximum weight of packing for each shipment shall be limited to approx. two (2) metric tons.

END OF SECTION

PART E

BILL OF QUANTITIES

SCOPE AND MEASUREMENT

SCOPE AND MEASUREMENTS

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SCOPE AND MEASUREMENT

1. SCOPE OF WORK

1.01 GENERAL

A. The scope of work under this Contract Package II includes the furnishing of all labor, materials, supervision, tools and equipment, and technical and professional services, necessary for the construction of approximately 20 kilometers of track work for a single line railroad services as referred to "Cengkareng Airport Line" as part of Perusahaan Jawatan Kereta Api (PJKA) network; all in accordance with the conditions of Contract, drawings and specifications, for the following:

- Track laying work, including spreading lower ballast, installation of track panel assemblies and spreading and compacting upper ballast.
- Turnouts.
- Level crossings including installation of track blocks and wood blocks where applicable.
- Insulated rail joints.
- Railroad signs.
- Switching devices.

The work shall also include the following necessary work to complete the construction of track work base:

- Track laying work in the track work base with the materials furnished by the Employer; and shall include loading and hauling of the track materials from the designated station to the track work base.
- Levelling or grading work at stock-pile yard at the location as directed by the Engineer.
- Construction of warehouse(s) in the track work base.

B. For convenience in reference and control, the total work under this Contract is subdivided into major categories and groups as follows:

Groups under Package II

- (1) Track Materials
- (2) Equipment
- (3) Track Laying Work

1.02 WORK NOT INCLUDED

Within the Site of the Work

- Civil works for the railroad tracks to include subballast.
- Fencing.
- Cutting and repair of existing streets preparatory to construction of level crossings.

2. MEASUREMENT FOR PAYMENT

2.01 GENERAL

This section defines how pay items, enumerated in Bill of Quantities, are measured for payment. All lump sum items may be paid based on progress payment.

Abbreviations:

The following abbreviations have been used in the Bill of Quantities:

<u>Abbreviation</u>	<u>Full Meaning</u>
C.M.	cubic meter
S.M.	square meter
L.M.	lineal meter
No.	number
M.T.	metric ton
L.S.	lump sum

Work shall be measured net.

Item No. Title and Description for Scope and Measurement

GROUP 1: TRACK MATERIALS

- 1.01 R54 FLAT BOTTOM HEAD RAILS - shall consist of the supply and delivery of flat bottom head railway rails of the types and in the quantities necessary to complete the required track work; exclusive of installation; and shall include:
- a. Standard Type, 25 m length
 - b. R3 Compromise Rail
- shall be measured by metric ton of the rail material actually placed in the completed track work.
- 1.02 FISHPLATE AND ACCESSORIES - shall consist of the supply and delivery of rolled steel fishplates, steel bolts, nuts and spring washers of the types and in the quantities necessary to complete the required track work; exclusive of installation.
- shall be measured by count of the individual set actually placed in the completed work.
- 1.03 INSULATED JOINT FOR R54 RAILS - shall consist of the supply and delivery of insulated rail joint assembly of the type and in the quantity necessary to complete the required track work; exclusive of installation.
- shall be measured by count of the individual set of insulated rail joint assemblies actually placed in the completed track work.
- 1.04 P.C. SLEEPERS FOR R54 RAILS - shall consist of the supply and delivery of P.C. sleepers of the type and in the quantity necessary to complete the required track work, exclusive of installation.
- shall be measured by count of the individual number of units actually placed in the completed track work.

<u>Item No.</u>	<u>Title and Description for Scope and Measurement</u>
1.05	<p>WOOD SLEEPERS FOR R54 RAILS - shall consist of the supply and delivery of wood sleepers of the types and in the quantities necessary to complete the required track work, exclusive of installation, and shall include:</p> <p>a. Wood Sleepers for Rail Joints.</p> <p>b. Wood Sleepers for Through Plate Girders.</p> <p>- shall be measured by count of the individual number of units actually placed in the completed track work.</p>
1.06	<p>FASTENING DEVICES FOR R54 RAILS - shall consist of the supply and delivery of fastening devices of the types and in the quantities necessary to complete the required track work; exclusive of installation; and shall include:</p> <p>a. For P.C. Sleepers - Elastic fastening clips, elastic pads and insulation materials.</p> <p>b. For Wood Joint Sleepers - Elastic fastening clips, tie pads, steel bolts, steel nuts and track spikes.</p> <p>c. For Through Plate Girder - Elastic fastening clips, tie pads, steel bolts, steel nuts and track spikes.</p> <p>- shall be measured by count of the individual set of respective types actually placed in the completed work.</p>
1.07	<p>TURNOUTS - shall consist of the supply and delivery of railroad turnouts of the types, crossing sleepers, fastening devices in the quantity required for track work, exclusive of installation; and shall include:</p> <p>a. #12 Simple turnouts</p> <p>b. #10 Run-Over Type</p> <p>- shall be measured by count of the individual set of the respective types actually placed in the completed work.</p>

<u>Item No.</u>	<u>Title and Description for Scope and Measurement</u>
1.08	<p>BALLAST - shall consist of the supply and delivery of aggregate ballast material of the type and in the quantity necessary to complete the required track work, exclusive of installation.</p> <p>- shall be measured by the cubic meters of aggregate ballast material actually placed in the completed work.</p>
1.09	<p>FISHPLATE FOR TEMPORARY JOINTING - shall consist of the supply and delivery of fishplates and temporary joint services of the types and in the quantities necessary to complete the required temporary rail jointing work, exclusive of installation.</p> <p>- shall be measured by count of the individual set of fishplates actually placed in the completed work.</p>
1.10	<p>TRAIN STOPPER - shall consist of the supply and delivery of hydraulic train stopper of the type and in the quantity necessary to complete the required train stopper work.</p> <p>- shall be measured by count of the individual set of hydraulic damper type stopper actually placed in the completed track work.</p>
1.11	<p>RAILROAD SIGNS - shall consist of the supply and delivery of railroad sign assemblies of the types and in the quantities necessary to complete the required track work; and shall include sign panels, posts and associated items.</p> <p>- shall be measured by count of the individual number of railroad signs of the respective types actually placed in the completed work.</p>

Item No. Title and Description for Scope and Measurement

GROUP 2: EQUIPMENT

2.01 TRACK MOTOR CAR - shall consist of the supply and delivery of track motor car as required for track laying work and maintenance of the track.

- shall be measured by count of the individual set of track motor car delivered for the work as specified.

GROUP 3: TRACK LAYING WORK

3.01 PLACEMENT OF BALLAST - shall consist of spreading work of ballast as supplied and delivered under Item 1.08 necessary to complete the required track work; and shall also include loading, hauling and placement exclusive of compaction; and shall include:

a. Lower ballast.

b. Upper ballast.

- shall be measured by cubic meters of ballast materials actually placed based upon the indicated track laying work layouts.

3.02 TRACK LAYING - shall consist of track laying work with track materials as supplied and delivered under Item 1.01 through 1.06 necessary to complete the required track work; and shall also include loading, hauling and placement.

- shall be measured by lineal meters of installed track based upon the indicated track laying layout.

3.03 COMPACTING AND INSPECTION OF BALLAST - shall consist of compacting of ballast as prepared under Item 3.02 and tolerance inspections for the completed work.

- shall be measured by lineal meters of compacted ballast based upon the indicated track laying work.

Item No. Title and Description for Scope and Measurement

- 3.04 TRACK LAYING ON THROUGH PLATE GIRDER -
shall consist of track laying work at the location on through plate girder bridge, with track materials as prepared under Item 1.01 through 1.06 necessary to complete the required track work; and shall also include loading, hauling and placement.
- shall be measured by lineal meters of installed track based upon the indicated track laying layout.
- 3.05 INSTALLATION OF TURNOUT - shall consist of installation work of turnouts as prepared under Item 1.07 necessary to complete the required track work; and shall also include fabrication of turnout assemblies, spreading of upper ballast and tamping as prepared under Item 3.01; and shall include:
- a. #12 Simple turnout
- b. #10 Run-Over Type
- shall be measured by count of the individual set of turnouts of the respective types actually placed in the completed track work.
- 3.06 INSTALLATION OF TRAIN STOPPER - shall consist of installation work for Sand Drag Type and Hydraulic Damper Type as prepared under Item 1.10 and 1.08 respectively; necessary to complete the required track work; and shall include:
- a. Sand Drag Type
- b. Hydraulic Damper Type
- shall be measured by count of the individual set of train stopper actually placed in the completed train stopper installation work.
- 3.07 INSTALLATION OF RAILROAD SIGNS - shall consist of installation work of railroad signs as prepared under Item 1.11 necessary to complete the required track work; shall include fabrication, excavation, backfill, and compaction; disposal of surplus excavation.
- shall be measured by count of the individual number of railroad signs of the respective types actually placed in the completed work,

<u>Item No.</u>	<u>Title and Description for Scope and Measurement</u>
3.08	<p>THERMIT RAIL WELDING - shall consist of rail welding work of the rail as prepared under Item 3.02 and 3.04 necessary to complete the required track work.</p> <p>- shall be measured by count of the individual set of rail weldings actually performed in the completed work.</p>
3.09	<p>LEVEL CROSSING CONSTRUCTION -shall consist of construction work of level crossings of the types and quantities indicated necessary to complete the required track work; shall include other related work; and shall include:</p> <p>a. Concrete Track Block</p> <p>b. Wooden Block</p> <p>- shall be measured by count of the individual number of level crossings actually placed in the completed work.</p>

END OF SCOPE AND MEASUREMENT

BILL OF QUANTITIES

BIDDER: _____

DATE: _____

SIGNATURE: _____

GENERAL SUMMARY

AMOUNT, RP.

1. MATERIALS	_____
2. MACHINES	_____
3. TRACK LAYING WORK	_____
TOTAL	_____

BILL OF QUANTITIES

BIDDER: _____

DATE: _____

SIGNATURE: _____

1. MATERIALS

PAY ITEM No.	REF. SPEC. NO.	DESCRIPTION OF ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE			AMOUNT		
					L.C. RP.	F.C. US\$	L.C. RP.	F.C. US\$	TOTAL RP.	
1.01		R54 FLAT BOTTOM HEAD RAILS -								
a.	201	STANDARD TYPE, 25 M LENGTH	2,580	M.T.						
b.	202	R3 COMPROMISE RAIL	9	SET						
1.02	203,204 205	FISHPLATES AND ACCESSORY	860	SET						
1.03	210	INSULATED JOINT FOR R54	160	SET						
1.04	207	P.C. SLEEPERS FOR R54	41,000	No.						
1.05	-	WOOD SLEEPERS FOR -								
a.		JOINT	800	No.						
b.		THROUGH PLATE GIRDER	30	No.						
1.06	206	FASTENING DEVICES FOR -								
a.		P.C. SLEEPER	44,700	SET						
b.		JOINT	515	SET						
c.		THROUGH PLATE GIRDER	30	SET						
1.07	212	TURNOUTS FOR R54 -								
a.		#12 SIMPLE TURNOUTS	16	SET						
b.		#10 RUN-OVER TYPE	4	SET						

BILL OF QUANTITIES

BIDDER: _____

DATE: _____

SIGNATURE: _____

1. MATERIALS

PAY ITEM No.	REF. SPEC. NO.	DESCRIPTION OF ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE		AMOUNT		
					L.C. RP.	F.C. US\$	L.C. RP.	F.C. US\$	TOTAL RP.
1.08	208	BALLAST	45,600	C.M.					
1.09	-	FISHPLATE FOR TEMPORARY JOINTING	50	SET					
1.10	214	HYDRAULIC DAMPER TYPE BUFFER STOP	3	SET					
1.11	213	RAILROAD SIGNS	420	No.					
		TOTAL OF MATERIALS							

BILL OF QUANTITIES

BIDDER: _____

DATE: _____

SIGNATURE: _____

2. MACHINES

PAY ITEM No.	REF. SPEC. NO.	DESCRIPTION OF ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE		AMOUNT		TOTAL RP.
					L.C. RP.	F.C. US\$	L.C. RP.	F.C. US\$	
2.01	215	HEAVY MOTOR CAR	1	SET					
		TOTAL OF MACHINES							

BILL OF QUANTITIES

BIDDER: _____

DATE: _____

SIGNATURE: _____

3. TRACK LAYING WORK

PAY ITEM No.	REF. SPEC. NO.	DESCRIPTION OF ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE			AMOUNT	
					L.C. RP.	F.C. US\$	L.C. RP.	F.C. US\$	TOTAL RP.
3.01	209	PLACEMENT OF BALLAST FOR -							
		a. LOWER LAYER	37,000	C.M.					
b.		UPPER LAYER	8,500	C.M.					
3.02	209	TRACK PANEL INSTALLATION	22,000	L.M.					
3.03	209	COMPACTING OF BALLAST AND INSPECTION OF TRACK TOLERANCE	23,000	L.M.					
3.04	209	TRACK PANEL INSTALLATION ON THROUGH PLATE GIRDER	20	L.M.					
3.05	209	INSTALLATION OF TURNOUTS -							
		a. #12 SIMPLE TURNOUT	16	SET					
b.		#10 RUN-OVER TYPE	4	SET					
3.06	209	INSTALLATION OF BUFFER STOPS -							
		a. SAND DRAG TYPE	7	SET					
b.		HYDRAULIC DAMPER TYPE	3	SET					
3.07	209	INSTALLATION OF RAILROAD SIGNS	420	No.					
3.08	-	THERMIT RAIL WELDING	1,425	SET					

BIDDER: _____

DATE: _____

SIGNATURE: _____

BILL OF QUANTITIES

3. TRACK LAYING WORK

PAY ITEM No.	REF. SPEC. NO.	DESCRIPTION OF ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE		AMOUNT		
					L.C. RP.	F.C. US\$	L.C. RP.	F.C. US\$	TOTAL RP.
3.09		LEVEL CROSSING CONSTRUCTION -							
a.	211	CONCRETE TRACK BLOCK TYPE	11	NO.					
b.	-	WOODEN BLOCK TYPE	5	NO.					
		TOTAL OF TRACK LAYING WORK							

