



प्लाज्मा अनुसंधान संस्थान
Institute for Plasma Research

भाट, इंदिरा पुल के पास , गांधीनगर - 382 428
Bhat, Nr Indira Bridge,
Gandhinagar - 382 428. GUJARAT
(INDIA)
Tel. : + 91 - 23962000
Fax : + 91 - 23962277

PART - II : TECHNICAL BID

काम का नाम

Name of work

Tender for Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.

Tender Notice No: IPR/TN/CIVIL-PR/01/2020 dated 03.03.2020

दो बोली प्रणाली

Two Bid System

Address of Tender:

Chairperson, Infrastructure and Campus development committee,

Inviting Authority

अध्यक्ष, अवसंरचना और कैम्पस विकास समिति

INSTITUTE FOR PLASMA RESEARCH

Near Indira Bridge,

Bhat - Gandhinagar - Gujarat - 382428

Contact Person: Mr. Prashant. Singh, Officer In-charge, e-Tender, IPR (E-mai id: etender.icdc@ipr.res.in)

Telephone No. -079-2396 2000 - 2396 2069

Fax No. -079 -2396 2277

NOTE: In case of any conflict/contradiction between English and hindi version, English version will prevail.

INSTITUTE FOR PLASMA RESEARCH
NEAR INDIRA BRIDGE, BHAT, GANDHINAGAR – 382 428
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भाट, निकट इन्दिरा पुल, गांधीनगर - ३८२४२८, गुजरात (भारत)

Institute for **Plasma Research**

Bhat, Near Indira Bridge, Gandhinagar - 382428, Gujarat (INDIA)

Phone : +91-79-23962000, Fax: +91-79-23962277,

Web: <http://www.ipr.res.in>

SECTION - 1 (i) Tender Notice (Newspaper Advertisement)

INSTITUTE FOR PLASMA RESEARCH

Nr. Indira Bridge, Bhat, Gandhinagar - 382 428

Phone: 079-23962069, Fax: 079-23962277

Tender Notice No: IPR/TN/CIVIL-PR/01/2020 (Two Bid System) dated 03.03.2020

निदेशक की ओर से अध्यक्ष, अवसंरचना और कैम्पस विकास समिति द्वारा ई-निविदा मोड के माध्यम से ऑनलाइन आइटम दर निविदाएं आमंत्रित की जाती हैं, प्लाज़्मा रिसर्च संस्थान, पास। इंदिरा ब्रिज, भाट, गांधीनगर - गुजरात - 382 428, दो बोलियों में, योग्य ठेकेदारों से निम्नलिखित कार्यों के लिए।

Online item rate tenders are invited through e-tendering mode by the Chairperson, Infrastructure and Campus development committee, on behalf of Director, Institute for Plasma Research, Nr. Indira Bridge, Bhat, Gandhinagar - Gujarat - 382 428, in two bids, from eligible contractors for the following works.

Name of Work	Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.
Approx. Estimated Cost (Rs)	Rs. 21,11,951/-
Completion Period	120 Days (Including monsoon period, if any)
Document available for view and downloading on website www.tenderwizard.com/DAE	From 10:00 Hours on 04.03.2020 and Up to 17:00 Hours on 20.03.2020

योग्यता मानदंड और निविदा दस्तावेज के साथ विस्तृत निविदा सूचना वेबसाइट www.tenderwizard.com/DAE पर मुफ्त दृश्य और डाउनलोड के लिए उपलब्ध है। ई-निविदा प्रक्रिया में भाग लेने के लिए, उपर्युक्त ई-निविदा पोर्टल पर पंजीकरण करना अनिवार्य है। इच्छुक एजेंसियों को प्रसंस्करण शुल्क और ईएमडी के साथ निर्दिष्ट तारीख को या उससे पहले निर्दिष्ट दस्तावेजों को स्कैन / भरना होगा।

Detailed tender notice along with Eligibility criteria and Tender Document is available on website www.tenderwizard.com/DAE for free view and downloading. To participate in e-tendering process, it is mandatory to get registered on the above e-tender portal. The interested agencies are required to scan/ fill in and upload the specified documents along with processing fees and Earnest money deposit on or before the closing date.

निदेशक, आईपीआर किसी भी या सभी निविदाकारों के पूर्ण या हिस्से में निविदा को स्वीकार या अस्वीकार करने का अधिकार सुरक्षित रखता है या बिना किसी कारण बताए टोटो में निविदा रद्द करने का अधिकार सुरक्षित रखता है।

The Director, IPR reserves the right to accept or reject tender in full or part of any or all tenderers or to cancel the tender in Toto without assigning any reason thereof.

विस्तृत एनआईटी और निविदा दस्तावेज संस्थान के वेबसाइट <http://www.ipr.res.in/documents/tenders.html> पर संदर्भ उद्देश्य के लिए भी उपलब्ध हैं।

Detailed NIT & Tender Document are also available on the Institute's website <http://www.ipr.res.in/documents/tenders.html> for reference purpose only. For further information, Contact Person : Mr. Prashant Singh, Officer In-charge e-Tender, IPR email: etender.icdc@ipr.res.in Ph. No. 079-2396 2000 - 23962069



प्लाज्मा अनुसंधान संस्थान

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SECTION - 1 (ii) Detailed Tender Notice

भाग-ए: ऑनलाइन सबमिशन के लिए निर्देश

PART-A: INSTRUCTION FOR ONLINE SUBMISSION

1 डाउनलोड करने, अपलोड करने और मुफ्त दृश्य के लिए कदम-

1 Steps for downloading, uploading and free view-

संभावित बोलीदाता या सामान्य जनता वेबसाइट www.tenderwizard.com/DAE से निविदा दस्तावेजों के मुफ्त पीडीएफ प्रारूप को देख और डाउनलोड कर सकते हैं।> डीआई के निविदा> प्लाज्मा अनुसंधान संस्थान, गांधीनगर
Prospective bidders or General public can see and download free of cost **PDF format** of the tender documents from website www.tenderwizard.com/DAE > **Tender Of DAE > Institute for plasma research, Gandhinagar.**

निविदा में भाग लेने के लिए, संभावित बोलीदाता से अनुरोध है कि उपयोगकर्ता आईडी / पासवर्ड / कक्षा III डिजिटल हस्ताक्षर प्रमाणपत्र के साथ वेबसाइट www.tenderwizard.com/DAE के होम पेज में लॉगिन के बाद एक्सेल प्रारूप डाउनलोड करें। आईपीआर / डीआई में ई-निविदा के लिए सेवाएं मैसर्स आईटीआई लिमिटेड, निविदा विज़ार्ड हेल्प डेस्क सेंटर, # 24, पहला मंजिल, सुधा कॉम्प्लेक्स, हवन्नूर सर्किल के पास, तीसरी चरण, चौथा ब्लॉक, बसेश्वरनगर, बेंगलूर द्वारा प्रदान की जाती है। - 560 07 9, पीएच: 91-80-40482000, टेलीफैक्स: 91-80-40482114, ईमेल: daehelpdesk@gmail.com

To participate in the tender, Prospective Bidder are requested to download the Excel formats, after login in the Home page of the website www.tenderwizard.com/DAE with User id/ Password /Class III Digital **Signature Certificate**. The services for e-tendering in IPR/DAE is provided by M/s ITI Ltd., Tender wizard Help Desk Centre, # 24, 1st Floor, Sudha Complex, Near Havanoor Circle, 3rd Stage, 4th Block, Basaveshwaranagar, Bangalore - 560 079, Ph:91-80-40482000, Telefax: 91-80-40482114, Email: daehelpdesk@gmail.com.

विशेष निविदा के एक्सेल प्रारूपों को डाउनलोड करने के लिए कदम :
Steps to Download the excel formats of particular tender:

- a: लागू बटन पर क्लिक करें
- a: Click on **UNAPPLIED** button

- b: अनुरोध बटन पर क्लिक करें
- b: Click on **REQUEST** button

- c: इलेक्ट्रॉनिक मोड के माध्यम से ई-भुगतान के माध्यम से ऑनलाइन निविदा प्रसंस्करण शुल्क का भुगतान करें।
c: Pay Tender Processing fee online via e-payment through electronic mode
- d: बटन पर क्लिक करें .
d: Click on **SUBMIT** button,
- e: इन प्रोग्रेस बटन पर क्लिक करें (स्टेटस कॉलम बोलीदाता को निविदा के रूप में प्राप्त किया जाएगा)
e: Click on **INPROGRESS** button (In status column bidder will find the tender as **RECEIVED**)
- f: बोलीदाता जमा करने की अंतिम तारीख तक किसी भी समय के लिए अनुलग्नक बटन संपादित करके आवश्यक निविदा दस्तावेज डाउनलोड करने में सक्षम हो जाएगा।
f: Bidder will be able to download required Tender Documents by clicking **EDIT attachment** button for any number of times till last date of submission.
- 1 संभावित बोलीदाता को एक्सेल दस्तावेज़ भरना होगा और इसे नामित किए बिना अपलोड करना होगा। कृपया निविदा जमा करने के लिए सहायता पुस्तिका देखें या आईटीआई हेल्पडेस्क से संपर्क करें।
1 Prospective Bidder has to fill Excel Documents and upload the same without renaming it. Please refer Help Manual for Tender submission or contact ITI Helpdesk.
- 2 इच्छुक बोलीदाता को निविदा और सावधानी मानदंडों को ध्यान से आमंत्रित करने वाले नोटिस में नियम और शर्तें पढ़नी चाहिए। अगर वह खुद को योग्य मानता है तो उसे केवल अपनी बोली जमा करनी चाहिए और वह आवश्यक सभी दस्तावेजों के कब्जे में है।
2 The intending bidder must read the terms and conditions in the notice inviting tender & prequalification criteria carefully. He should only submit his bid if he considers himself eligible and he is in possession of all the documents required.
- 3 बोली जमा करने का मतलब बोलीदाता द्वारा Form "I". के रूप में संलग्न प्रारूप के अनुसार ऑनलाइन प्रस्तुत किए जाने वाले उपक्रम की स्वीकृति होगी।
3 Submission of bid shall mean acceptance of undertaking to be furnished online by bidder as per format enclosed as Form "I".
- 4 वेबसाइट पर पोस्ट बोलीदाताओं के लिए सूचना और निर्देश निविदा दस्तावेज का हिस्सा बनेंगे। आवश्यक प्रसंस्करण शुल्क का भुगतान करने के बाद निविदा डाउनलोड और अपलोड करने के लिए केवल www.tenderwizard.com/DAE पर अपलोड किया जाना है।
4 Information and Instructions for bidders posted on website shall form part of tender document. The tender is to be downloaded and uploaded only on www.tenderwizard.com/DAE after paying requisite processing fee.
- 5 बोली केवल अनिवार्य स्कैन किए गए दस्तावेजों को अपलोड करने के बाद ही प्रस्तुत की जा सकती है, "आईटीआई लिमिटेड, नई दिल्ली" के पक्ष में प्रसंस्करण शुल्क का भुगतान, आईपीआर के पक्ष में ईएमडी और निर्दिष्ट अन्य दस्तावेज। किसी भी मामले में प्रसंस्करण शुल्क वापस नहीं किया जाएगा।

5. The bid can only be submitted after uploading the mandatory scanned documents, payment of processing fee in favour of "ITI LIMITED, NEW DELHI", Earnest Money Deposit in favour of IPR and other documents as specified. Processing fee shall not be refunded in any case.

6. बोलियां जमा करने के बाद ठेकेदार किसी भी समय संशोधित बोली को फिर से जमा कर सकता है लेकिन अधिसूचित किए गए बोली के ऑनलाइन जमा करने की तिथि निर्धारित करने की तारीख से पहले। बोलीदाता निर्धारित जमा तिथि और ऑनलाइन जमा करने के समय से पहले बोली वापस ले सकता है। लेकिन, जब बोलीदाता बोली वापस ले लेता है, तो उसे पुनः सबमिट नहीं किया जा सकता है।

देय तिथि और समय के बाद निविदा दस्तावेज जमा करने की अनुमति नहीं दी जाएगी। ई-टेंडरिंग पोर्टल पर प्रदर्शित होने वाला समय बोलीदाता पर अंतिम और बाध्यकारी होगा।

6. After submitting bids the contractor can re-submit revised bid any number of times but before stipulated closing time and date of online submission of bid as notified. The bidder can withdraw the bid before stipulated closing date and time of online submission. But, once the bidder withdraws the bid, it cannot be resubmitted.

Submission of the tender document after the due date and time shall not be permitted. Time being displayed on e-tendering portal shall be final and binding on the Bidder.

7. ठेकेदारों, जो www.tenderwizard.com/DAE वेबसाइट पर नामांकित नहीं हैं, को नामांकन प्राप्त करने की आवश्यकता है।

7. The contractors, who are not enrolled on www.tenderwizard.com/DAE website, are required to get enrolled.

8. इच्छुक बोली लगाने वाले को बोली जमा करने के लिए वैध कक्षा -3 डिजिटल हस्ताक्षर होना चाहिए।

8. The intending bidder must have valid class-III digital signature to submit the bid.

9. ठेकेदार को प्रत्येक आइटम की दर उद्धृत करना सुनिश्चित करना चाहिए। आंकड़ों में उद्धरण दर के लिए कॉलम का मतलब येलो रंग में दिखाई देता है और पल दर दर्ज की जाती है, यह स्काई ब्लू हो जाती है। इसके अलावा, किसी भी कोशिका का चयन करते समय एक चेतावनी प्रकट होती है कि यदि कोई भी सेल खाली छोड़ दिया जाता है तो उसे "0" के रूप में माना जाएगा। इसलिए, यदि कोई सेल खाली छोड़ दिया गया है और बोली लगाने वाले द्वारा कोई दर उद्धृत नहीं की जाती है, तो इस तरह की वस्तु की दर को "0" (शून्य) के रूप में माना जाएगा। बोली लगाने वाले को विनिर्देशों, मात्रा बिल और GCC प्रावधानों के अनुसार शून्य की उद्धृत दर पर ऐसी वस्तुओं को ज़िक्र करना होगा।

9. Contractor must ensure to quote rate of each item. The column meant for quoting rate in figures appears in **YELLOW** colour and the moment rate is entered, it turns **SKY BLUE**. In addition to this, while selecting any of the cells a warning appears that **if any cell is left blank the same shall be treated as "0"**. Therefore, if any cell is left blank and no rate is quoted by the bidder, rate of such item shall be treated as "0" (ZERO). The bidder shall be required to execute such items at his quoted rate of zero as per specifications, bill of quantity and GCC provisions.

10. निविदा प्रसंस्करण शुल्क के सफल ई-भुगतान पर, बोलीदाता ई-निविदा पोर्टल से निविदा दस्तावेज (एक्सेल शीट्स सहित, यदि कोई हो) डाउनलोड कर सकते हैं। बोलीदाताओं को ई-टेंडरिंग पोर्टल से केवल अंतिम तिथि और समय से पहले प्रसंस्करण शुल्क की ओर ई-भुगतान का विवरण अपलोड करना होगा और अन्यथा निविदा

दस्तावेज (एक्सेल शीट्स सहित, यदि कोई हो) डाउनलोड करें, अन्यथा, यह संभव नहीं होगा उन्हें ई-निविदा पोर्टल पर ई-निविदा दस्तावेज अपलोड करने के लिए।

ध्यान दें: ऊपर दिए गए भुगतान विवरण की पुष्टि किए बिना निविदा दस्तावेज (एक्सेल शीट्स सहित, यदि कोई हो) डाउनलोड करना ई-निविदा पोर्टल वैध नहीं होगा और संक्षेप में अस्वीकार कर दिया जाएगा।

बोलीदाताओं को सलाह दी जाती है कि सर्वर पर अंतिम मिनटों या अपलोड करने में जटिलताओं से बचने के लिए समय पर अपने दस्तावेजों को अच्छी तरह से अपलोड करें। किसी भी मामले में आईपीआर दस्तावेजों को अपलोड करने में किसी भी प्रकार की समस्या के लिए ज़िम्मेदार नहीं होगा।

10. On successful e-payment of tender processing fees, the Bidders can download the tender document (including Excel sheets, if any) from the e-tendering portal. The Bidders have to upload the details of e-payment towards processing fees, before the last date & time and download the tender documents (including Excel sheets, if any) from the e-tendering portal only, otherwise, it will not be possible for them to upload the e-tender documents on the e-tendering portal.

Note: Downloading the tender documents (including Excel sheets, if any) without confirmation of payment details on above e-tendering portal shall not be valid and rejected summarily.

Bidders are advised to upload their documents well in time, to avoid last minutes rush on the server or complications in uploading. IPR, in any case, will not be responsible for any type of problem in uploading the documents.

11. बोलीदाता अपने ईमेल और बैंक खाते को सक्रिय रखने और परिवर्तन के मामले में अपनी प्रोफ़ाइल को अपडेट करने के लिए पूरी तरह उत्तरदायी होते हैं। यह आवश्यक है क्योंकि संचार संस्थान द्वारा ई-मेल द्वारा अधिमानतः किया जाएगा। इसके अलावा, ई-निविदा पोर्टल द्वारा सभी ऑटो जेनरेट किए गए मेल इस ई-मेल पते पर भेजे जाएंगे।
11. The bidders are solely responsible to keep their email and bank account active and to update their profile in case of change. This is essential as communication shall preferably be done by e-mail by Institute. Moreover, all the auto generated mail by e-tendering portal shall be sent on this e-mail address.
12. ठेकेदार JPG प्रारूप और PDF प्रारूप के रूप में दस्तावेज़ अपलोड कर सकते हैं।
12. Contractor can upload documents in the form of JPG format and PDF format.
13. बोलीदाताओं को सलाह दी जाती है कि वे अपने स्वयं के लाभ के लिए निविदा प्रसंस्करण शुल्क के ऑनलाइन भुगतान को सुविधाजनक बनाने के लिए कोर बैंकिंग समाधान शाखा (with NEFT / RTGS) के साथ बैंक खाता खोलें।
13. Bidders are advised to open bank account with core banking solution branch (with NEFT / RTGS) in order to facilitate online payment of tender processing fee for their own benefit.
14. विस्तृत एनआईटी और तकनीकी बोली समझौते का हिस्सा होगी। यदि किसी भी स्तर पर बोलीदाता इसे स्वीकार करने से इंकार कर देता है, तो बोली खारिज कर दी जाएगी और ईएमडी जब्त कर दी जाएगी। आगे अनुशासनात्मक कार्रवाई भी शामिल की जा सकती है।

14. The detailed NIT and Technical bid shall be part of agreement. If the bidder at any stage refuses to accept the same, the bid shall be rejected and Earnest Money Deposit shall be forfeited. Further disciplinary action is liable to be taken including.
15. निविदा दस्तावेज जमा करने में किसी भी समस्या के मामले में, बोलीदाता को सहायता डेस्क की सहायता हो सकती है या उस वेबसाइट या मोबाइल पर दिए गए सहायता पुस्तिका का उपयोग कर सकते हैं और कहीं और उल्लिखित ई-मेल का उपयोग किया जा सकता है।
15. In case of any problem with the submission of the tender document, the Bidder may have the assistance of help desk or use the help manual given on the said website or mobile and e-mail mentioned elsewhere.
16. निविदा ऑनलाइन जमा की जाएगी। इसे जमा करने का कोई अन्य तरीका स्वीकार्य नहीं है।
16. The tender shall be submitted online. No other mode of submission is acceptable.
17. नियत तारीख और समय के बाद निविदा प्रस्तुत करने की अनुमति नहीं दी जाएगी। ई-टेंडरिंग पोर्टल पर प्रदर्शित किया जा रहा समय आवेदक के लिए अंतिम और बाध्यकारी होगा।
17. Submission of the Tender after the due date and time shall not be permitted. Time being displayed on e-tendering portal shall be final and binding on the applicant.
18. खोलने पर, बोलीदाता अपनी बोली स्थिति देख सकते हैं। बोली के उद्घाटन के दौरान बोलीदाता के अधिकृत प्रतिनिधि उपस्थित रह सकते हैं (यदि ऐसी इच्छा हो तो)। अधिकृत प्रतिनिधि के पास उनकी कंपनी के सक्षम प्राधिकारी द्वारा जारी वैध फोटो पहचान और मूल अधिकार पत्र होना चाहिए।
18. On opening, the Bidders can see their bid status. The authorized representative of Bidders may remain present (if so desires) during opening of Bid. The authorized representative should have valid photo identity and original authority letter issued by competent authority of their company.
18. ई-टेंडरिंग संबंधित प्रश्नों / सेवाओं के लिए हेल्प डेस्क-
a) मेसर्स आईटीआई के प्रतिनिधि,
श्री सुनील के पटेल, मोबाइल नंबर 09624981992
ई-मेल : twhelpdesk426@gmail.com,
daehelpdesk@tenderwizard.co.in,
nodalofficer.et@ipr.res.in
b) अखिल भारतीय हेल्प लाइन नंबर: 91-80-40482000,
ई-मेल: daehelpdesk@tenderwizard.co.in
सभी कार्य दिवसों पर सुबह 10.00 बजे से शाम 6 बजे तक।
19. Help Desk for e-tendering related queries / services-
a) Representative of M/s ITI
Shri Sunil K Patel
Mobile No. 09624981992
e-mail : twhelpdesk426@gmail.com,

daehelpdesk@tenderwizard.co.in

nodalofficer.et@ipr.res.in

b) All India Help line No: 91-80-40482000,

e-mail: daehelpdesk@tenderwizard.co.in

From 10.00 AM to 6.00 PM on all working days.

20. आईपीआर किसी भी आवेदन के बिना किसी भी आवेदन को स्वीकार या अस्वीकार करने का अधिकार सुरक्षित रखता है। किसी भी शर्त के साथ आवेदन तुरंत अस्वीकार कर दिया जाएगा।
20. Institute reserves the right to accept or reject the tender(s) in full or in part, without assigning any reason thereof. Tenders with any conditions including conditional rebate shall be rejected forthwith.

भाग-बी: निविदा सूचना विवरण
PART-B: TENDER NOTICE DETAILS

Tender Notice No: IPR/TN/CIVIL-PR/01/2020 (Two Bid System) dated 03.03.2020

Tender notice for Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.

निदेशक की ओर से अध्यक्ष, अवसंरचना और कैम्पस विकास समिति द्वारा ई-निविदा मोड के माध्यम से ऑनलाइन आइटम दर निविदाएं आमंत्रित की जाती हैं, प्लाज़्मा रिसर्च संस्थान, पास। इंदिरा ब्रिज, भाट, गांधीनगर - गुजरात - 382 428, दो बोलियों में, योग्य ठेकेदारों से निम्नलिखित कार्यों के लिए।

Online item rate tenders are invited through e-tendering mode by the Chairperson, Infrastructure and Campus development committee, on behalf of Director, Institute for Plasma Research, **Nr. Indira Bridge, Bhat, Gandhinagar - Gujarat - 382 428**, in two bids, from eligible contractors for the following works.

1	NIT No.	IPR/TN/CIVIL-PR/01/2020 dated 03.03.2020
2	Name of work	Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.
3	Estimated cost of Construction works (Rs)	Rs.21,11,951/-
4	Earnest Money Deposit (EMD)	EMD of Rs.42,239/- (Rupees Forty Two Thousand Two Hundred and Thirty Nine only) to be submitted in the form of Demand Draft / Pay order / Fixed Deposit Receipt issued by Scheduled banks in favour of Institute For Plasma Research , Bhat, Gandhinagar- 382428 Note: 1) EMD in the form of cheque will not be accepted. The bid can only be submitted after uploading the scanned copy of EMD Documents and original should be deposited in office of Tender Inviting Authority within the period of bid submission as mentioned. Bids received without requisite EMD shall be summarily rejected.
5	Completion period	120 Days (Including monsoon period, if any)
6	Fee of Tender Document	NIL
7	Tender Processing Fee	Rs. 1246/- should be paid only by e-payment through electronic mode to M/S ITI Limited
8	Performance Guarantee	5% of Tendered Value to be provided upon issue of Letter of Acceptance and before placing Work Order
9	Availability of Tender Documents for view and download on website	From 10:00 Hours on 04.03.2020 and Up to 17:00 Hours on 20.03.2020
		www.tenderwizard.com/DAE

10	Seeking pre-bid clarification on Tender document	The applicant can seek clarifications regarding Tender document up to 17:00 Hours on 03.04.2020 by uploading their queries on website www.tenderwizard.com/DAE . The clarifications will be uploaded on the same web portal by 17:00 Hours on 09.04.2020
11	Site Visit, if any	Site visit by Agencies (if any) – up to 17:00 Hours on 27.03.2020 Contact officer Mr. Prashant Singh, officer in-charge, e-tender, Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar -382428. Preferably by email: etender.icdc@ipr.res.in or through Tel No:-079-2396 2000, 2396 2069
12	Last date and time of closing of online submission of tenders	29.04.2020 up to 13:00 Hours
13	Last date for submission of Original Instrument (DD, etc.) towards EMD.	On or before 13:00 Hours on 29.04.2020 in the Office of Mr. Prashant. Singh, Officer In-charge e-Tender, Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar -382428 Phone no. 079 2396 2000 – 2396 2069
14	Date and time of online opening of Technical Bid.	On 29.04.2020 at 15:30 Hours Tender will be opened at Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar -382428 at the stipulated date and time above
15	Date of opening of Financial Bids of qualified bidders	Will be notified at a later date.
16	Help Desk for e-tendering related queries /services	a) Representative of M/s. ITI Shri. Sunil K Patel Mobile No. 09624981992 e-mail : twhelpdesk426@gmail.com , daehelpdesk@tenderwizard.co.in nodalofficer.et@ipr.res.in b) All India Help line No: 91-80-40482000, e-mail: daehelpdesk@tenderwizard.co.in From 10.00 AM to 6.00 PM on all working days.

भाग-सी: आवश्यकताएं और योग्यता CRITERIA

PART-C: REQUIREMENTS AND ELIGIBILITY CRITERIA

बोलीदाता, जो स्वयं की निम्नलिखित आवश्यकताओं को पूरा करते हैं, केवल आवेदन करने के लिए पात्र होंगे। संयुक्त उद्यम स्वीकार नहीं किए जाते हैं।

The Bidders, who fulfill the following requirements on their own, shall only be eligible to apply. Joint ventures are not accepted.

Sr. No.	Eligibility Criteria	Documentary proof for the eligibility (To be Scanned and Uploaded) Note: The applicants are requested to fill up the facts & figure in the prescribed format. Simply filling like Yes or No shall not be accepted.
1.	Should have satisfactorily completed similar works during the seven years ending previous day of last day of submission of tender, of value as below (i) Three similar works each costing not less than Rs. 8 Lacs or (ii) Two similar works each costing not less than Rs. 13 Lacs or (iii) One similar work costing not less than Rs. 17 Lacs Similar means any civil construction works for buildings or fencing work with concertina coil & chain link. Note: The value of executed works shall be brought to current costing level by enhancing the actual value of works at simple rate of 7% per annum; calculated from the date of completion to previous day of last day of submission of tenders.	Work orders and Completion certificates issued by the authority concerned Documentary Proof: 1. Work Orders & Completion certificate for qualifying completed work(s) issued by Engineer-in-Charge or Owner should be attached. 2. Completion certificates for works issued by Private parties shall be supported by TDS (Tax deducted at Source) Certificates.
2.	Should have had average annual turnover of Rs. 10.5 lacs on construction work during the last three consecutive years ending 31 st March, 2019. Note: Year in which no turnover is shown would also be considered for working out the average.	Annexure -Form "A": Financial information, Chartered Accountant certificate for the Annual financial turnover showing Profit & Loss as submitted to Income Tax Department. Note: Balance sheet duly audited by chartered accountant to be submitted.
3.	Should not have incurred any loss (profit after tax should be positive) in more than two years during the last five consecutive years ending on 31 st March, 2019.	Annexure -Form "A": Financial information, Chartered Accountant certificate for the Annual financial turnover showing Profit & Loss as submitted to Income Tax Department. Note: Balance sheet duly audited by chartered accountant to be submitted.
4.	Should have solvency of Rs.8.4 Lacs issued by Bank.	Annexure Form "B" - Form of Bankers Certificate from a Bank

5.	Proof of registration with Government / Semi Government organizations / Statutory Bodies / reputed organization like CPWD, MES, BSNL, Railways, State PWDs etc. in appropriate class OR having experience in execution of similar nature of works with corporate / PSU / Banks etc.	Registration certificate in appropriate class OR Work order / completion certificate of similar nature of works with corporate / PSU / Banks etc.
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भाग- डी: दस्तावेजों को स्कैन और अपलोड किया जाना चाहिए
PART- D: DOCUMENTS TO BE SCANNED & UPLOADED

संभावित बोलीदाता सभी पात्रता मानदंडों को पूरा करने और ऑनलाइन निविदा दस्तावेज जमा करने से पहले आवश्यक सभी दस्तावेजों के कब्जे में खुद को संतुष्ट करेंगे। इच्छुक एजेंसियों को बोली जमा करने की अवधि के भीतर निम्नलिखित सूचियों के अनुसार दस्तावेजों को स्कैन / भरना और अपलोड करना आवश्यक है:

Prospective Bidders shall satisfy themselves of fulfilling all the eligibility criteria and in possession of all the documents required before submission of online tender document. The interested agencies are required to scan / fill in and upload the documents as per following lists within the period of bid submission:

ध्यान दें: बोलीदाताओं से अनुरोध है कि वे निर्धारित प्रारूप में तथ्यों और आंकड़े को भरें। बस हां या नहीं भरना स्वीकार नहीं किया जाएगा।

Note: The Bidders are requested to fill up the facts & figure in the prescribed format. Simply filling like Yes or No shall not be accepted.

1	Proof of Eligibility Criteria No.1: Work orders and Completion certificates issued by the authority concerned Documentary Proof: 1. Work Orders & Completion certificate for qualifying completed work(s) issued by Engineer-in-Charge or Owner should be attached. 2. Completion certificates for works issued by Private parties shall be supported by TDS (Tax deducted at Source) Certificates.
2	Proof of Eligibility Criteria No.2&3: Annexure -Form "A": Financial information, Chartered Accountant certificate for the Annual financial turnover showing Profit & Loss as submitted to Income Tax Department. Note: Entire Balance sheet duly audited by chartered accountant to be submitted.
3	Proof of Eligibility Criteria No.4 - Annexure Form "B"- Form of Bankers Certificate from a scheduled Bank.
4	Proof of Eligibility Criteria No.5: Registration certificate in appropriate class OR Work order / completion certificate of similar nature of works with corporate / PSU / Banks etc.
5	Form "E" - Information about Organization Structure
6	Form "F" - List of Administrative & Technical staff available with the Bidder and that proposed to be deployed to complete this work in time
7	Form "G"- Information about construction plant, Machinery, Equipment, Accessories, infrastructure facility proposed by the bidder and that proposed to be deployed to complete this work in time.
8	Form "H" Mandate Form for Payment as per Format given.
9	Undertaking as per Form "I" to be furnished by Bidders
10	Form "J" - Letter of transmittal (To be up-loaded on their letter)

11	PAN (Permanent Account Number) Registration / TAN Registration details
12	GST Registration Certificate
13	Copy of Earnest Money Deposit of Rs. 42,239/-
14	Power of attorney of the signatory of bid as per relevant clause of NIT
15	Integrity Pact: To be signed by the bidder and upload
16	Additional documents if any to meet the eligibility criteria
Note : Scanned copy of original certificates to be uploaded	

Note:

1. The applicant may furnish any additional information, which they think necessary to establish their eligibility and capability to successfully complete the envisaged work. No information shall be entertained after last date of online submission of tenders unless it is called by the competent authority. If any information furnished by the applicant is found incorrect at a later stage, they shall be liable to be debarred from tendering /taking up of work in IPR. IPR reserves the right to verify the particulars furnished by the applicant independently and reject any application without assigning any reason. Prospective bidders shall satisfy themselves of fulfilling all the eligibility criteria before submission of the tender. The Institute reserves the right to not consider the tender documents of the bidders not fulfilling the stipulated criteria .
2. It is binding on the bidder to fill the data required for assessment of eligibility criteria in the excel sheet uploaded for the purpose. The technical evaluation shall be done based on the data provided in excel sheet and the relevant documents uploaded to support the same. In case where the relevant information is not filled in the uploaded excel sheets while commensurate supporting documents are uploaded, the supporting documents shall not be considered in evaluation. Therefore the bidders in their own interest shall fill all the relevant information in excel sheets and upload relevant documents. IPR shall not accept any new document after bid opening. IPR may ask for clarification and submission of documents in support of documents/information already submitted.

**PART - E: STANDARD FORMATS FOR ELIGIBILITY CRITERIA TO BE
UPLOADED**

FORM "J": LETTER OF TRANSMITTAL

From:

To
Chairperson ICDC,
Institute for Plasma Research,
Bhat,
Gandhinagar - 382428

Kind Attention: Mr. Prashant Singh, Officer In-charge e-tenders.

Subject: Submission of bids for the work Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.

Ref: E-Tender Notice No.: IPR/TN/CIVIL-PR/01/2020

Sir,

Having examined the details given and bid document for the above work, I/We hereby submit the relevant information.

1. I/We hereby certify that all the statements made and information supplied in the enclosed Forms "A" to "I" and accompanying statements are true and correct.
2. I/We have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/We submit the requisite certified solvency certificate and authorize IPR to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/We also authorize IPR officials to approach individuals, employers, firms and Institute to verify our competence and general reputation.
4. I/We submit the following certificates in support of our suitability, technical knowhow and capability for having successfully completed the following eligible similar works:

S. No.	Name of work	Certified by/from

Certificate : It is certified that the information given in the enclosed eligibility bid are correct. It is also certified that I / We shall be liable to be debarred , disqualified / cancellation of enlistment in case any information furnished by me / us is found to be incorrect.

Date of submission:

Seal and signature of bidder

FORM "A": FINANCIAL INFORMATION

- I. Financial Analysis** - Details to be furnished duly supported by figures in balance sheet/ profit and loss account for the last five years duly certified by the Chartered Accountant, as submitted by the Bidder to the Income Tax Department (copies to be scanned & uploaded).

Particulars	Financial Year				
	2014-15	2015-16	2016-17	2017-18	2018-19
i) Gross Annual turnover on construction work					
ii) Profit/Loss					
iii) Certified by					

Signature of Chartered Accountant with seal

Signature of Bidder

**FORM "B": FORM OF BANKER'S CERTIFICATE FROM
SCHEDULED BANK**

This is to certify that to the best of our knowledge and information that _____ M/s.
_____ (with address) as a customer of our bank are / is respectable and
can be treated as good for any engagement up to a limit of _____ Rs. _____ (Rupees
_____).

This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

(Signature)
For the Bank

NOTE: (1) Bankers certificates should be on letter head of the Bank
(2) In case of partnership firm, certificate should include names of all partners as recorded with the Bank.

FORM "C": PRESCRIBED FORMATS: DETAILS TO BE FURNISHED FOR COMPLETED WORKS DURING LAST SEVEN YEARS ENDING PREVIOUS DAY OF LAST DAY OF SUBMISSION OF TENDER.

Details	Work -1	Work -2	Work- 3
Project name & Location:			
Owner or client: (Name and Address, contact Number of Officer to whom reference can be made)			
Project description:			
1. Type of Building:			
2. Type/nature of works details.			
Whether For Government/Semi Government/ Government undertaking/ Government autonomous bodies:			
Tendered Project Cost:			
Actual Project Cost:			
Project duration (as per contract): (in months)			
Start date (dd/mm/yy):			
Actual date of Completion (dd/mm/yy):			
Actual duration (Months):			
Reasons for delay (if any):			
Any penalty/ Bonus:			
Any Litigation/ Arbitration/claim/Dispute pending (with details of claim and award if any):			
Copy of Completion certificate & Work order received from client to be attached			

Note:

- 1) For similar completed works, Original or attested scanned copies of initial work order and final completion certificate from client have to be uploaded.
- 2) The final completion certificate shall mention Name of work, Work order value, Completion value, duration, Client name & Address, Location of work, Stipulated start and completion date, Actual Start and Completion date, Reasons for Delay (if any), Nature of Work etc.
- 3) Bidder should submit separate form for giving details of work completed for each year, separate sheets if any shall be numbered in sequence.
- 4) Certified that the above list of work complete and no work has been left-out and the information given is correct to knowledge and belief.

FORM "D": INFORMATION ABOUT ALL ONGOING WORKS:

Details	Work -1	Work -2	Work- 3
a) Project name & Location :			
b) Owner or client: (Name and Address, contact Number of Officer to whom reference can be made):			
c) Project details in brief:			
d) Stipulated start date :			
e) Actual Start date :			
f) Time period :			
g) Stipulated completion date :			
h) Present Status of work in Percentage completion:			
i) Work Order Value (in lakhs) :			
j) Work done value (RA bill) of work (in lakhs):			
k) Type/nature of works details.			
l) slow progress if any and Reasons for Delay, if any:			
m) Copy of Work order received from client to be attached			

Note:

- 1) Original or attested scanned copies as well as hardcopies of initial work order from client have to be uploaded.
- 2) The certificate shall mention Name of work, Work order value, duration, Client name & Address, Location of work, Stipulated start and completion date, Actual Start and Completion date, Reasons for Delay (if any) , Nature of Work etc.
- 3) Certified that the above list of work is complete and no work has been left-out and the information given is correct to knowledge and belief.

FORM "E" INFORMATION ABOUT ORGANISATION STRUCTURE:

Sr. No.	Particulars	Details to be filled
1	Name of Firm	
2	Postal Address	
3	Contact Nos.	
	Office	
	Residence	
	Mobile	
4	Fax No.	
5	Name of Contact Person	
6	E - mail Address	
7	Legal status of Bidder : (Please tick and attach attested copies of original document defining the legal status)	
	(1) An Individual	
	(2) A Proprietary firm	
	(3) A Partnership firm	
	(4) A Pvt. Ltd. Company	
	(5) A Public Ltd. Company or Corporation	
	Dept./Organization & Place of registration, Registration No.	
	Names and Titles of Director & Officers with designation proposed to be concerned with this work	
	Designation of individuals authorised to act on behalf of the organization.	

Sr. No.	Particulars	Details to be filled
	Was the applicant ever required to suspend construction for a period of more than six months continuously after you commenced the construction? If so, give the name of the project and reasons of suspension of work.	
	Has the applicant or any constituent partner in case of partnership firm, ever abandoned the awarded work before its completion? If so, give name of the project and reasons for abandonment.	
	Has the applicant, or any constituent partner in case of partnership firm, ever been debarred / black listed for tendering in any organisation at any time? If so give details.	
	Has the applicant or any constituent partner in case of partnership firm, ever been convicted by a court of law? If so, give details.	
9	Any other information considered necessary but not included above.	

Note:

1. Bidder should attach separate sheets if required and if space given in the formats is not sufficient but strictly as per above formats only.

FORM "H": MANDATE FORM -FORMAT TO BE ENCLOSED

To,
The Accounts Officer, Institute for Plasma Research, Bhat, Gandhinagar - 382 428

Sub: Bank Details for Payment through Electronic Mode

Sir,

It is requested that our payment may please be arranged through Electronic Mode. The details of bank are as under:

1. IFSC CODE

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

2. NEFT Code

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

3. Account No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Full Account No. for payment to be made through Electronic Mode.

4. Account Type. CURRENT A/C (11)/CASH CREDIT A/C (13)

5. MICR NO.

--	--	--	--	--	--	--	--	--	--

Note: 1st three digit & last of 3 digit of MICR No. should not be zero.

6. Name of Bank:

7. Name of Branch:

8. Address of Bank:

I hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for any reasons, I would not hold the user institution responsible and agree to discharge the responsibility expected of me as a participant under the scheme.

Yours faithfully,

()
Signature of authorized Officer
With Name, Designation & Company's seal.

FORM "I": UNDERTAKING TO BE FURNISHED ONLINE BY THE BIDDER -
TO BE UPLOADED BY THE BIDDER ON THEIR LETTER HEAD AFTER SIGNING THIS TEMPLATE
(UNDERTAKING)

Name of Work: Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.

Tender number: **IPR/TN/CIVIL-PR/01/2020** (Two Bid System):

I DO HEREBY UNDERTAKE

- 1 That all the information being submitted by me is genuine, authentic, true and valid on the date of submission of tender and if any formation is found to be false at any stage of tendering or contract period I will be liable to the penal actions as prescribed in NIT.
- 2 That I accept all terms and conditions of NIT, including general terms and condition, special / additional terms and conditions, addendum, corrigendum, clarifications as stated there in the tender document as available on the website.
- 3 That I am giving my consent for e-payment.
- 4 That I do authorize IPR for seeking information / clarification from by bankers, clients having reference in this bid.
- 5 That I have uploaded photo copies of all relevant documents as prescribed in the tender document in support of the information and data furnished by me online.
- 6 That I accept all the undertakings as specified elsewhere in the tender document.
- 7 That this online agreement will be a part of my bid and if the work is awarded to me /us, this will be a part of our agreement with corporation.
- 8 That I hereby forward Earnest Money Deposit in demand draft or Pay order of any scheduled bank If I/we, fail to furnish the prescribed performance guarantee within prescribed period, I/we agree that the said Director, IPR or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely. Further, it I/we fail to commence work as specified, I/we agree that Director, IPR or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to those in excess of that limit at the rates to be determined in accordance with the provision contained in Clause 12.2 and 12.3 of the tender form. Further, I/We agree that in case of forfeiture of Earnest money & Performance Guarantee as aforesaid. I/We shall be debarred for participation in the re-tendering process of the work.
- 9 I/We undertake and confirm that eligible similar work(s) has/have not been got executed through another contractor on back to back basis. Further that, if such a violation comes to notice of Department, then I/We shall be debarred for tendering in The Institute in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the Engineer-in-Charge shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.

Signature of Bidder with Seal

PART- F - Tender Evaluation Process

On opening of Technical bid, further detailed scrutiny / evaluation will be carried out. During the evaluation of technical bids, the documents furnished by the Bidders will be scrutinized in detail. Any tender, found as not fulfilling the eligibility criteria will be summarily rejected and such offers will not be considered for further processing.

The Bidders who satisfies the eligibility criteria mentioned as above shall be considered as technically qualified and eligible for further processing.

The price bid of only those Bidders who have been technically qualified will be opened separately on a specified date (with due intimation to the qualified bidders) and further processed, as per tender procedure/ stipulations of Tender.

SECTION - 1 (iii) BRIEF PARTICULARS OF THE WORK

प्रस्तावित साइट आईपीआर-भाट, गांधीनगर, गुजरात में स्थित है
The proposed site is located at IPR-Bhat, Gandhinagar, Gujarat.

निविदाकार को अध्यक्ष, अवसंरचना और कैम्पस विकास समिति, प्लाज़्मा रिसर्च संस्थान की पूर्व अनुमति के साथ काम की साइट पर जाने की सलाह दी जाती है ताकि निर्माण पानी और विद्युत शक्ति के लिए संभावित टैपिंग बिंदुओं को ढेर करने के लिए साइट स्थान तक पहुंच के साथ खुद को परिचित किया जा सके। इस काम को पूरा करने वाले ठेकेदार संस्थान के सुरक्षा विनियमन और किसी भी उपकरण, संचालन, जल निकासी, सुरक्षा इत्यादि के हस्तांतरण के संबंध में संस्थान / पुलिस अधिकारियों द्वारा लगाए गए स्थानीय सांविधिक नियमों का सख्ती से पालन करेंगे।

The tenderer is advised to visit the site of work with prior permission of Chairperson, Infrastructure and Campus development committee, Institute for Plasma Research by contacting Mr. Prashant Singh, Officer Incharge e-tender, IPR (Email: etender.icdc@ipr.res.in) to acquaint himself/herself/themselves with access to sites location for stacking the materials probable tapping points for construction water and electric power. The contractor carrying out this work will strictly abide by security regulation of the Institute and also local statutory regulations imposed by the Institute / Police authorities regarding transshipment of any equipment, operation, drainage, security etc., wherever applicable.

TENTATIVE SCOPE OF WORK:

Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.

The Concertina coil and chain link fencing is to be executed all around the existing compound wall, the scope include closing of expansion joint as per the detail mentioned in the drawing, followed by increasing the height of the compound wall with brick masonry at specified location and then executing the Chainlink and Concertina coil fencing work.

The scope of work also include executing epoxy flooring work in a laboratory at IPR premises and providing and fixing of aluminium cupboard and allied works as per the detailed bill of quantities.

SECTION – 1 - (iv) INFORMATION & INSTRUCTIONS FOR BIDDERS

1.0 General:-

1.1. All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, a "Nil" or "no such case" entry should be made in that column. If any particulars / queries are not applicable in case of the Bidder, it should be stated as "Not Applicable". The Bidders may please note that giving incomplete/ unclear information called for in the forms, or making any change in the prescribed forms, or deliberately suppressing any information, may result in disqualification of the Bidder summarily. Applications duly filled in / scan copies of original shall be uploaded in web site: www.tenderwizard.com/DAE before closing date and time of online submission of tender. **No applications shall be received in physical form.**

1.2. The Bidder should sign each page on the application along with enclosures with rubber stamp before scanning / uploading.

1.3. Overwriting should be avoided. Corrections, if any, should be made by neatly crossing out and shall be rewritten with initials and date. Pages of the pre-qualification document are numbered. Additional sheets, if any added by the Bidder, should also be numbered by him. They should be uploaded along with letter of transmittal.

1.4. References, information and certificates from the respective clients certifying suitability, technical knowhow or capability of the Bidder should be signed by an officer not below the rank of Executive Engineer or equivalent.

1.5. The Bidder may furnish any additional information, which he thinks is necessary to establish his capabilities to successfully complete the envisaged work. He is, however, advised not to furnish superfluous information. No information shall be entertained after submission of tender document unless the Institute calls for it.

1.6. Any information furnished by the Bidder found to be incorrect either immediately or at a later date, would render him liable to be debarred from tendering/taking up of work in **IPR**.

1.7. Any clarification given by the Institute on the basis of queries raised by the Bidders shall be uploaded and shall become part of the tender condition.

1.8. The Bidder can seek clarifications regarding tender document up to 03.04.2020 (**17:00 Hours**) by uploading their queries on website www.tenderwizard.com/DAE. The clarifications will be uploaded on the same web portal by 09.04.2020 (**17:00 Hours**). No request for clarification will be considered after **03.04.2020 (17:00 Hours)**.

1.9. Confidentiality Clauses: -

i) Confidentiality:

No party shall disclose any information to any 'Third party' concerning the matters under this contract generally. In particular, any information identified as "Proprietary" in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party.

This clause shall apply to the sub-contractors, consultants, advisors or the employees engaged by a party with equal force.

ii) "Restricted information":-

Any contravention of the above-mentioned provisions by any contractor, sub-contractor, consultant, adviser or the employees of a contractor, will invite penal consequences under the above said legislation.

iii) Prohibition against use of **IPR's** name without permission for publicity purposes: The contractor or sub-contractor, consultant, adviser or the employees engaged by the contractor shall not use **IPR's** name for any publicity purpose through any public media like Press, Radio, TV or Internet without the prior written approval of IPR.

2.0 Method of Application:

2.1 If the Bidder is an individual, the application shall be signed by him above his full typewritten name and current address.

2.2 If the Bidder is a proprietary firm, the application shall be signed by the proprietor above his full typewritten name and the full name of his firm with its current address.

2.3 If the Bidder is a firm in partnership, the application shall be signed by all the partners of the firm above their full typewritten names and current addresses or alternatively by a partner holding power of attorney for the firm. In the latter case a certified copy of the power of attorney should accompany the application. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the application.

2.4 If the Bidder is a limited company or corporation, the application shall be signed by a duly authorized person holding power of attorney for signing the application accompanied by a copy of the power of attorney. The Bidder should also upload a copy of the Memorandum of Articles of Association duly attested by a Public Notary.

3.0 Final Decision Making Authority:

The Director, IPR reserves the right to accept or reject any application/s and to annul the pre-qualification process and reject all applications at any time, without assigning any reason or incurring any liability to the Bidders.

4.0 Particulars provisional:

The particulars of the work given in Section-1 (iii) are provisional. They are liable to change and must be considered only as advance information to assist the Bidder.

5.0 The Bidder should **own construction equipment** as per list required for the proper and timely execution of the work. Else, he should certify that he would be able to manage the equipment by hiring, etc. and submit the list of firms from whom he proposes to hire.

6.0 The Bidder should have sufficient number of **Technical and Administrative employees** for the proper execution of the contract. The Bidder should submit list of well qualified and experienced Engineers and Supervisors stating clearly how those would be deployed for execution of works.

B - GENERAL RULES & DIRECTIONS

1.0 Scope of bid : The Chairperson I-CDC ,IPR invites bids for the work. The successful bidder should provide the services during the period of work as per the terms and conditions specified in the NIT, general condition of contract, technical specifications, special conditions of contract and schedules.

2.0 Eligible bidders

2.1 Bidding is open to all eligible bidders meeting the eligibility criteria as defined in prequalification criteria. Bidders are advised to note the eligibility criteria specified in the notice inviting tender.

2.2 Incomplete bids and bidders not meeting the minimum qualification criteria shall be summarily rejected. It may be noted that mere submission of bid does not imply that your offer shall be considered. Tenders are considered only after IPR themselves assess the document submitted along with the bid by the bidder meets the eligibility criteria as specified in notice inviting e-tender during evaluation of bid.

2.3 The bidder who has been blacklisted / de-registered / holiday at any of the sites of IPR, DAE, and any other government department shall not be eligible for participation in tenders of IPR for that period.

3.0 One bid per bidder

3.1 Each bidder shall submit only one bid. A bidder who submits or participates in more than one bid will cause the bidder's participation to be disqualified for all the proposals.

4.0 Cost of bidding

4.1 The bidder shall bear all costs associated with the preparation and submission of his bid and the Institute will in no case be responsible and liable for these costs.

5.0 Site visit

5.1 The bidder and any of his authorized personnel or agents may be granted permission by the IPR to enter upon its premises and lands for the purpose of site visit. The Bidder is advised to visit the site of work, at his own cost, and examine it and its surroundings by himself, collect all information that he considers necessary for proper assessment of the prospective assignment. He may contact **Mr. Prashant Singh, officer in-charge, e-tender**, Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar - 382428. Preferably by **email: etender.icdc@ipr.res.in** or through **Tel No:-079-2396 2000, 2396 2069**, for fixing appointment prior to visit the site. However, the bidder, his personnel and agents will be responsible against all liability in respect thereof, including death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

5.2 The bidder should inform the Institute at least two days in advance about the proposed site visit.

5.3 The bidder, at his own responsibility and risk is encouraged to visit, inspect and survey the site and its surroundings and satisfy himself before submitting his bid as to the form and nature of the site, the means of access to the site, the accommodation he may require, etc.

5.4 In general, bidders shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidder shall be deemed to have full knowledge of the site, whether he inspects it or not and no extra claims due to any misunderstanding or otherwise shall be allowed.

5.5 The costs of visiting the site shall be at the bidders' own expense. Any report shared at the site, by the Institute is subject to verification by the contractor. Any deviations of information in the report and the actual site will not be the responsibility of the IPR.

5.6 The bidders are requested to bring photo identification like passport, voters' identity card, and driving license, PAN card, identity card issued by employer, Aadhar card etc. for security regulations. Any electronic devices like mobiles, radio, transistors, camera etc. are not allowed inside IPR premises.

5.7 The bidder shall forward any query/question by e-mail within the stipulated date and time given in NIT. The clarification given by the IPR shall be visible to all the bidders without disclosing the identity of the bidder raising the query. The questions/query received after stipulated date and time shall not be entertained and no response shall be forwarded. The submission of bid shall mean that the bidder has seen the response and accepts the content.

6.0 Content of bidding documents

6.1 Submission of a bid by a bidder implies that he has read this notice and all other contract documents, clarification, addendum, corrigendum and has made himself aware of the scope and specifications of the work to be executed and of conditions.

6.2 The bidder shall submit the bid, which satisfies each and every condition laid down in the bid documents, failing which, the bid is liable to be rejected.

6.3 The documents listed below comprise one set of bid document:

- Technical Bid
- Price Bid

7.0 Pre-bid meeting: Not applicable

8.0 Amendment of bid documents

8.1 Before the deadline for submission of bids, IPR may modify the bidding documents by issuing addendum on web site.

8.2 Any addendum so issued shall be part of the bid documents as well as contract document.

8.3 To give prospective bidders reasonable time to take an addendum into account in preparing their bids, the IPR may extend the date for submission of bids, if necessary.

8.4 Corrigendum, addendum or any other information regarding tender shall be uploaded only on web site. Hence, the bidders are requested to visit the web site (www.tenderwizard.com/DAE) regularly. The above documents shall become part of bid and agreement. Submission of bid shall imply that bidder has noted and accepted content of all the corrigendum/addendum/clarifications and effect of same has been included in price bid.

9.0 Language of the bid

9.1 All documents relating to the bid shall be in the English language, unless stated otherwise.

10.0 Earnest Money Deposit

10.1 The Earnest Money Deposit amount may be paid in the modes described below. The IPR shall not pay interest on the same in any case. The bidder is responsible for timely payment of Earnest Money Deposit, so that IPR receives the same before stipulated date and time. Even if the payment made by the bidder within the stipulated date and time is not received by the IPR due to reasons beyond control of the bidder, bid will be considered as non-responsive and rejected. If the Earnest Money Deposit amount paid by bidder is less than stipulated, the bid shall be rejected.

The Earnest Money Deposit to be submitted in the form of demand draft or Pay order of any Scheduled Bank in favour of INSTITUTE FOR PLASMA RESEARCH, Bhat, Gandhinagar, Gujarat. The bid can only be submitted after uploading the scanned copy of DD etc. and original should be deposited in office of Tender Inviting Authority within the period of bid submission. The bidder is solely responsible for timely deposition of Earnest Money Deposit in the correct account.

10.2 EMD exempted - Not applicable

10.3 (a) in case of two part bid, the Earnest Money Deposit of technically unqualified bidders after technical evaluation shall be returned.

(b) Earnest Money Deposit of qualified unsuccessful bidders will be returned to them within a month (30 days) from the date of acceptance of bid of the successful bidder.

(c) Earnest Money Deposit of successful bidder will be returned after submission of the performance guarantee amount.

(d) Earnest Money Deposit of the bidder who has withdrawn the bid shall be returned after opening of the bid.

10.4 The Earnest Money Deposit shall be forfeited, if;

a) The bidder withdraws / modifies his bid or any item thereof after opening of bid.

b) The successful bidder fails within the specified time limit to submit the performance guarantee and commence the work.

10.5 The IPR at its discretion shall refund the Earnest Money Deposit by RTGS/NEFT or through any other electronic mode to the account number as registered by the bidder himself on e-tendering portal.

11.0 Bid prices, rates & taxes

11.1 The bidder should quote his rates in figures only.

11.2 In the case of item rate tenders, only rates quoted shall be considered. In case of lump sum tender, only lump sum quoted amount shall be considered.

11.3 The rates, prices and total bid price submitted by the contractor shall be inclusive of terminal or other duties, GST, VAT, CST, turnover tax, work contract tax, octroi, cess, or any other similar tax applicable under the existing laws or levy by the statutory authorities/state/central government in

performance of this contract including GST. This is an indivisible works contract. The rates quoted shall include all taxes including Goods and Service Tax (GST) at applicable rates and levies, duties, cess etc., payable under respective statutes. Deductions as per statutes will be effected from the bill and remitted to the Department concerned.

11.4 Tax deduction at source

At the time of its payments due to the contractor under this contract, the statutory deduction of income tax at source (IT TDS) shall be made from time to time as may be required by the government.

IPR shall provide the necessary withholding tax certificates to the contractor within the time stipulated by the relevant law to enable the contractor to file the same with the government.

11.5 The evaluation of price bid will be done strictly on the basis of rates/total bid price quoted by bidder in the price bid format plus service tax as applicable.

12.0 Currencies of bid and payment

12.1 The unit rates and the prices shall be quoted by the bidder in Indian rupees, unless otherwise specified in the special conditions of contract.

13 Bid validity

13.1 The bids submitted shall remain valid for acceptance for a period of **120 days** from the date of opening of the bid. The bidder shall not be entitled during the period of validity, to revoke or cancel his bid or vary / modify the bid given or any item thereof. In case of bidder revoking or cancelling his bid, varying any terms in regard thereof, the full amount of Earnest Money Deposit paid by the bidder along with the bid shall be forfeited by IPR.

13.2 In exceptional circumstances, prior to expiry of the original bid validity period, IPR may request the bidders to extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting its Earnest Money Deposit but his bid will not be considered. A bidder agreeing to the request will not be required or permitted to modify its bid, but will be required to extend the validity of its Earnest Money Deposit for the period of the extension.

14.0 Alternative proposals by bidders

14.1 Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.

15.0 Submission of the bids

15.1 The date and time of on-line bid submission shall remain unaltered even if the specified date for the submission of the bid is declared as holiday for the office inviting tender.

15.2 The IPR may extend the deadline for submission of bids by issuing an amendment, in which case, all rights and obligations of the Institute and the bidders previously subject to the original deadline will then be subject to the new deadline.

15.3 Any bid received by the IPR after the deadline prescribed above will be rejected.

15.4 The bidders shall note the following before submission of bid

- (a) If the digital signature certificate (DSC) holder is sole proprietor of the firm, power of attorney need not be submitted.
- (b) In case DSC holder is bidding on behalf of partnership firm, joint venture, consortium etc. power of attorney or any other legally acceptable document viz. partnership deed, board resolution etc. authorizing DSC holder to bid on behalf of the bidder is to be uploaded. In case of non-submission the bid shall be summarily rejected.

16.0 Bid opening

16.1 Tender opening shall be done on-line. On opening, the Bidders can see their bid status. The authorized representative of Bidders may remain present (if so desires) during opening of Bid. The authorized representative should have valid photo identity and original authority letter issued by competent authority of their company. If the date of opening is declared as holiday then bid will be opened on next working day. In exceptional cases opening of tenders can be done on any day or time after scheduled date and time of opening. Corrigendum issued for opening of tender shall be uploaded on website.

16.2 The bids without stipulated Earnest Money Deposit amount and other mandatory documents as per NIT shall be summarily rejected.

16.3 In two part tenders financial bid of only qualified bidder shall be opened.

17.0 Clarification of bids

17.1 To assist in the examination and comparison of bids, the IPR may, at its discretion, ask any bidder for clarification of his bid, including breakdown of unit rates. The request for clarification and the response shall be in writing or by email / fax, but no change in the price or substance of the bid shall be sought, offered, or permitted. If the bidder does not respond within the stipulated time, then the bid of the bidder will be evaluated on its own merit.

17.2 Bidder shall not contact the IPR on any matter relating to his bid from the time of the bid opening to the time the contract is awarded.

17.3 Any effort by the bidder to influence the IPR bid evaluation, bid comparison or contract award decisions, may result in the rejection of his bid.

18.0 Examination of bids and determination of responsiveness

18.1 Prior to detailed evaluation of bids, the IPR will determine whether each bid(s) meets

- (a) the minimum requirements as per pre-qualification criteria
- (b) is accompanied by the required Earnest Money Deposit
- (c) is responsive to the requirements of the bidding documents
- (d) has been properly signed by authorized signatory as per clause-15.4 .

18.2 A responsive bid is one which conforms to all the terms, conditions and specification of the bidding documents.

19.0—Evaluation and comparison of bids - Not Applicable

~~19.1—The Institute reserves the right to accept or reject any offer. IPR also reserves the right to award only part of the work.~~

~~19.2—The estimated effect of the price adjustment conditions under variations and deviations of the conditions of contract, during the period of implementation of the contract, will not be taken into account in bid evaluation.~~

20.0—Award criteria - Not Applicable

~~20.1—The IPR shall award the contract to the bidder whose evaluated offer / bid has been determined to be the technically suitable and financially lowest (L1) and is substantially responsive to the bidding document, provided further that the bidder is determined to be qualified to execute the contract satisfactorily. The technically and financially suitable bids in other types of bids shall be decided as per criteria given in eligibility requirement. In case of tie between two lowest bidders, both the bidders shall be given a chance to offer rebate to decide the lowest bid. If the situation still remains same the lottery shall be adopted to decide the award.~~

~~20.2—L-1 bidder will be required to produce the original documents in support of the information furnished by him on line for verification as specified in NIT/e tender notice. The bidder shall submit the same on any working day within specified period after issue of letter to this effect. In case the L-1 bidder fails to produce the documents within the specified period or if any of the information furnished by L-1 bidder on line is found to be false during verification of original document, which changes the eligibility status of the bidder, then the bid shall be disqualified with forfeiture of Earnest Money Deposit and banning of the concerned bidder for participation in future tenders for five years. The next financial lowest qualified bidder shall be awarded the work subject to producing original documents.~~

~~20.3—Submission of illegible or blank document may render the bid non responsive and liable for rejection. Submission of bid will be recognized and accepted as a certificate regarding authentication of all information provided in the bid and acceptance of all terms & conditions, general condition of contract, notice inviting tender etc., since such acceptance by bidder with digital signature is legally tenable.~~

~~20.4—The IPR reserves the right not to award the work without assigning reason and without incurring any liability to the bidder or bidders.~~

21.0 Notification of award and signing of agreement

21.1 The bidder whose bid has been accepted will be notified of the award by the IPR prior to expiration of the bid validity period by issue of work order. The notification may also be made through letter of intent, wherein the work order shall follow.

21.2 The details of award can be seen on web site. The bidders can request for debriefing in writing within fifteen days of award. They shall be informed about suitable days to visit the office of the concerned officer. Requests beyond deadline shall not be entertained.

21.3 The work order will constitute the formation of the contract subject only to the furnishing of a performance guarantee within period as specified in schedule F.

21.4 An agreement shall be made and signed by both the parties. The agreement will incorporate all correspondence between the IPR and the successful bidder, bid documents etc. The bid document as uploaded on website www.tenderwizard.com/DAE shall be forming part of agreement. The successful bidder shall be responsible for compliance at his own cost with the stamp duty act of the state where the agreement is being executed. The non-judicial stamp paper of appropriate value after adjudication shall be submitted by the successful bidder at his own cost.

22.0 Corrupt or fraudulent practices

22.1 The IPR requires that bidders / suppliers / contractors under this contract, observe the highest standard of ethics during the procurement and execution of this contract. In pursuance of this policy, the IPR:

(a) Defines, for the purpose of these provisions, the terms set forth below as follows:

(i) "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution; and

(ii) "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the IPR, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the IPR of the benefits of free and open competition.

(b) Will reject a proposal for award of work if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.

(c) will declare a bidder ineligible, either indefinitely or for a stated period of time, to be awarded a contract / contracts if at any time it determines that the bidder has engaged in corrupt or fraudulent practices in competing for, or in executing, the contract.

22.2 The bidder may make representation in connection with processing of tender directly and only to the competent authority (calling tender) as mentioned in the tender document. However, if such representation is found to be un-sustentative and/ or frivolous and if the tender has to be closed because of the delays / disruptions caused by such representations and the job has to be re-tendered, then such bidder will not be allowed to participate in the re-invited tender.

In case, any bidder while making such representation to competent authority also involves other officials of IPR and / or solicits/ invokes external intervention other than as may be permitted under the law and if the tender has to be closed because of the delays / disruptions caused by such interventions and has to be re-tendered, then the particular bidder will not be allowed to participate in the re-invited tender.

23.0 Disclosures

23.1 Any change in the constitution of the contractor's firm, where it is a partnership firm, joint venture or consortium partnerships as declared in the bid should be disclosed to the IPR, at any time between the submission of bids and the signing of the contract.

SECTION: 2

Conditions of Contract

SECTION: 2 - (i) - GENERAL CONDITIONS.

Definitions

1. The **Contract** means the documents forming the tender and acceptance thereof and the formal agreement executed between the Director, IPR and the Contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-in-Charge and all these documents taken together shall be deemed to form one contract and shall be complementary to one another.
2. In the contract, the following expressions shall, unless the context otherwise requires, have the meanings, hereby respectively assigned to them:
 - i. The expression **works or work** shall, unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.
 - ii. The **Site** shall mean the land/or other places on, into or through which work is to be executed under the contract or any adjacent land, path or street through which work is to be executed under the contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.
 - iii. The **Contractor** shall mean the individual, firm or company, whether incorporated or not, undertaking the works and shall include the legal personal representative of such individual or the persons comprising such firm or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.
 - iv. The **Director or Director, IPR** means the Director of the Institute for Plasma Research.
 - v. **The Chairperson, ICDC, IPR** means chairman of the Infrastructure and campus development committee of the Institute for Plasma Research.
 - vi. The **Engineer-in-charge** means the Engineer or Officer who shall supervise and be in - charge of the work and who shall sign the contract on behalf of the Director, IPR as mentioned in Schedule 'F' hereunder.
 - vii. Department/**Institute**/IPR/Principal Employer shall mean the Institute for Plasma Research .
 - viii. **Accepting Authority** shall mean the authority mentioned in Schedule 'F'.
 - ix. **Excepted Risk** are risks due to riots (other than those on account of contractor's employees), war (whether declared or not), invasion, act of foreign enemies, hostilities, civil war, rebellion, revolution, insurrection, military or usurped power, any acts of the Institute/Government, damages from air-crafts, acts of God, such as earth-quake, lightening and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the Accepting Authority or causes solely due to use or occupation by the Institute of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to Institute's faulty design of works.
 - x. **Market Rate** shall be rate as decided by the Engineer-in-Charge on the basis of the cost of materials and labour at the site where the work is to be executed plus the percentage mentioned in Schedule 'F' to cover, all overheads and profits.
 - xi. **Schedule(s)** referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers or the Schedule of Rates mentioned in Schedule 'F' hereunder, with the amendments thereto issued up to the date of receipt of the tender by concerned competent authority.

- xii. **District Specifications** means the specifications followed by the State Government in the area where the work is to be executed.
- xiii. **Tendered value** means the value of the entire work as stipulated in the letter of award.
- xiv. **Date of commencement of work:** The date of commencement of work shall be the date of start as specified in schedule 'F' or the first date of handing over of the site, whichever is later, in accordance with the phasing if any, as indicated in the tender document.

Scope and Performance

3. Where the context so requires, words imparting the singular only also include the plural and vice versa. Any reference to masculine gender shall whenever required include feminine gender and vice versa.

4. Headings and Marginal notes to these General Conditions of Contract shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.

5. The contractor shall be furnished, free of cost one certified copy of the contract documents except standard specifications, Schedule of Rates and such other printed and published documents, together with all drawings as may be forming part of the tender papers. None of these documents shall be used for any purpose other than that of this contract.

6. Works to be carried out

The work to be carried out under the Contract shall, except as otherwise provided in these conditions, include all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for and in the full and entire execution and completion of the works. The descriptions given in the Schedule of Quantities (Schedule-A) shall unless otherwise stated, be held to include wastage on materials, carriage and cartage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other labours necessary in and for the full and entire execution and completion of the work as aforesaid in accordance with good practice and recognized principles.

7. Sufficiency of Tender

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the Schedule of Quantities, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.

8. Discrepancies and Adjustment of Errors

The several documents forming the Contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawing and figured dimensions in preference to scale dimensions and special conditions in preference to General Conditions.

8.1 In the case of discrepancy between the Schedule of Quantities, the Specifications and/or the Drawings, the following order of preference shall be observed:

- i) Description of Schedule of Quantities.
- ii) Particular Specification and Special Condition, if any.
- iii) Drawings.
- iv) SAC SOR Specifications.

- v) C.P.W.D. Specifications.
- vi) Indian Standard Specifications of B.I.S.

8.2 If there are varying or conflicting provisions made in any one document forming part of the contract, the Accepting Authority shall be the deciding Authority with regard to the intention of the document and his decision shall be final and binding on the contractor.

8.3 Any error in description, quantity or rate in Schedule of Quantities or any omission there from shall not vitiate the Contract or release the Contractor from execution of the whole or any part of the works comprised therein according to drawings and specifications or from any of his obligations under the contract.

9. **Signing of Contract**

The successful tenderer/contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work sign the contract consisting of:

i) The notice inviting tender, all the documents including drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

ii) Standard Form as mentioned in Schedule 'F' consisting of:

- a) Various standard clauses with corrections up to the date stipulated in Schedule 'F' along with annexure thereto.
- b) Safety Code.
- c) Model Rules for the protection of health, sanitary arrangements for workers employed by Institute or its contractors.
- d) Labour Regulations.
- e) List of Acts and omissions for which fines can be imposed.

iii) No Payment for the work done will be made unless contract is signed by the contractor.

10. Director or his representative may issue instruction/actions for the said works from time to time, which should be binding on the contractor.

SECTION - 2 - (ii) - CLAUSES OF CONTRACT

GENERAL CLAUSES OF CONTRACT (GCC)

CLAUSE 1 (Performance Guarantee)

- i) The contractor shall submit an irrevocable **Performance Guarantee of 5%** (Five percent) of the tendered amount in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (notwithstanding and/or without prejudice to any other provisions in the contract) within the period specified in Schedule F from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-Charge up to a maximum period as specified in schedule 'F' on written request of the contractor stating the reason for delays in procuring the Performance Bank Guarantee, to the satisfaction of the Engineer-In-Charge. This guarantee shall be in the form of banker's cheque of any schedule bank /Demand draft of any schedule bank/ pay order of any schedule bank or Fixed Deposit Receipt or Guarantee bond of any schedule bank in accordance with the form annexed hereto. In case a fixed deposit receipt is furnished by the contractor to the Institute as part of the Performance Bank Guarantee and the bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Institute to make good the deficit.
- ii) The Performance Guarantee shall be initially valid up to the stipulated date of completion plus 60 days beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of Performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest. However, in case of contracts involving maintenance of building and services/any other work after construction of same building and services/other work, then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned yearwise proportionately.
- iii) The Engineer-in-Charge shall not make a claim under the performance guarantee except for amounts to which the Director, IPR is entitled under the contract (notwithstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:
 - a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-Charge may claim the full amount of the Performance Guarantee.
 - b) Failure by the contractor to pay the Director, IPR any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by the Engineer-in-Charge.
- iv) In the event of the contract being determined or rescinded under provision of any of the Clause/Condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the Director, IPR.
- v) On substantial Completion of any work which has been completed to such an extent that the intended purpose of the work is met and ready to use, then a provisional Completion certificate shall be recorded by the Engineer-in-Charge. The provisional certificate shall have appended with a list of outstanding balance item of work that need to be completed in accordance with the provisions of the contract.

This provisional completion certificate shall be recorded by the concerned Engineer- in-charge with the approval of Chairperson I-CDC After recording of the provisional Completion Certificate for the work by the competent authority, the 80 % of performance guarantee shall be returned to the contractor, without any interest.

However in case of contracts involving Maintenance of building and services / any other work after construction of same building and services/ other work, then 40% of performance guarantee shall be returned to the contractor, without any interest after recording the provisional Completion certificate.

CLAUSE 1A (Recovery of Security Deposit)

The person / persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit the Institute at the time of making any payment to him for work done under the contract to deduct a sum at the rate of 2.5% of the gross amount of each running bill and final bill till the sum along with the sum already deposited as earnest money, will amount to security deposit of 2.5% of the tendered value of the work.

Such deductions will be made and held by Institute by way of Security Deposit unless he /they has /have deposited the amount of Security at the rate mentioned above in Cash or in the form of / or Fixed Deposit Receipts. In case a fixed Deposit Receipt of any Scheduled bank is furnished by the contractor to the Institute as a part of the Security Deposit and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the government to make good the deficit.

All compensations or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or from any sums which may be due to or may become due to the contractor by Institute on any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good, in cash or fixed deposit receipt tendered by the State Bank of India or by scheduled banks endorsed in favor of the Institute, any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof. The security deposit shall be collected from the running bills and final bill of the contractor at the rates mentioned above.

The security deposit as deducted above can be released against bank guarantee issued by a Scheduled bank on its accumulations to a minimum of Rs. 5 Lac subject to the condition that amount of such bank guarantee, except last one shall not be less than Rs. 5 Lac. Provided further that the validity of bank guarantee including the one given against the earnest money shall be in conformity with provisions contained in clause 17 which shall be extended from time to time depending upon extension of contract granted under provisions of clause 2 and clause 5.

In case of contracts involving maintenance of building and services/other work, then 50% of performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

CLAUSE 2 (Compensation for Delay)

If the contractor fails to maintain the required progress in terms of clause 5 or to complete the work and clear the site on or before the contract or justified extended date of completion, as per clause 5(excluding any extension under Clause 5.5) as well as any extension granted under clauses 12 and 15, he shall, without prejudice to any other right or remedy available under the law to the Government on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the authority

specified in schedule 'F' (whose decision in writing shall be final and binding) may decide on the amount of Tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in Clause 5 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period of completion has been specified.

Compensation for delay of work @ 1.0 % per month of delay to be computed on per day basis.

Provided always that the total amount of compensation for delay to be paid under this Condition shall not exceed 10% of the Tendered Value of work or of the Tendered Value of the Sectional part of work as mentioned in Schedule 'F' for which a separate period of completion is originally given.

In case no compensation has been decided by the Authority in schedule 'F' , during the progress of work, this shall be no waiver of right to levy compensation by the said authority if the work remains incomplete on final justified extended date of completion. If the Chairperson ICDC decides to give further extension of time allowing performance of work beyond the justified extended date, the contractor shall be liable to pay compensation for such extended period. If any variation in amount of contract takes place during such extended period beyond justified extended date and the contractor becomes entitled to additional time under clause 12, the net period for such variation shall be accounted for while deciding the period for levy of compensation. However, during such further extended period beyond the justified extended period, if any delay occurs by events under sub clause 5.2, the contractor shall be liable to pay compensation for such delay.

Provided that compensation during the progress of work before the justified extended date of completion for delay under this clause shall be for non-achievement of sectional completion or part handing over of work on stipulated/justified extended date for such part work or if delay affects any other works/services. This is without prejudice to right of action by the Engineer in Charge under clause 3 for delay in performance and claim of compensation under that clause.

In case action under clause 2 has not been finalized and the work has been determined under clause 3, the right of action under this clause shall remain post determination of contract but levy of compensation shall be for days the progress is behind the schedule on date of determination, as assessed by the authority in Schedule F, after due consideration of justified extension. The compensation for delay, if not decided before the determination of contract, shall be decided after of determination of contract.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Institute /Government. In case, the contractor does not achieve a particular milestone mentioned in schedule F, or the re-scheduled milestone(s) in terms of Clauses 5.4, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied as above. - With-holding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.

CLAUSE 2A (Incentive for early completion) (Not applicable)

~~In case, the contractor completes the work ahead of updated stipulated date of completion or justified extended date of completion as determined under clauses 5.3,12 & 15 a bonus @ 1% (one per cent) of the tendered value per month computed on per day basis, shall be payable to the contractor, subject to a maximum limit of 5% (five per cent) of the tendered value. Provided that justified time for extra work shall~~

~~be calculated on pro rata basis as cost of extra work X stipulated period /tendered value. The amount of bonus, if payable, shall be paid along with final bill after completion of work. Provided always that provision of the Clause 2A shall be applicable only when so provided in Schedule F'.~~

CLAUSE 3 (When Contract can be determined)

Subject to other provisions contained in this clause, Engineer-in-Charge may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages, and/or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

- (i) If the contractor having been given by the Engineer-in-charge a notice in writing to rectify; reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or unworkman like manner shall omit to comply with the requirement of such notice for a period of seven days thereafter.
- (ii) If the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence so that in the opinion of the Engineer-in-Charge (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Engineer-in-Charge.
- (iii) If the contractor fails to complete the work or section of work with individual date of completion on or before the stipulated or justified extended date, on or before such date of completion; and the Engineer in Charge without any prejudice to any other right or remedy under any other provision in the contract has given further reasonable time in a notice given in writing in that behalf as either mutually agreed or in absence of such mutual agreement by his own assessment making such time essence of contract and in the option of Engineer-in-Charge the contractor will be unable to complete the same or does not complete the same within the period specified..
- (iv) If the contractor persistently neglects to carry out his obligations under the contract and/or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge.
- (v) If the Contractor shall offer or give or agree to give to any person in Institute or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing of forbearing to do or for having done of forborne to do any act in relation to the obtaining or execution of this or any other contract for Institute.
- (vi) If the Contractor shall enter in to a contract with Institute in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer- in- Charge.
- (vii) If the contractor shall obtain a contract with Institute as a result of wrong tendering or other non-bonafide methods of competitive tendering or commits breach of Integrity Agreement.
- (viii) If the contractor being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors.
- (ix) If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or

if circumstances shall arise which entitle the court or the creditors to appoint a receiver or a manager or which entitle the court to make a winding up order.

- (x) If the contractor shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days.
- (xi) If the contractor assigns,(excluding part(s) of work assigned to other agency(s) by the contractor as per terms of contract), transfers, sublets (engagement of labour on a piece work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer, sublet or otherwise parts with entire works or any portion thereof without the prior written approval of the Engineer- In charge.

When the contractor has made himself liable for action under any of the cases aforesaid, Engineer-in-Charge shall have powers:

- (a) To determine the contract as aforesaid so far as performance of work by the contractor in concerned(of which determination notice in writing to the contractor under the hand of the Engineer - in - Charge shall be conclusive evidence). Upon such determination the Earnest Money Deposit, Security Deposit already recovered and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of the Institute.
- (b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof, as shall be un-executed out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined or rescinded as above, shall not be allowed to participate in the tendering process for the balance work.

In the event of above courses being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements /agreements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer- in-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

CLAUSE 3A

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work or one month whichever is more , either party may close the contract by giving notice to the other party stating reasons. In such eventuality, the Performance Guarantee of the contractor shall be refunded within following time limits:

- (i) If the Tendered value of work is uptoRs. 45 Lac: 15 days.
- (ii) If the Tendered value of work is more than Rs. 45 lac and up to 2.5 Crore: 21 days.
- (iii) If the Tendered Value of work is more than Rs. 2.5 Crore: 30 days.

Neither party shall claim any compensation for such eventuality. This clause is not applicable for any breach of the contract by either party.

CLAUSE 4 (Contractor Liable to pay Compensation even if action not taken under Clause 3)

In any case in which any of the powers conferred upon the Engineer - in - Charge by Clause-3 thereof, shall have become exercisable and the same are not exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Engineer-in-Charge putting in force all or any of the powers vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the contractor, take possession of (or at the sole discretion of the Engineer-in-Charge which shall be final and binding on the contractor) use as on hire (the amount of the hire money being also in the final determination of the Engineer-in-Charge) all or any tools, plant, materials and stores, in or upon the works, or the site thereof belonging to the contractor, or procured by the contractor and intended to be used for the execution of the work/or any part thereof, paying or allowing for the same in account at the contract rates, or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge, whose certificate thereof shall be final, and binding on the contractor, clerk of the works, foreman or other authorized agent to remove such tools, plant, materials, or stores from the premises (within a time to be specified in such notice) in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

CLAUSE 5 (Time and Extension for Delay)

The time allowed for execution of the Works as specified in the Schedule 'F' or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in schedule 'F' or from the date of handing over of the site notified by the Engineer-in-Charge, whichever is later. However the handing over of site by the Engineer-in-Charge, in full or in part (if so provided in contract), shall be completed within two months from issue of acceptance letter. If the contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited by the Engineer-in-Charge and shall be absolutely at the disposal of the Institute - without prejudice to any other right or remedy available in law, -

5.1 As soon as possible but within twenty one days of award of work and in consideration of

- a) Schedule of handing over of site as specified in the Schedule 'F'.
- b) Schedule of issue of designs as specified in the Schedule 'F'.

- (i) The Contractor shall submit a Time and Progress Chart for each milestone. The Engineer-in-Charge may within 30 days thereafter, if required modify, and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-Charge. The work programme shall include all details of balance drawings and decision required to complete the contract with specific dates by which these details are required by contractor without causing any delay in execution of the work. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for

any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per mile stones given in Schedule F.

- (ii) In case of non submission of construction programme by the contractor the program approved by the Engineer-in-Charge shall be deemed to be final.
- (iii) The approval by the Engineer-in-Charge of such programme shall not relieve the contractor of any of the obligation under the contract.
- (iv) The Contractor shall submit the Time and Progress Chart and progress report using the mutually agreed software or in other format decided by the Engineer-in-Charge for the work done during previous month to the Engineer-in-charge on or before 5th day of each month failing which a recovery Rs. 2500/- (for work costing up to Rs. 20 Crores)/Rs. 5000/- (for work costing more than Rs. 20 Crores) shall be made on per week or part basis in case of delay in submission of the monthly progress report.

5.2 If the work(s) be delayed by:

- (i) force majeure, or
- (ii) abnormally bad weather, or
- (iii) serious loss or damage by fire, or
- (iv) civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work, or
- (v) delay on the part of other contractors or tradesmen engaged by Engineer-in-Charge in executing work not forming part of the Contract, or
- (vi) Non-availability of stores, which are the responsibility of Institute to supply or
- (vii) Non-availability or break down of tools and Plant to be supplied or supplied by the Institute or
- (viii) Any other cause like above which, in the reasoned opinion of the Engineer-in-Charge is beyond the Contractor's control.

then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge – for entry in the hindrance register (physical or web-based as prescribed in Schedule F but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

The contractor shall have no claim of damages for extension of time granted or rescheduling of milestone/s for events listed in sub clause 5.2.

5.3 In case the work is hindered by any reasons, in the opinion of the contractor, by the Department or for someone for whose action the Department is responsible, the contractor may immediately give notice thereof in writing to the Engineer-in-Charge in the same manner as prescribed under sub Clause 5.2 seeking extension of time or rescheduling of milestone/s. The authority as indicated in Schedule 'F' shall, if justified, give a fair and reasonable extension of time and reschedule the mile stones for completion of work after due consideration of the same within 30 days of receipt of such request. In event of non application by the contractor for extension of time, Chairperson I-CDC after affording opportunity to the contractor may give, supported with a programme, a fair and reasonable extension within a reasonable period of occurrence of the event.

Such extension of time or rescheduling of milestone/s shall be without prejudice to any other right or remedy of the parties in contract or in law; provided further that for concurrent delays under this sub clause and sub clause 5.2 to the extent the delay is covered under sub clause 5.2 the contractor shall be entitled to only extension of time and no damages.

5.4 Request for rescheduling of Mile stones or extension of time, to be eligible for consideration, shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay on the prescribed forms i.e. Form of application by the contractor for seeking rescheduling of milestones (Appendix-XVI) or Form of application by the contractor for seeking extension of time (Appendix -XVII) respectively to the authority as indicated in Schedule 'F'. The Contractor shall indicate in such a request the period by which rescheduling of milestone/s or extension of time is desired.

With every request for rescheduling of milestones, or if at any time the actual progress of work falls behind the approved programme by more than 10% of the stipulated period of completion of contract, the contractor shall produce a revised programme which shall include all details of pending drawings and decisions required to complete the contract and also the target dates by which these details should be available without causing any delay in execution of the work. A recovery as specified in Schedule 'F' shall be made on per day basis in case of delay in submission of the revised programme.

5.4.1 In any such case the authority as indicated in Schedule 'F' may give a fair and reasonable extension of time for completion of work or reschedule the mile stones. Such extension or rescheduling of the milestones shall be communicated to the Contractor by the authority as indicated in Schedule 'F' in writing, within 30 days of the date of receipt of such request from the Contractor in prescribed form. In event of non application by the contractor for extension of time Chairperson I-CDC after affording opportunity to the contractor, may give, supported with a programme (as specified under 5.4 above), a fair and reasonable extension within a reasonable period of occurrence of the event.

5.5 In case the work is delayed by any reasons, in the opinion of the Chairperson I-CDC, by the contractor for reasons beyond the events mentioned in clause 5.2 or clause 5.3 or clause 5.4 and beyond the justified extended date; without prejudice to right to take action under Clause 3, the Chairperson I-CDC may grant extension of time required for completion of work without rescheduling of milestones. The contractor shall be liable for levy of compensation for delay for such extension of time.

CLAUSE 6 (Measurement of Work Done) (Not Applicable)

~~Engineer in Charge shall, except as otherwise provided, ascertain and determine by measurement the value in accordance with the contract of work done.~~

~~All measurements of all the items having financial value shall be entered in Measurement Book and/or level field book so that a complete record is obtained of all the items of work performed under the contract.~~

~~All such measurements and levels shall be taken jointly by the Engineer in charge or his authorized representative and by the contractor or his authorised representative from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer in Charge and the contractor or their representatives in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties,~~

~~If for any reason the contractor or his authorized representatives is not available and the work of recording measurements is suspended by the Engineer in Charge or his representative, the Engineer in Charge and the Department shall not entertain any claim from contractor for any loss or damages on this account. If the contractor on his authorised representative does not remain present at the time of such measurements after the contractor or his authorised representative has been given a notice in writing three(3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer in Charge or his representative shall be deemed to be accepted by the Contractor.~~

~~The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements and recording levels~~

~~Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed.~~

~~The contractor shall give not less than seven days notice to the Engineer in charge or his authorised representative in charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer in charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work. And if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Engineer in charge's consent being obtained in writing the same shall be uncovered at the contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.~~

~~Engineer in charge or his authorised representative may cause either themselves or through another officer of the department to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.~~

~~It is also a term of this contract that recording of measurement of any work in the measurement book and /- or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or materials to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.~~

CLAUSE 6A (Computerized Measurement Book)

Engineer-in-charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract.

All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book having pages of A-4 size as per the format of the department so that a complete record is obtained of all the items of works performed under the contract.

All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-charge

or his authorized representative as per interval or program fixed in consultation with Engineer-in-charge or his authorized representative. After the necessary corrections made by the Engineer-in-charge, the measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-charge for the dated signatures by the Engineer-in-charge and the contractor or their representatives in token of their acceptance.

Whenever bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked / test checked from the Engineer-in-Charge and/or his authorized representative. The Contractor will, thereafter, incorporate such changes as may be done during these checks/test checks in his draft computerized measurements, and submit to the department a computerized measurement book, duly bound, and with its pages machine numbered. The Engineer-in-Charge and / or his authorized representative would thereafter check this MB, and record the necessary certificates for their checks/ test checks.

The final, fair, computerized measurement given by the contractor duly bound, with its pages machine numbered should be 100% correct, and no cutting or over writing in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound, after getting the earlier MB cancelled by the department. Thereafter the MB shall be taken in the Divisional Office Records, and allotted a number as per the Register of Computerized MBs. This should be done before the corresponding bill is submitted to the Division office for Payment. The contractor shall submit two spare copies of such computerized MBs for the purpose of reference and record by the various officers of the department.

The contractor shall also submit to the Institute separately his computerized abstract of cost and the bill based on these measurements, duly bound and its pages machine numbered along with two spare copies of the "bill". Thereafter, this bill will be processed by the Institute and allotted a number as per the computerized record in the same way as done for the measurement book meant for measurements.

The Contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements/ levels by the engineer-in-charge or his representative.

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications, notwithstanding any provision in the relevant standard method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the bureau of Indian standards and if for any item no such standard is available then a mutually agreed method shall be followed.

The contractor shall give not less than seven days notice to the Engineer-in-charge or his authorized representative in charge of the work before covering up or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked and /or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and /or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer in charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and /or test checking measurements without such notice having been given or the engineer in charge's consent being obtained in writing the same shall be uncovered at the contractor's expense or in default thereof no payment or allowances shall be made for such work or the materials with the same was executed.

Engineer- in-charge or his authorized representative may cause either themselves or through another officer of the Institute to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.

It is also a term of this contract that checking and/or test checking the measurements of any item of work in the measurement book and / or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

CLAUSE 7 (Payment on Intermediate Certificate to be regarded as Advances)

No payment shall be made for work, estimated to cost Rupees One Lac - or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over One lac,, the interim or running account bills shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format of the Institute in triplicate on or before the date of every month fixed for the same by the Engineer-in-Charge. The contractor shall not be entitled to be paid any such interim payment if the gross work done together with net payment adjustment of advances for material collected, if any, since the last such payment is less than the amount specified in Schedule 'F', in which case the interim bill shall be prepared on the appointed date of the month after the requisite progress is achieved. Engineer-in-Charge shall arrange to have the bill verified by taking or causing to be taken, where necessary, the requisite measurements of the work. In the event of the failure of the contractor to submit the bills no claims whatsoever due to delays on payment including that of interest shall be payable to the contractor. Payment on account of amount admissible shall be made by the Engineer- in-Charge certifying the sum to which the contractor is considered entitled by way of interim payment at such rates as decided by the Engineer-in-Charge. The amount admissible shall be paid by 10th working day after the day of presentation of the bill by the Contractor to the Engineer-in-Charge or his Asst. Engineer together with the account of the material issued by the Institute, or dismantled materials, if any. In the case of works outside the headquarters of the Engineer- in-Charge, the period of ten working days will be extended to fifteen working days. In case of delay in payment of intermediate bills after 45 days of submission of bill by the contractor provided the bill submitted by the contractor found to be in order, a simple interest @ 10% - per annum shall be paid to the contractor from the date of expiry of the prescribed time limit which will be compounded on yearly basis.

All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Engineer-in-Charge relating to the work done or materials delivered forming part of such payment, may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.

Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided without prejudice to the right of the Institute to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.

The Engineer-in-Charge in his sole discretion on the basis of a certificate from the Assistant Engineer to the effect that the work has been completed up to the level in question make interim advance payments without detailed measurements for work done (other than foundations, items to be covered under finishing items) up to lintel level (including sunshade etc.) and slab level, for each floor working out at 75% of the assessed value. The advance payments so allowed shall be adjusted in the subsequent interim bill to be submitted by the contractor within 10 days of the interim payment. In case of delay in submission of bill by the contractor a simple interest @ 10% per annum shall be paid to the Institute from the date of expiry of prescribed time limit which will be compounded on yearly basis. **Payments in Composite Contracts:** In case of composite tenders, running payment for the major component shall be by Engineer-In-Charge of major discipline to the main contractor. Running payment for minor components shall be recommended by the Engineer-in Charge of the discipline of minor component directly to the main contractor.

In case main contractor fails to make the payment to the contractor associated by him within 15 days of receipt of each running account payment, then on the written Complaint of contractor associated for such minor component, Engineer in charge of minor component shall serve the show cause to the main contractor and if reply of main contractor either not received or found unsatisfactory, he may make the payment directly to the contractor associated for minor component as per terms and conditions of the agreement drawn between main contractor and associate contractor fixed by him, Such payment made to the associate contractor shall be recovered by Engineer-in-Charge of major or minor component from the next RA/ final bill to main contractor as the case may be.

CLAUSE 7A

No Running Account Bill Shall be paid for the work till the applicable labour licenses, registration with EPFO, ESIC and BOCW Welfare Board, whatever applicable are submitted by the contractor to the Engineer-in-Charge.

CLAUSE 8 (Completion Certificate and Completion Plans)

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and within thirty days of the receipt of such notice the Engineer-in-Charge shall inspect the work and if there is no defect in the work, shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements required for his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, floor or other parts of the building, in, upon, or about which the work is to be executed or of which the may have had possession for the purpose of the execution thereof, and not until the work shall have been measured by the Engineer-in-Charge. If the contractor shall fail to comply with the requirements of this Clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish etc., and dispose of the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

CLAUSE 8 A (Contractor to keep Site Clean)

When the annual repairs and maintenance of works are carried out, the splashes and droppings from white washing, colour washing, painting etc., on walls, floor, windows, etc. shall be removed and toe surface cleaned simultaneously with the completion of these items of work in the individual rooms, quarters or premises etc. where the work is done without waiting to the actual completion of all the other items of work in the contract. In case the contractor fails to comply with the requirements of this clause, the Engineer-in- Charge shall have the right to get this work done at the cost of the contractor either departmentally or through any other agency. Before taking such action, the Engineer - in - Charge shall give ten days notice in writing to the contractor.

CLAUSE 8 B (Completion Plans to be Submitted by Contractor)

The Contractor shall submit completion plan as required vide General Specification for Electrical works(Part-I internal)2005 and (Part-II External) 1994 as applicable, within thirty days of the completion of the work.

In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum of 0.1% of Tendered Value of limit prescribed in Schedule F Whichever is more as may be fixed by the Institute and in this respect the decision of the Institute shall be final and binding on the contractor.

The Contractor shall submit completion plan for Internal and External Civil, Electrical and Mechanical Services within thirty days of the completion of the work, provided that the service plans having been issued for execution by the Engineer-in-Charge, unless the contractor, by virtue of any other provision in the contract, is required to prepare such plans.

CLAUSE 9 (Payment of Final Bill)

The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Engineer-in-Charge whichever is earlier. No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in-Charge, will, as far as possible be made within the period specified here in under, the period being reckoned from the date of receipt of the bill by the Engineer-in- Charge or his authorized Asst. Engineer, complete with account of materials issued by the Institute and dismantled materials.

- | | | |
|------|--|-----------|
| i) | If the Tendered value of work is up to Rs.45 lakhs : | :2 months |
| ii) | If the Tendered value of work is more than Rs.45 lakhs and up to Rs.2.5 Crore: | 3 months |
| iii) | If the Tendered value of work exceeds Rs.2.5 Crore: | :6 months |

In case of delay in payment of final bills after prescribed time limit, a simple interest @10% per annum shall be paid to the contractor from the date of expiry of prescribed time limit which will be compounded on yearly basis, provided the final bill submitted by the contractor found to be in order.

CLAUSE 9 A (Payment of Contractor's Bills to Banks)

Payments due to the contractor may, if so desired by him, be made to his bank, registered financial, Co-operative or thrift societies or recognized financial Institutions instead of direct to him provided that the contractor furnishes to the Engineer-in-Charge (1) an authorization in the form of a legally valid document such as a power of attorney conferring authority on the bank, registered financial, Co-operative or thrift societies or recognized financial Institutions to receive payments and (2) his own acceptance of the correctness of the amount made out as being due to him by Institute or his signature on the bill or other claim preferred against Institute before settlement by the Engineer-in-Charge of the account or claim by payment to the bank, registered financial, Co-operative or thrift societies or recognized financial Institutions. While the receipt given by such banks registered financial, Co-operative or thrift societies or recognized financial Institutions shall constitute a full and sufficient discharge for the payment, the contractor shall whenever possible present his bills duly receipted and discharged through his bank, registered financial, Co-operative or thrift societies or recognized financial Institutions

Nothing herein contained shall operate to create in favour of the bank, registered financial, Co-operative or thrift societies or recognized financial Institutions any rights or equities vis a-vis the Director, IPR.

CLAUSE 10 (Materials Supplied by the Institute)

Materials which the Institute will supply are shown in Schedule 'B' which also stipulates quantum, place of issue and rate(s) to be charged in respect thereof. The contractor shall be bound to procure them from the Engineer-in-Charge.

As soon as the work is awarded, the contractor shall finalize the programme for the completion of work as per clause 5 of this contract and shall give his estimates of materials required on the basis of drawings/ or schedule of quantities of the work. The Contractor shall give in writing his requirement to the Engineer-in-Charge which shall be issued to him keeping in view the progress of work as assessed by the Engineer-in-Charge, in accordance with the agreed phased programme of work indicating monthly requirements of various materials. The contractor shall place his indent in writing for issue of such materials at least 7 days in advance of his requirement.

Such materials shall be supplied for the purpose of the contract only and the value of the materials so supplied at the rates specified in the aforesaid schedule shall be set off or deducted, as and when materials are consumed in items of work (including normal wastage) for which payment is being made to the contractor, from any sum then due or which may therefore become due to the contractor under the contract or otherwise or from the security deposit. At the time of submission of bills, the contractor shall certify that balance of materials supplied is available at site in original good condition.

The contractor shall submit along with every running bill (on account or interim bill) material - wise reconciliation statements supported by complete calculations reconciling total issue, total consumption and certified balance (diameter/section-wise in the case of steel) and resulting variations and reasons therefore. Engineer-in-Charge shall (whose decision shall be final and binding on the contractor) be within his rights to follow the procedure of recovery in clause 42 at any stage of the work if reconciliation is not found to be satisfactory.

The contractor shall bear the cost of getting the material issued, loading, transporting to site, unloading, storing under cover as required, cutting assembling and joining the several parts together as necessary. Notwithstanding anything to the contrary contained in any other clause of the contract and (or the CPWA Code) all stores/materials so supplied to the contractor or procured with the assistance of the Institute shall remain the absolute property of Institute and the contractor shall be the trustee of the

stores/ materials, and the said stores/ materials shall not be removed/ disposed off from the site of the work on any account and shall be at all times open to inspection by the Engineer-in-Charge or his authorized agent. Any such stores/ materials remaining unused shall be returned to the Engineer-in-Charge in as good a condition in which they were originally supplied at a place directed by him, at a place of issue or any other place specified by him as he shall require, but in case it is decided not to take back the stores/ materials the contractor shall have no claim for compensation on any account of such stores/ materials so supplied to him as aforesaid and not used by him or for any wastage in or damage to in such stores/ materials. On being required to return the stores/ materials, the contractor shall hand over the stores/ materials.

On being required to return the stores / materials , the contractor shall hand over the stores/ materials on being paid or credited such price as the Engineer-in-Charge shall determine, having due regard to the condition of the stores/ materials. The price allowed for credit to the contractor, however, shall be at the prevailing market rate not exceeding the amount charged to him, excluding the storage charge, if any. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to account for contravention of the terms of the license or permit and/ or for criminal breach of trust, be liable to Institute for all advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach. Provided that the contractor shall in no case be entitled to any compensation or damages on account of any delay in supply or non-supply thereof all or any such materials and stores provided further that the contractor shall be bound to execute the entire work if the materials are supplied by the Institute within the original scheduled time for completion of the work plus 50% thereof or schedule time plus 6 months whichever is more if the time of completion of work exceeds 12 months, but if a part of the materials only has been supplied within the aforesaid period, then the contractor shall be bound to do so much of the work as may be possible with the materials and stores supplied in the aforesaid period. For the completion of the rest of the work, the contractor shall be entitled to such extension of time as may be determined by the Engineer-in-Charge whose decision in this regard shall be final and binding on the contractor.

The contractor shall see that only the required quantities of materials are got issued. Any such material remaining unused and in perfectly good/ original condition at the time of completion or determination of the contract shall be returned to the Engineer-in-Charge at the stores from which it was issued or at a place directed by him by a notice in writing. The contractor shall not be entitled for loading, transporting. Unloading and stacking of such unused material except for the extra lead, if any involved, beyond the original place of issue.

CLAUSE 10A (Materials to be provided by the Contractor)

The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by the Institute.

The contractor shall, at his own expense and without delay, supply to the Engineer-in- Charge samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Engineer-in- Charge furnish proof, to the satisfaction of the Engineer-in-Charge that the materials so comply. The Engineer-in-Charge shall within thirty days of supply of samples or within such further period as he may require intimate to the Contractor in writing whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Engineer-in-Charge for his approval fresh samples complying with the specifications laid down in the contract. When materials are required to be tested in accordance with specifications, approval of the Engineer-in-Charge shall be issued after the test results are received.

The Contractor shall at his risk and cost submit the samples of materials to be tested or analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the Engineer-in-Charge. The Contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.

The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Engineer-in-Charge may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Engineer-in-Charge and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer-in-Charge or his authorized representative 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 and every assistance in obtaining the right to such access.

The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full powers to require other proper materials to be substituted thereof and in case of default, the Engineer-in-Charge may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the Contractor.

The Contractor shall at his own expense, provide a material testing lab at the site for conducting routine field tests. The lab shall be equipped at least with the testing equipment as specified in Schedule F.

CLAUSE 10 B

(i) Secured Advance on Non-perishable Materials

The contractor, on signing an indenture in the form to be specified by the Engineer-in-Charge, shall be entitled to be paid during the progress of the execution of the work up to 75% of the assessed value of any materials which are in the opinion of the Engineer-in-Charge **nonperishable, non-fragile and noncombustible and are in accordance with the contract** and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be recovered / deducted from the next payment made under any of the clause or clauses of this contract.

Such secured advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of the Engineer-in-Charge provided the contractor provides a comprehensive insurance cover for the full cost of such materials. The decision of the Engineer-in-Charge shall be final and binding on the contractor in this matter. No secured advance, shall however, be paid on high-risk materials such as ordinary glass, sand, petrol, diesel etc.

(ii) Mobilization Advance: (Not applicable)

Mobilization advance not exceeding 10% of the tendered value may be given, if requested by the contractor in writing within one month of the order to commence the work. Such advance shall be in two or more installments to be determined by the Engineer in Charge at his sole discretion. The first installment of such advance shall be released by the Engineer in charge to the contractor on a request made by the contractor to the Engineer in Charge in this behalf. The second and subsequent installments shall be released by the Engineer in Charge only after the contractor furnishes a proof of the satisfactory utilization of the earlier installment to the entire satisfaction of the Engineer in Charge.

Before any installment of advance is released, the contractor shall execute Bank Guarantee Bonds not more than 6 in number form Schedule Bank for the amount equal to 110% of the amount advance and valid for the period till recovery of advance. This (Bank Guarantee from Schedule Bank for the amount equal to 110% of the balance amount of advance) shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery.

Provided always that provision of clause 10B (ii) shall be applicable only when so provided in schedule 'F'.

(iii) Plant Machinery & Shuttering Material Advance (Not applicable)

An advance for plant, machinery & shuttering material required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant and machinery, which in the opinion of the Engineer in Charge will add to the expeditious execution of work and improve the quality of work. The amount of advance shall be restricted to 5% percent of the tender value. In the case of new plant and equipment to be purchased for the work, the advance shall be restricted to 90% of the price of such new plant and equipment paid by the contractor for which the contractor shall produce evidence satisfactory to the Engineer in Charge. In the case of second hand and used plants and equipment, the amount of such advance shall be limited to 50% of the depreciated value of plant and equipment as may be decided by the Engineer in Charge. The contractor shall, if so required by the Engineer in Charge, submit the statement of value of such old plant and equipment duly approved by a Registered Valuer recognized by the Central Board of Direct Taxes under the Income Tax Act, 1961. No such advance shall be paid on any plant and equipment of perishable nature and on any plant and equipment of a value less than Rs. 50,000/- Seventy five percent of such amount of advance shall be paid after the plant & equipment is brought to site and balance twenty five percent on successfully commissioning the same.

Leasing of equipment shall be considered at par with purchase of equipment and shall be covered by tripartite agreement with the following:

1. Leasing company which gives certificate of agreeing to lease equipment to the contractor.
2. Engineer in Charge, and
3. The contractor

This advance shall further be subject to the condition that such plant and equipment (a) are considered by the Engineer in Charge to be necessary for the works; (b) and are in working order and are maintained in working order; (c) hypothecated to the Institute as specified by the Engineer in Charge before the payment of advance is released. The contractor shall not be permitted to remove from the site such hypothecated plant and equipment without the prior written permission of the Engineer in Charge. The contractor shall be responsible for maintaining such plant and equipment in good working order during the entire period

~~of hypothecation failing which such advance shall be entirely recovered in lump sum. For this purpose, steel scaffolding and form work shall be treated as plant and equipment.~~

~~The contractor shall insure the Plant and Machinery for which mobilization advance is sought and given, for a sum sufficient to provide for their replacement at site. Any amounts not recovered from the insurer will be borne by the contractor.~~

(iv) Interest & Recovery :

~~The mobilization advance and plant and machinery advance in (ii) & (iii) above bear simple interest at the rate of 10 per cent per annum and shall be calculated from the date of payment to the date of recovery, both days inclusive, on the outstanding amount of advance. Recovery of such sums advanced shall be made by the deduction from the contractor's bills commencing after first ten per cent of the gross value of the work is executed and paid, on pro-rata percentage basis to the gross value of the work billed beyond 10% in such a way that the entire advance is recovered by the time eighty per cent of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount up to the date of recovery of the installment.~~

~~(v) If the circumstances are considered reasonable by the Engineer-in-Charge, the period mentioned in (ii) and (iii) for request by the contractor in writing for grant of mobilization advance and plant and equipment advance may be extended in the discretion of the Engineer-in-Charge.~~

CLAUSE 10 C (Payment on Account of Increase in Prices /Wages due to Statutory Order(s))

If after submission of the tender, if the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 hereof) and/or wages of labour increases as a direct result of the coming into force of any fresh law, or statutory rule or order (but not due to any variation of rate in GST applicable on such material(s) being considered under this clause) beyond the price/wages prevailing at the time of the last stipulated date of receipt of tenders including extensions, if any, for the work during contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, then the amount of the contract shall accordingly be varied

If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and/or wages of labour as prevailing at the time of last stipulated date of receipt of tender including extensions, if any, is decreased as a direct result of the coming into force of any fresh law or statutory rules or order (but not due to any changes in sales tax/VAT Central/State Excise/Custom Duty) Institute shall in respect of materials incorporated in the works (excluding the materials covered under Clause 10CA and not being materials supplied from the Engineer-in-Charge's stores in accordance with Clause-10 hereof) and/or labour engaged on the execution of the work after the date of coming into force of such law statutory rule or order be entitled to deduct from the dues of the contractor, such amount as shall be equivalent to the difference between the prices of the materials and/or wages as prevailed at the time of the last stipulated date for receipt of tenders including extensions if any for the work and the prices of materials and/or wages of labour on the coming into force of such law, statutory rule or order. This will be applicable for the contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2.

Engineer-in-Charge may call books of account and other relevant documents from the contractor to satisfy himself about reasonability of increase in prices of materials and wages.

The contractor shall, within a reasonable time of his becoming aware of any alteration in the price of any such materials and/or wages of labour, give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition together with all information relating thereto which he may be in position to supply.

For this purpose, the labour component of 85% of the value the work executed during period under consideration shall not exceed the percentage as specified in Schedule F, of the value of work done during that period the increase/decrease in labour shall be considered on the minimum daily wages in rupees of any unskilled adult male mazdoor, fixed under any law, statutory rule or order. The cost of work for which escalation is applicable (W) is same as cost of work done worked out as indicated in sub-para(ii) of clause 10CC except the amount of full assessed value of secured Advance.

CLAUSE 10 CA (Payment due to variation in prices of materials after receipt of tender) (not applicable)

~~If after submission of the tender, the price of materials specified in Schedule F increases/decreases beyond the price(s) prevailing at the time of the last stipulated date for receipt of tenders (including extensions, if any) for the work, then the amount of the contract shall accordingly be varied and provided further that any such variations shall be effected for stipulated period of Contract including the justified period extended under the provisions of Clause 5 of the Contract without any action under Clause 2.~~

~~However for work done during the justified period extended as above, it will be limited to indices prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on pro-rata basis only as cost of extra work x stipulated period/tendered cost).~~

~~The increase/decrease in prices of cement, steel reinforcement and structural steel and POL shall be determined by the price indices issued by the Director General (Works), CPWD. For other items provided in the Schedule 'F' shall be determined by the All India Wholesale Price Indices of Material as published by Economic Advisor to Government of India, Ministry of Commerce and Industry and base price for cement, steel reinforcement, structural steel & POL as issued under the authority of Director General (Works) CPWD applicable for Delhi including Noida, Gurgaon, Faridabad & Ghaziabad and base price of other materials issued as indicated in Schedule „F“ as valid on the last stipulated date of receipt of tender, including extension if any and for the period under consideration. In case, price index of a particular material is not issued by the ministry of Commerce and Industry, then the price index of nearest similar material as indicated in Schedule 'F' shall be followed~~

~~The amount of the contract shall accordingly be varied for all such materials and will be worked out as per the formula given below for individual material:-~~

~~a) Adjustment for component of individual material~~

$$V = P \times Q \times (C1 - C10) / C10$$

~~where,~~

~~V = Variation in material cost i.e. increase or decrease in the amount in rupees to be paid or recovered.~~

~~P = Base Price of material as issued under authority of DG(W), as indicated in Schedule 'F'.~~

~~For Projects and Original works~~

~~Q = Quantity of material brought at site for bonafide use in the works since previous bill excluding such quantity consumed in the deviated quantities of items beyond deviation limit and extra/substituted item, paid /to be paid at rates derived on the basis of market rate under clause 12.2.~~

~~CI0 = Price index for cement, steel reinforcement bars and structural steel and POL as issued by the DG, CPWD and corresponding to the time of base price of respective material indicated in Schedule 'F'. For other items, if any, provided in Schedule 'F', All India Wholesale Price Index for the material as published by the Economic Advisor to Government of India, Ministry of Industry and Commerce and corresponding to the time of base price of respective material indicated in Schedule 'F'.~~

~~CI = Price index for cement, steel reinforcement bars, structural steel and POL as issued under the authority of DG, CPWD for period under consideration. For other items, if any, provided in Schedule 'F' All India Wholesale Price Index for material for period under consideration as published by Economic Advisor to Institute of India, Ministry of Industry and Commerce.~~
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~~(i) In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on prorata basis only as cost of extra work x stipulated date of completion/ tendered cost) shall be considered.~~

~~Provided always that provisions of the preceding Clause 10 C shall not be applicable in respect of Materials covered in this clause.~~

~~(ii) If during progress of work or at the time of completion of work, it is noticed that any material brought at site is in excess of requirement, then amount of escalation if paid earlier on such excess quantity of material shall be recovered on the basis of cost indices as applied at the time of payment of escalation or as prevailing at the time of effecting recovery, whichever is higher.~~

~~(iii) Cement mentioned wherever in this clause includes Cement component used in RMC brought at site from outside approved RMC plants, if any.~~

~~(iv) The date wise record of ready mix concrete shall be kept in a register and the cement consumption for the same shall be calculated accordingly.~~

~~(v) If built up steel items are brought at site from work shop, then the variation shall be paid for the structural steel up to the period when the built up item /finished product is brought at site~~

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~~CLAUSE 10 CC (Payment due to Increase/Decrease in Prices/Wages (Excluding materials covered under clause 10 CA) after receipt of Tender for works) (Not applicable)~~

~~If the prices of materials (not being materials supplied or services rendered at fixed prices by the Institute in accordance with clause 10 & 34 thereof) and/or wages of labour required for execution of the work increase, the contractor shall be compensated for such increase as per provisions detailed below and the amount of the contract shall accordingly be varied, subject to the condition that such compensation for escalation in prices and wages shall be available only for the work done during the stipulated period of the contract including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2. However, for the work done during the justified period extended as above, the compensation as detailed below will be limited to prices/wages prevailing at the time of stipulated date~~

of completion or as prevailing for the period under consideration, whichever is less. No such compensation shall be payable for a work for which the stipulated period of completion is equal to or less than the time as specified in Schedule F. Such compensation for escalation in the prices of materials and labour, when due, shall be worked out based on the following provisions:-

(i) ~~The base date for working out such escalation shall be the last stipulated date of receipt of tenders including extension, if any.~~

(ii) ~~The cost of work on which escalation will be payable shall be reckoned as below:-~~

a) ~~Gross value of work done up to this quarter: (A)~~

b) ~~Gross Value of work done up to the last quarter: (B)~~

c) ~~Gross value of work done since previous quarter (A - B): (C)~~

d) ~~Full assessed value of Secured Advance (excluding materials covered under clause 10CA) fresh paid in this quarter (D)~~

e) ~~Full assessed value of Secured Advance (excluding materials covered under clause 10CA) recovered in this quarter: (E)~~

f) ~~Full assessed value of Secured Advance for which escalation is payable in this quarter (D - E) : (F)~~

g) ~~Advance payment made during this quarter: (G)~~

h) ~~Advance payment recovered during this quarter: (H)~~

i) ~~Advance payment for which escalation is payable in this quarter (G - H) (I)~~

j) ~~Extra Items/deviated quantities of items paid as per Clause 12 based on prevailing market rates during this quarter: (J)~~

Then, ~~$M = C + F + I + J$~~

$$N = 0.85 M$$

k) ~~Less cost of material supplied by the Institute as per Clause 10 and recovered during the quarter (K)~~

l) ~~Less cost of services rendered at fixed charges as per Clause 34 and recovered during the quarter (L)~~

Cost of work for which escalation is applicable: $W = N - (K + L)$

(iii) ~~Components for materials (except cement, reinforcement bars, structural steel, POL or other materials covered under clause 10 CA), labour, etc. shall be pre-determined for every work and incorporated in the conditions of contract attached to the tender papers included in Schedule 'F'. The decision of the Engineer in Charge in working out such percentage shall be binding on the contractors.~~

(iv) ~~The compensation for escalation for other materials (excluding cement, reinforcement bars, structural steel, POL or other materials covered under clause 10 CA) shall be worked as per the formula given below:-~~

(a) ~~Adjustment for civil component (except cement, structural steel, reinforcement bars, POL and other materials covered under clause 10CA)/electrical component of construction 'Materials'~~

$$(b) \text{ } V_m = W \times \frac{X_m}{100} \times \frac{M_1 - M_0}{M_0}$$

$$100 \text{ --- } M_0$$

V_m = Variation in material cost i.e. increase or decrease in the amount in rupees to be paid or recovered.

W = Cost of Work done worked out as indicated in sub para (ii) of Clause 10CC

~~X_m = Component of 'materials' (except cement, structural steel, reinforcement bars, POL and other materials covered under clause 10CA) expressed as percent of the total value of work~~

~~MI = All India Wholesale Price Index for civil component/electrical component* of construction material as worked out on the basis of all India wholesale price index for individual commodities/group items for the period under consideration as published by the Economic Advisor to Govt of India Ministry of Industry & Commerce and applying weightages to the individual commodities/group items. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of stipulated date of completion considering the effect of extra work (extra time to be calculated on prorata basis only as cost of extra works x stipulated period / tendered cost , shall be considered.)~~

~~MI₀ = All India Wholesale Price Index for civil component/electrical component* of construction material as worked out on the basis of all India wholesale price index for individual commodities/group items valid on the last stipulated date of receipt of tender including extension, if any, as published by the Economic Advisor to Govt of India Ministry of Industry & Commerce and applying weightages to the individual commodities/group items.~~

~~—*Note: relevant component only will be applicable.~~

~~(v) The following principles shall be followed while working out the indices mentioned in para (iv) above.~~

~~(a) The Compensation for escalation shall be worked out at quarterly intervals and shall be with respect to the cost of work done as per bills paid during the three calendar months of the said quarter . The date of preparation of bills as finally entered in measurement book by the Assistant Engineer/date of submission of bill finally by the contractor to the department in case of computerized measurement books shall be the guiding factor to decide the bills relevant to the quarterly interval. The first such payment shall be made at the end of three months after the month (excluding the month in which tender was accepted) and thereafter at threemonths' interval . At the time of completion of work , the last period for payment might become less than 3 months , depending on the actual date of completion.~~

~~(b) The index (MI/FI etc.) relevant to any quarter /period for which such compensation is paid shall be the arithmetical average of the indices , relevant to the three calendar months . If the period up to date of completion after quarter covered by the last such installment of payment , is less than three months , the index MI and FI shall be the average of the indices for the months falling within that period.~~

~~(vi) The compensation for escalation for **labour** shall be worked out as per the formula given below:~~

$$\text{VL} = W \times \frac{Y}{100} \times \frac{L_1 - L_0}{L_0}$$

~~VL : Variation in labour cost i.e. amount of increase or decrease in rupees to be paid or recovered.~~

~~W=Value of work done, worked out as indicated in sub-para (ii) above.~~

~~Y : Component of labour expressed as a percentage of the total value of the work.~~

~~LI: Minimum wage in rupees of an unskilled adult male mazdoor fixed under any law, statutory rule or order as applicable on the last date of the quarter previous to the one under consideration. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the minimum wage prevailing on the last date of quarter previous to the quarter pertaining to updated stipulated date of completion considering effect of extra work (extra time to be calculated on prorate basis only as cost of extra work x stipulated period / tendered cost, shall be considered.)~~

~~LI0= Minimum daily wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as on the last stipulated date of receipt of tender including extension, if any.~~

~~(vii) The following principles will be followed while working out the compensation as per sub para (vi) above:~~

~~(a) The minimum wage of an unskilled male mazdoor mentioned in sub para (vi) above shall be the higher of the wage notified by Government of India, Ministry of Labour and that notified by the local administration both relevant to the place of work and the period of reckoning.~~

~~(b) The escalation for labour also shall be paid at the same quarterly intervals when escalation due to increase in cost of materials and/or P.O.L. is paid under this clause. If such revision of minimum wages takes place during any such quarterly intervals, the escalation compensation shall be payable at revised rates only for work done in subsequent quarters.~~

~~(c) Irrespective of variations in minimum wages of any category of labour, for the purpose of this clause, the variation in the rate for an unskilled adult male mazdoor alone shall form the basis for working out the escalation compensation payable on the labour component.~~

~~(viii) In the event the price of materials and/or wages of labour required for execution of the work decrease/s, there shall be a downward adjustment of the cost of work so that such price of materials and/or wages of labour shall be deductible from the cost of work under this contract and in this regard the formula herein before stated under this Clause 10CC shall mutatis mutandis apply, provided that:~~

~~(a) no such adjustment for the decrease in the price of materials and/or wages of labour aforementioned would be made in case of contracts in which the stipulated period of completion of the work is equal to or less than the time as specified in Schedule „F.~~

~~(b) The Engineer in Charge shall otherwise be entitled to lay down the procedure by which the provision of this sub clause shall be implemented from time to time and the decision of the Engineer in Charge in this behalf shall be final and binding on the contractor.~~

~~(ix) Provided always that :~~

~~(a) where provisions of clause 10CC are applicable provisions of clause 10C will not be applicable but provisions of clause 10 CA will be applicable.~~

~~(b) Where provisions of Clause 10CC are not applicable, provisions of clause 10C and 10 CA will become applicable.~~

~~**Note :** Updated stipulated date of completion (period of completion plus extra time for extra work for compensation under clause 10 C , 10 CA and 10 CC , the factor of 1.25 taken in to account for calculating the extra item under clause 12.1 for extra time shall not be considered while calculating~~

~~the updated stipulated date of completion for this purpose in clause 10 C, Clause 10 CA , and clause 10 CC.~~

CLAUSE 10D (Dismantled Material of Institute Property)

The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc. as Institute's property and such materials shall be disposed off to the best advantage of the Institute according to the instructions in writing issued by the Engineer-in-Charge.

CLAUSE 11 (Work to be Executed in Accordance with Specifications, Drawings, Orders etc.)

The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions that are not included in the standard specifications of works specified in Schedule 'F' or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract.

The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

CLAUSE 12: (Deviations / Variations Extent and Pricing)

The Engineer-in-Charge shall have power (i) to make alteration in, omissions from, additions to, or substitutions for the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and (ii) to omit a part of the works in case of non-availability of a portion of the site or for any other reasons and the contractor shall be bound to carry out the works in accordance with any instructions given to him in writing signed by the Engineer-in-Charge and such alterations, omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the contractor may be directed to do in the manner specified above as part of the works, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.

The Completion cost of any agreement for Maintenance works including works of up gradation, aesthetic, special repair, and addition/alteration shall not exceed 1.25 times of the Tendered amount. Any further deviation beyond this limit upto 1.5 times of tendered amount shall be approved by Chiarperson I-CDC with recorded reason and in exceptional case, The Director shall have full power to approve the deviation beyond 1.50 times of tendered amount with recorded reason and take suitable corrective action.

12.1 The time for completion of the works shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered be extended, if requested by the contractor, as follows:

- (i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus
- (ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge.

12.2 Deviation, Extra Items and Pricing:

A. For Projects and original works :

In the case of extra item(s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, which shall include invoices, voucher etc. and Manufacturer's specification for the work failing which the rate approved later by the Engineer-in-Charge shall be binding and the Engineer-in-Charge shall within the prescribed time limit of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined, failing which it will be deemed to have been approved.

B. For Maintenance works including works of upgradation, aesthetic ,special repair, addition/alteration:

In the case of Extra Items(s) being the schedule items (**Space application Centre (SAC Ahmedabad SOR items)**), these shall be paid as per Schedule rate plus cost index (at the time of tender) plus /minus percentage above or below quoted contract amount.

Payment of extra items in case of non-scheduled items (**NON SAC SOR items**) shall be made as per the prevailing market rate.

12.2a Deviation, Substituted Items, Pricing:

A. For Project and Original works :

In the case of substituted items, (items that are taken up with partial substitution or in lieu of items of work in the contract), the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para.

- (a) If the market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).
- (b) If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

B. For Maintenance works including works of upgradation, aesthetic, special repair, addition/alteration:

In the case of substituted item(s) being the schedule items (**Space application Centre (SAC Ahmedabad SOR items)**) these shall be paid as per the schedule rate plus cost index (at the time of tender) plus /minus

percentage above /below quoted contract amount. Payment of Substitute in case of non-schedule items (NON SAC SOR) shall be made as per prevailing market rate.

12.2b Deviation, Deviated Quantities, Pricing

A. For Project and original works:

In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in schedule F, the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis, for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities the Engineer-in-Charge shall within prescribed time limit of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

B. For Maintenance works including works of upgradation, aesthetic, special repair, addition/alteration:

In the case of contract items, which exceed the limits laid down in schedule F, the contractor shall be paid rates specified in the schedule of quantities.

The prescribed time limit for finalizing rates for extra item(s), Substitute item (s) and Deviated quantities of contract items is within 30days after submission of proposal by the contractor without observation of the Engineer-in-Charge.:

12.3 A. For Project and Original works:

The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in Schedule F, and the Engineer-in- Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

B. For Maintenance works including works of upgradation, aesthetic, special repair, addition/alteration:

In case of decrease in the rates prevailing in the market of items for the work in excess of the limits laid down in Schedule F, the Engineer-In-Charge shall after giving notice to the contractor within one month of occurrence of excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rate for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

12.4 The contractor shall send to the Engineer-in-Charge once every three months an up to date account giving complete details of all claims for additional payments to which the contractor may consider himself entitled and of all additional work ordered by the Engineer-in-Charge which he has executed during the preceding quarter failing which the contractor shall be deemed to have waived his right. However, the Engineer in charge may authorize consideration of such claims on merits.

12.5 For the purpose of operation of Schedule F, the following works shall be treated as works relating to foundation unless & otherwise defined in the contract:

- i) For building: All works up to 1.2 meters above ground level or up to floor 1 level whichever is lower.,
- ii) For abutments, piers, and well staining: All works up to 1.2 m above the bed level.
- iii) For retaining walls, wing walls, compound walls, chimneys, overhead reservoirs/tanks and other elevated structures: All works up to 1.2 meters above the ground level.
- iv) For reservoirs/tanks (other than overhead reservoirs/tanks): All works up to 1.2 meters above the ground level.
- v) For basement: All works up to 1.2 m above ground level or up to floor 1 level whichever is lower.
- vi) For Roads all items of excavation and filling including treatment of sub-base.

12.6 Any operation incidental to or necessarily has to be in contemplation of tenderer while filling tender, or necessary for proper execution of the item included in the Schedule of Quantities or in the schedule of rates mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer or the rate given in the said schedule of rates, as the case may be. Nothing extra shall be admissible for such operations.

CLAUSE 13 (Foreclosure of Contract due to Abandonment or Reduction in Scope of Work)

If at any time after acceptance of the tender or during the progress of the work, the purpose or object for which the work is being done changes due to any supervening cause and as a result of which the work has to be abandoned or reduced in scope the Engineer-in-Charge shall give notice in writing to that effect to the contractor stating the decision as well as the cause for such decision and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.

The contractor shall be paid at contract rates full amount for works executed at site and, in addition, a reasonable amount as certified by the Engineer-in-Charge for the items hereunder mentioned which could not be utilized on the work to the full extent in view of the foreclosure:

- i) Any expenditure incurred on preliminary site work, e.g. temporary access roads, temporary labour huts, staff quarters and site office; storage accommodation and water storage tanks.
- ii) Institute shall have the option to take over contractor's materials or any part thereof either brought to site or of which the contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work) provided, however, Institute shall be bound to take over the materials or such portions thereof as the contractor does not desire to retain. For materials taken over or to be taken over by Institute, cost of such materials as detailed by Engineer-in-Charge shall be paid. The cost shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the contractor.
- iii) If any materials supplied by Institute are rendered surplus, the same except normal wastage shall be returned by the contractor to Institute at rates not exceeding those at which these were originally issued less allowance for any deterioration or damage which may have been caused whilst the materials were

in the custody of the contractor. In addition, cost of transporting such materials from site to Institute stores, if so required by Institute, shall be paid.

- iv) Reasonable compensation for transfer of T & P from site to contractor's permanent stores or to his other works, whichever is less. If T & P are not transported to either of the said places, no cost of transportation shall be payable.
- v) Reasonable compensation for repatriation of contractor's site staff and imported labour to the extent necessary.

The contractor shall, if required by the Engineer- in-Charge furnish to him books of account, wage books, time sheets and other relevant documents and evidence as may be necessary to enable him to certify the reasonable amount payable under this condition.

The reasonable amount of items on (i), (iv) and (v) above shall not be in excess of 2% of the cost of the work remaining incomplete on the date of closure, i.e. total stipulated cost of the work as per accepted tender less the cost of work actually executed under the contract and less the cost of contractor's materials at site taken over by the Institute as per item (ii) above. Provided always that against any payments due to the contractor on this account or otherwise, the Engineer-in-Charge shall be entitled to recover or be credited with any outstanding balances due from the contractor for advance paid in respect of any tool, plants and materials and any other sums which at the date of termination were recoverable by the Institute from the contractor under the terms of the contract.

In the event of action being taken under Clause 13 to reduce the scope of work, the contractor may furnish fresh Performance Guarantee on the same conditions, in the same manner and at the same rate for the balance tendered amount and initially valid up to the extended date of completion or stipulated date of completion if no extension has been granted plus 60 days beyond that. Wherever such a fresh Performance Guarantee is furnished by the contractor the Engineer-in-Charge may return the previous Performance Guarantee.

CLAUSE 14: Carrying out part work at risk & cost of contractor:

If contractor,

(i) At any time makes default during currency of work or does not execute any part of the work with the due diligence and continues to do so even after a notice in writing of 7 days from the Engineer-in-Charge; or

(ii) Commits default to complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given in that behalf by the Engineer-in-Charge; or

(iii) Fails to complete the works or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in a notice given in writing in that behalf by the Engineer-in-Charge;

The Engineer-in-Charge without invoking action under clause 3 may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to Institute, by a notice in writing to take the part work/part incomplete work of any item(s) out of his hands and shall have powers to:

- (a) Take possession of the site and any materials, constructional plant, implements, stores, etc, thereon; and/or
- (b) Carry out the part work/ part incomplete work of any item(s) by any means at the risk and cost of the contractor.

The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/part incomplete work of any items(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by Institute because of action under this clause shall not exceed 10% of the tendered value of the work.

In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the department are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor.

Any excess expenditure incurred or to be incurred by the Institute in completing the part works/ part incomplete work of any item(s) or the excess loss or damages suffered or may be suffered by the Institute as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to Institute in law or as per agreement be recovered from any money due to the contractor on any account and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the contractor fails to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sell any or all of the contractor's unused materials, constructional plant implements temporary building at site, etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract.

In the event of above course being adopted by the Engineer-in-Charge, the contractor shall have no claims to compensation for any loss sustained by him by reason of his having purchased any materials or entered into any engagements or made any advance on any account or with view to the execution of the work or the performance of the contract.

CLAUSE 15 (Suspension of Work)

(i) The contractor shall, on receipt of the order in writing of the Engineer-in-Charge, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:

- (a) on account of any default on the part of the contractor or ;
- (b) for proper execution of the works or part thereof for reasons other than the default of the contractor; or
- (c) for safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer-in-Charge.

- ii) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above:
- (a) the contractor shall be entitled to an extension of time equal to the period of every such suspension PLUS 25%, for completion of the item or group of items of work for which a separate period of completion is specified in the contract and of which the suspended work forms a part, and;
- (b) If the total period of all such suspensions in respect of an item or group of items or work for which a separate period of completion is specified in the contract exceeds thirty days, the contractor shall, in addition, be entitled to such compensation as the Engineer-in-Charge may consider reasonable in respect of salaries and/or wages paid by the contractor to his employees and labour at site, remaining idle during the period of suspension, adding thereto 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within fifteen days of the expiry of the period of 30 days.
- iii) If the works or part thereof is suspended on the orders of the Engineer-in-Charge for more than three months at a time, except when suspension is ordered for reason (a) in sub-para (i) above, the contractor may after receipt of such order serve a written notice on the Engineer-in-Charge requiring permission within fifteen days from receipt by the Engineer-in-Charge of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects only a part of the works as an omission of such part by the Institute or where it affects whole of the works, as an abandonment of the works by the Institute, shall within ten days of expiry of such period of 15days give notice in writing of his intention to the Engineer-in-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by the Institute, he shall have no claim to payment of any compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment. He shall, however, be entitled to such compensation, as the Engineer-in-Charge may consider reasonable, in respect of salaries and/or wages paid by him to his employees and labour at site, remaining idle in consequence adding to the total thereof 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within 30 days of the expiry of the period of 3 months.

CLAUSE 15 A (Compensation in case of Delay of Supply of Material by Institute)

The contractor shall not be entitled to claim any compensation from Institute for the loss suffered by him on account of delay by Institute in the supply of materials in schedule "B" where such delay is covered by difficulties relating to the supply of wagons, force majeure or any reasonable cause beyond the control of Institute.

This clause 15 A will not be applicable for works where no material is stipulated.

CLAUSE 16 (Action in case Work not done as per Specifications)

All works under or in course of execution or executed in pursuance of the contract shall at all times be open and accessible to the inspection and supervision of the Engineer-in-charge, his authorized subordinates in charge of the work and all the superior officers, officer of the Quality Assurance unit of the Institute or any organization engaged by the Institute for Quality Assurance and of the Chief Technical Examiner's Office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present

for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

If it shall appear to the Engineer-in-charge or his authorized subordinates in-charge of the work or to the Chief Engineer in charge of Quality Assurance or his subordinate officers or the officers of the organization engaged by the Institute for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract the contractor shall, on demand in writing which shall be made (six months in the case of work costing Rs. 10 Lac and below except road work) of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of, notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in-charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 2 of the contract (for non-completion of the work in time) for this default.

In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the authority specified in Schedule 'F' may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the contractor.

CLAUSE 17 (Contractor Liable for Damages, defects during maintenance period) I

If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any building, road, road kern, fence, enclosure, water pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within twelve months (six months in the case of work costing Rs. Ten lacs and below except road work) after a certificate, final or otherwise, of its completion shall have been given by the Engineer-in-Charge as aforesaid arising out of defect or improper materials or workmanship the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-Charge shall cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof. The security deposit of the contractor shall not be refunded before the expiry of twelve months (six months in the case of work costing Rs. Ten lacs and below except road work) after the issue of the certificate, final or otherwise, of completion of work, or till the final bill has been prepared and passed whichever is later. Provided that in the case of road work if in the opinion of the Engineer-in-Charge, half of the security deposit is sufficient, to meet all liabilities of the contractor under this contract, half of the security deposit will be refundable after six months and the remaining half after twelve months of the issue of the said certificate of completion or till the final bill has been prepared and passed whichever is later.

In case of Maintenance and Operation works of E&M services, the security deposit deducted from contractors shall be refunded within one month from the date of final payment or within one month from the date of completion of the maintenance contract whichever is earlier.

CLAUSE 18 (Contractor to Supply Tools & Plants, etc.)

The contractor shall provide at his own cost all materials (except such special materials, if any, as may in accordance with the contract be supplied from the Engineer-in-Charge's stores), machinery, tools & Plants as specified in Schedule F. In addition to this, appliances, implements, other plants ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specifications or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting the measurement for examination at any time and from time to time of the work or materials. Failing his so doing, the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses may be deducted, from any money due to the contractor, under this contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portions thereof.

CLAUSE 18 A (Recovery of Compensation paid to Workmen)

In every case in which by virtue of the provisions sub-section (1) of Section 12, of the Workmen's Compensation Act, 1923, Institute is obliged to pay compensation to a workman employed by the contractor, in execution of the works, Institute will recover from the contractor, the amount of the compensation so paid; and, without prejudice to the rights of the Institute under sub-section (2) of Section 12, of the said Act, Institute shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Institute to the contractor whether under this contract or otherwise. Institute shall not be bound to contest any claim made against it under sub-section (1) Section 12, of the said Act, except on the written request of the contractor and upon his giving to Institute full security for all costs for which Institute might become liable in consequence of contesting such claim.

CLAUSE 18 B (Ensuring Payment and Amenities to Workers if Contractor fails)

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation and Abolition) Central Rules, 1971, Institute is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the rules under Clause 19 H or under the Contractors Labour Regulations, or under the Rules framed by Institute from time to time for the protection of health and sanitary arrangements for workers employed by Contractors. Institute will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of the Institute under sub-section(2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, Institute shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Institute to the contractor whether under this contract or otherwise Institute shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, of the said Act, except on the written request of the contractor and upon his giving to the Institute full security for all costs for which Institute might become liable in contesting such claim.

CLAUSE 19 (Labour Laws to be complied by the Contractor)

The contractor shall obtain a valid license under the Contract Labour (R&A) Act 1970, and the Contract Labour (Regulation and Abolition) Central Rules 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. **The contractor shall also comply with provision of the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979.**

The contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986.

The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.

Any failure to fulfill these requirements shall attract the penal provisions of this contract arising out of the resultant non-execution of the work.

CLAUSE 19 A

No labour below the age of Eighteen years shall be employed on the work.

CLAUSE 19 B (Payment of wages)

Payment of wages:

(i) The contractor shall pay to labour employed by him either directly or through sub contractors, wages not less than fair wages as defined by the Government, Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970 and the contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

(ii) The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him.

(iii) In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with the contractor's Labour Regulations made by Government from time to time in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorized made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

(iv) (a) The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non fulfillment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.

(b) Under the provision of Minimum Wages (Central) Rules 1950, the contractor is bound to allow to the labours directly or indirectly employed in the works one day rest for 6 days continuous work and pay wages at the same rate as for duty. In the event of default, the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labours and pay the same to the persons entitled thereto from any money due to the contractor by the Engineer-in-Charge concerned.

In the case of Union Territory of Delhi, however, as the all inclusive minimum daily wages fixed under Notification of the Delhi Administration No.F.12(162)MWO/DAB/ 43884-91, dated 31-12-1979 as amended from time to time are inclusive of wages for the weekly day of rest, the question of extra payment for weekly holiday would not arise.

(v)The contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefits Act, 1961, and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws relating thereto and the rules made there under from time to time.

(vi)The contractor shall indemnify and keep indemnified the Institute against payments to be made under and for the observance of the laws aforesaid and the Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.

(vii)The laws aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

(viii) Whatever is the minimum wage for the time being, or if the wage payable is higher than such wage, such wage shall be paid by the contractor to the workmen directly without the intervention of Jamadar and that Jamadar shall not be entitled to deduct or recover any amount from the minimum wage payable to the workmen as and by way of commission or otherwise.

(ix) The contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.

CLAUSE 19 C

In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at his own expense arrange for the safety provisions as per C.P.W.D. Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the contractor fails to make arrangement and provide necessary facilities as aforesaid, he shall be liable to pay a penalty of Rs.200/- for each default and in addition the Engineer-in-Charge shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

CLAUSE 19D

The contractor shall submit by the 4th and 19th day of every month, to the Engineer-in-Charge a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively:

- (1) the number of labourers employed by him on the work,
- (2) their working hours,

- (3) the wages paid to them,
- (4) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them, and
- (5) the number of female workers who have been allowed maternity benefit according to Clause 19 F and the amount paid to them.

Failing which the contractor shall be liable to pay to the Institute, a sum not exceeding Rs.200/- for each default or materially incorrect statement. The decision of the Engineer-In-Charge shall be final in deducting from any bill due to the contractor the amount levied as fine and be binding on the contractor.

CLAUSE 19 E

In respect of all labour directly or indirectly employed in the works for the performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with all the rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by the Institute and its contractors.

CLAUSE 19 F

Leave and pay during leave shall be regulated as follows

1. Leave:

(i) in the case of delivery - maternity leave not exceeding 8 weeks, 4 weeks up to and including the day of delivery and 4 weeks following that day.

(ii) in the case of miscarriage - up to 3 weeks from the date of miscarriage.

2. Pay:

(i) In the case of delivery - leave pay during maternity leave will be at the rate of the women's average daily earnings, calculated on total wages earned on the days when full time work was done during a period of three months immediately preceding the date on which she gives notice that she expects to be confined or at the rate of Rupee one only a day whichever is greater.

(ii) In the case of miscarriage - leave pay at the rate of average daily earning calculated on the total wages earned on the days when full time work was done during a period of 3 (three) months immediately preceding the date of such miscarriage.

3. Conditions for the grant of Maternity Leave:

No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period of not less than 6 (six) months immediately preceding the date on which she proceeds on leave.

4. The contractor shall maintain a register of Maternity (Benefit) in the Prescribed Form as shown in Appendix - I and II, and the same shall be kept at the place of work.

CLAUSE 19 G

In the event of the contractor(s) committing a default or breach of any of the provisions of the Contractor's Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to the Institute a sum not exceeding Rs.200/- for every default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs.200/- per day for each day of default subject to a maximum of 5 % of the estimated cost of the work put to tender. The decision of the Engineer in-Charge shall be final and binding on the parties.

Should it appear to the Engineer-in-Charge that the contractor(s) is/are not properly observing and complying with the provisions of the Contractor's Labour Regulations and Model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (R& A) Central Rules 1971, for the protection of health and sanitary arrangements for work-people employed by the contractor(s) (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said Rules be complied with and the amenities prescribed therein be provided to the work-people within a reasonable time to be specified in the notice. If the contractor(s) shall fail within the period specified in the notice to comply with and/observe the said Rules and to provide the amenities to the work-people as aforesaid, the Engineer-in-Charge shall have the power to provide the amenities herein before mentioned at the cost of the contractor(s). The contractor(s) shall erect, make and maintain at his/their own expense and to approved standards all necessary huts and sanitary arrangements required for his/their work-people on the site in connection with the execution of the works, and if the same shall not have been erected or constructed, according to approved standards, the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said huts and sanitary arrangements be remodeled and/or reconstructed according to approved standards, and if the contractor(s) shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Engineer-in-Charge shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the contractor(s).

CLAUSE 19 H

The contractor(s) shall at his/their own cost provide his/their labour with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land out side Institute campus. (Note: Labour camp is not permitted inside Institute campus)

(i) (a) The minimum height of each hut at the eaves level shall be 2.10 m (7 ft.) and the floor area to be provided will be at the rate of 2.7 sqm. (30 sq.ft.) for each member of the worker's family staying with the labourer.

(b) The contractor(s) shall in addition construct suitable cooking places having a minimum area of 1.8 m x 1.5 m (6'x5') adjacent to the hut for each family.

(c) The contractor(s) shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each one hundred of the total strength, separate latrines and urinals being provided for women.

(d) The contractor(s) shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.

(ii)(a) All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Engineer-in-Charge. In case of sun-dried bricks, the walls should be plastered with mud gobri on both sides. The floor may be kutcha but plastered with mud gobri and shall be at least 15cm (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the contractor shall ensure that throughout the period of their occupation the roofs remain water-tight.

(b) The contractor(s) shall provide each hut with proper ventilation.

(c) All doors, windows, and ventilators shall be provided with suitable leaves for security purposes.

(d) There shall be kept an open space of at least 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20 ft.) according to the availability of site with the approval of the Engineer-in-Charge. Back to back construction will be allowed.

(iii) **Water Supply** - The contractor(s) shall provide adequate supply of water for the use of labourers. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purposes and three gallons of clean water per head per day for bathing and washing purposes. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/ their own cost make arrangements for laying pipe lines for water supply to his/their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.

(iv) The site selected for the camp shall be high ground, removed from jungle.

(v) **Disposal of Excreta-**

The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed, the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourers employed so that arrangements may be made by such Committee/authority for the removal of the excreta. All charges on this account shall be borne by the contractor and paid direct by him to the Municipality/authority. The contractor shall provide one sweeper for every eight seats in case of dry system.

(vi) **Drainage** - The contractor(s) shall provide efficient arrangements for draining away sludge water so as to keep the camp neat and tidy.

(vii) The contractor(s) shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.

(viii) **Sanitation** - The contractor(s) shall make arrangements for conservancy and sanitation in the labour camps according to the rules of the Local Public Health and Medical Authorities.

CLAUSE 19 I

The Engineer-in-Charge may require the contractor to dismiss or remove from the site of the work any person or persons in the contractors' employ upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements. In respect of maintenance/repair or renovation works etc. where the labour have an easy access to the individual houses, the contractor shall issue identity cards to the labourers, whether temporary or permanent and he shall be responsible for any untoward action on the part of such labour. Engineer In Charge will display a list of contractors working in the colony/Blocks on the notice board in the colony and also at the service center, to apprise the residents about the same.

CLAUSE 19 J

It shall be the responsibility of the contractor to see that the building under construction is not occupied by anybody unauthorized during construction, and is handed over to the Engineer-in-Charge with vacant possession of complete building. If such building though completed is occupied illegally, then the Engineer-in-Charge shall have the option to refuse to accept the said building/buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay a levy up to 5% of tendered value of work may be imposed by the Chairperson ICDC, IPR whose decision shall be final both with regard to the justification and quantum and be binding on the contractor.

However, the Chairperson I-CDC IPR, through a notice, may require the contractor to remove the illegal occupation any time on or before construction and delivery.

CLAUSE 19K (Employment of skilled /semi-skilled workers)

The Contractor shall, at all stages of work, deploy skilled / semiskilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training Institute /National institute of Construction Management & Research (NICMAR) / National Academy of Construction, CIDC or any similar reputed and recognized institutes managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled / semi skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in each respect of the trade, its scheduling and list of qualified tradesman along with requisite certificates from recognized institute to Engineer-in-charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesman within two days of written notice from Engineer-in- Charge. Failure on the part of contractor to obtain approval of Engineer-In-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by the contractor at the rate of Rs.100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

Provided always, that the provisions of this clause shall not be applicable for works with estimated cost put to tender being less than Rs. 5 Crores.

CLAUSE 19L (Contributions of EPF and ESI)

The ESI and EPF contributions on the part of employer in respect of this contract shall be paid by the contractor.

CLAUSE 20 (Minimum Wages Act to be Complied with)

The contractor shall comply with all the provisions of the Minimum Wages Act, 1948, and Contract Labour (Regulation and Abolition) Act, 1970, amended from time to time and rules framed there under and other labour laws affecting contract labour that may be brought into force from time to time.

CLAUSE 21 (Work not be sublet. Action in case of insolvency)

The contract shall not be assigned or sublet without the written approval of the Engineer-in-Charge. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or person in the employ of Institute in any way relating to his office or employment, or if any such officer. or person shall become in any way directly or indirectly interested in the contract, the Engineer-in-Charge on behalf of the Director, IPR shall have power to adopt the course specified in Clause 3 hereof in the interest of Institute and in the event of such course being adopted, the consequences specified in the said Clause 3 shall ensue.

CLAUSE 22

All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of Institute without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

CLAUSE 23 (Changes in firm's Constitution to be intimated)

Where the contractor is a partnership firm, the previous approval in writing of the Engineer- in-Charge shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern such approval as aforesaid shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If previous approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in contravention of Clause 21 hereof and the same action may be taken, and the same consequences shall ensue as provided in the said Clause 21.

CLAUSE 24

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer-in-Charge who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.

CLAUSE 25 (Settlements of Disputes & Arbitration)

Except where otherwise provided in the contract, all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

(i) If the contractor considers any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge or if the Engineer in Charge considers any act or decision of the contractor on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable and is disputed, such party shall promptly within 15 days of the arising of the disputes request the Chairperson I-CDC who shall refer the disputes to Dispute Redressal Committee (DRC) within 15 days along with a list of disputes with amounts claimed if any in respect of each such dispute. The Dispute Redressal Committee (DRC) shall give the opposing party two weeks for a written response, and, give its decision within a period of 60 days extendable by 30 days by consent of both the parties from the receipt of reference from Chairperson I-CDC. The constitution of Dispute Redressal Committee (DRC) shall be as indicated in Schedule 'F'. Provided that no party shall be represented before the Dispute Redressal Committee by an advocate/legal counsel etc.

If the Dispute Redressal Committee (DRC) fails to give its decision within the aforesaid period or any party is dissatisfied with the decision of Dispute Redressal Committee (DRC) or expiry of time limit given above, then either party may within a period of 30 days from the receipt of the decision of Dispute Redressal Committee (DRC), give notice to the Director IPR, for appointment of arbitrator on prescribed proforma as per Appendix XV under intimation to the other party.

It is a term of contract that each party invoking arbitration must exhaust the aforesaid mechanism of settlement of claims/disputes prior to invoking arbitration.

The Director IPR, shall in such case appoint the sole arbitrator within 30 days of receipt of such a request and refer such disputes to arbitration. It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed, if any, in respect of each such dispute along with the notice for appointment of arbitrator and giving reference to the decision of the DRC.

Parties, before or at the time of appointment of Arbitrator may agree in writing for fast track arbitration as per the Arbitration and Conciliation Act, 1996 (26 of 1996) as amended in 2015.

Subject to provision in the Arbitration and Conciliation Act, 1996 (26 of 1996) as amended in 2015 whereby the counter claims if any can be directly filed before the arbitrator without any requirement of reference by the appointing authority,

The arbitrator shall adjudicate on only such disputes as are referred to him by the appointing authority and give separate award against each dispute and claim referred to him and in all cases where the total amount of the claims by any party exceeds Rs. 1,00,000/-, the arbitrator shall give reasons for the award. It is also a term of the contract that if any fees are payable to the arbitrator, these shall be paid as per the Act.

The place of arbitration shall be as mentioned in Schedule F.

CLAUSE 26 (Contractor to indemnify Institute against Patent Rights)

The contractor shall fully indemnify and keep indemnified the Director, IPR against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under or action brought against Institute in respect of any such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the Director, IPR if the infringement of the

patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.

CLAUSE 27 (Lump sum Provisions in Tender)

When the estimate on which a tender is made includes lump sum in respect of parts of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Engineer-in-Charge payable of measurement, the Engineer-in-Charge may at his discretion pay the lump-sum amount entered in the estimate, and the certificate in writing of the Engineer-in-Charge shall be final and conclusive against the contractor with regard to any sum or sums payable to him under the provisions of the clause.

CLAUSE 28 (Action where no Specifications are specified)

In the case of any class of work for which there is no such specifications as referred to in Clause 11, such work shall be carried out in accordance with the Bureau of Indian Standards Specifications. In case there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturer's specifications, if not available then as per District Specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.

CLAUSE 29 (With-holding and lien in respect of sums due from contractor)

(i) Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, the Engineer-in-Charge or the Institute shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any deposited by the contractor and for the purpose aforesaid, the Engineer-in-Charge or the Institute shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the Engineer-in-Charge or the Institute shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Engineer-in-Charge of the Institute or any contracting person through the Engineer-in-Charge pending finalization of adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in-Charge or Institute will be kept withheld or retained as such by the Engineer-in-Charge or Institute till the claim arising out of or under the contract is determined by the arbitrator (if the contract is governed by the arbitration clause) by the competent court, as the case may be and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the Engineer-in-Charge or the Institute shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner limited company as the case may be, whether in his individual capacity or otherwise.

(ii) Institute shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract etc to be made after payment of the final bill

and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over payment and it shall be lawful for Institute to recover the same from him in the manner prescribed in sub-clause (i) of this clause or in any other manner legally permissible; and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it the amount of such under payment shall be duly paid by Institute to the contractor without any interest thereon whatsoever

Provided that the Institute shall not be entitled to recover any sum overpaid nor the contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the Chairperson I-CDC IPR on the one hand and the contractor on the other under any term of the contract permitting payment for work after assessment by the Chairperson I-CDC IPR

CLAUSE 29A (Lien in respect of claims in other contracts)

Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-in-Charge or the Institute or any other contracting person or persons through Engineer-in-Charge against any claim of the Engineer-in-Charge or Institute or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer- in-Charge or the Institute or with such other person or persons.

It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-in-Charge or the Institute will be kept withheld or retained as such by the Engineer-in-Charge or the Institute or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

CLAUSE 30 Employment of coal mining or controlled area labour not permissible

The contractor shall not employ coal mining or controlled area labour falling under any category whatsoever on or in connection with work or recruit labour from area within a radius of 32 km (20 miles) of the controlled area. Subject as above the contractor shall employ imported labour only i.e., deposit imported labour or labour imported by contractors from area, from which import is permitted.

Where ceiling price for imported labour has been fixed by state or Regional Labour Committee not more than that ceiling price shall be paid to the laour by the contractor.

The contractor shall immediately remove any labourer who may be pointed out by the Engineer-in-charge as being a coal minning or controlled area labourer. Failure to do so shall render the contractor liable to pay to Government a sum calculated at the rate of Rs. 10/- per day per labourer. The certificate of the Engineer-in Charge about the number of coal minning or controlled area labourer and the number of days for which worked shall be final and binding upon all parties to this contract.

It is declared and agreed between the parties that the aforesaid stipulation in this clause is one in which the public are interested within the meaning of the exception in Section 74 of Indian Contract Act, 1872.

Explanation:- Controlled Area means the following areas:

Districts of Dhanbad, Hazaribagh, Jamtara – a Sub-Division under Santhal Pargana Commissionery, Districts of Bankuara, Birbhum, Burdwan, District of Bilaspur.

Any other area which may be declared a controlled Area by or with the approval of the Central Government.

CLAUSE 31 (Unfiltered water supply)

The contractor(s) shall make his/their own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions.

- i) That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Engineer-in-Charge.
- ii) The Engineer-in-Charge shall make alternative arrangements for supply of water at the risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the opinion of the Engineer-in- Charge, unsatisfactory.

CLAUSE 31 A (Institute water supply, if available) - Not Applicable

~~Water if available may be supplied to the contractor by the Institute subject to the following conditions:~~

- ~~(i) The water charges @ 1% shall be recovered on gross amount of the work done.~~
- ~~(ii) The contractor(s) shall make his/their own arrangement of water connection and laying of pipelines from existing main of source of supply.~~
- ~~(iii) The Institute do not guarantee to maintain uninterrupted supply of water and it will be incumbent on the contractor(s) to make alternative arrangements for water at his/ their own cost in the event of any temporary break down in the Institute water main so that the progress of his/their work is not held up for want of water. No claim of damage or refund of water charges will be entertained on account of such break down.~~

CLAUSE 32 (Alternate water arrangements)

(i) Where there is no piped water supply arrangement and the water is taken by the contractor from the wells or hand pump constructed by the Institute, no charge shall be recovered from the contractor on that account. The contractor shall, however, draw water at such hours of the day that it does not interfere with the normal use for which the hand pumps and wells are intended. He will also be responsible for all damage and abnormal repairs arising out of his use, the cost of which shall be recoverable from him. The Engineer-in-Charge shall be the final authority to determine the cost recoverable from the contractor on this account and his decision shall be binding on the contractor.

(ii) The contractor shall be allowed to construct temporary wells in Institute land for taking water for construction purposes only after he has got permission of the Engineer-in-Charge in writing. No charges shall be recovered from the contractor on this account, but the contractor shall be required to provide necessary safety arrangements to avoid any accidents or damage to adjacent buildings, roads and service lines. He shall be responsible for any accidents or damage caused due to Construction and subsequent maintenance of the wells and shall restore the ground to its original condition after the wells are dismantled on completion of the work.

CLAUSE 33 (Return of Surplus materials)

Notwithstanding anything contained to the contrary in this contract where any materials for the execution of the contract are procured with the assistance of Institute either by issue from Institute stocks or purchase made under orders or permits or licenses issued by Institute the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose them off without the written permission of the Institute and return, if required by the Engineer-in-Charge, all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on being paid or credited such price as the Engineer-in-Charge shall determine having due regard to the condition of the materials. The price allowed to the contractor however shall not exceed the amount charged to him excluding the element of storage charges. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to action for contravention of the terms of the license or permit and/or for criminal breach of trust, be liable to Institute for all moneys, advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach.

CLAUSE 34 (Hire of Plant & Machinery)

(i) The contractor shall arrange at his own expense all tools, plant, machinery and equipment (hereinafter referred to as T&P) required for execution of the work except for the Plant & Machinery listed in Schedule 'C' and stipulated for issue to the contractor. If the contractor requires any item of T&P on hire from the T&P available with the Institute over and above the T&P stipulated for issue, the Institute will, if such item is available, hire it to the contractor at rates to be agreed upon between him and the Engineer-in-Charge. In such a case all the conditions hereunder for issue of T&P shall also be applicable to such T&P as is agreed to be issued.

(ii) Plant and Machinery when supplied on hire charges shown in Schedule 'C' shall be made over and taken back at the Departmental equipment yard/shed shown in Schedule 'C' and the contractor shall bear the cost of carriage from the place of issue to the site of work and back. The contractor shall be responsible to return the plant and machinery with condition in which it was handed over to him, and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation and otherwise during transit including damage to or loss of plant and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. Chairperson I-CDC, IPR shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.

(iii) The plant and machinery as stipulated above will be issued as and when available and if required by the contractor. The contractor shall arrange his program of work according to the availability of the plant and machinery and no claim what-so-ever will be entertained from him for any delay in supply by the Institute.

(iv) The hire charges shall be recovered at the prescribed rates from and inclusive of the date the plant and machinery were made over up to and inclusive of the date of the return in good order even though the same may not have been working for any cause except major breakdown due to no fault of the contractor or faulty use requiring more than three working day continuously (excluding intervening holidays and Sundays) for bringing the plant in order the contractor shall immediately intimate in writing to the Engineer-in-Charge when any plant or machinery gets out of order requiring major repairs as aforesaid. The Engineer-in-Charge shall record the date and time of receipt of such intimation in the log-sheet of the plant or machinery. Based on this, if the break-down before lunch period or major break-down will be computed considering half a day's break-down on the day of complaint. If the break-down occurs in the post-lunch period of major break-down will be computed starting from the next working day. In case of

any dispute under this clause the decision of the Chairperson I-CDC IPR shall be final and binding on the contractor.

(v) The hire charges shown above are for each day of 8 hours (inclusive of the one hour lunch break) or part thereof.

(vi) Hire charges will include service of operating staff as required and also supply of lubricating oil and stores for leaning purposes. Power fuel of approved type, firewood, kerosene oil etc. for running the plant and machinery and also the full time chowkidar for guarding the plant and machinery against any loss or damage shall be arranged by the contractor who shall be fully responsible for the safeguard and security of plant and machinery. The contractor shall on or before the supply of plant and machinery sign an agreement indemnifying the Institute against any loss or damage caused to the plant and machinery either during transit or at site of work.

(vii) Ordinarily, no plant and machinery shall work for more than 8 hours a day inclusive of one hour lunch break. In case of an urgent work however, the Engineer-in- Charge may, at his discretion, allow the plant and machinery to be worked for more than normal period of 8 hours a day. In that case, the hourly hire charges for overtime to be borne by the contractor shall be 50% more than the normal proportionate hourly charges (1/8th of the daily charges) subject to a minimum of half day's normal charges on any particular day. For working out hire charges for over time, a period of half an hour and above will be charged as one hour and a period of less than half an hour will be ignored.

(viii) The contractor shall release the plant and machinery every seventh day for periodical servicing and/or wash out which may take about three to four hours or more. Hire charges for full day shall be recovered from the contractor for the day of servicing wash out irrespective of the period employed in servicing.

(ix) The plant and machinery once issued to the contractor shall not be returned by him on account of lack of arrangements of labour and materials, etc. on his part, the same will be returned only when they are required for major repairs or when in the opinion of the Engineer-in-Charge the work or a portion of work for which the same was issued is completed.

(x) Log Book for recording the hours of daily work for each of the plant and machinery supplied to the contractor will be maintained by the Institute and will be countersigned by the contractor or his authorized agent daily. In case the contractor contests the correctness of the entries and/or fails to sign the Log Book, the decision of the Engineer-in-Charge shall be final and binding on him. Hire charges will be calculated according to the entries in the Log Book and will be binding on the contractor. Recovery on account of hire charges for road rollers shall be made for the minimum number of days worked out on the assumption that a roller can consolidate per day and maximum quantity of materials or area surfacing as noted against each in the annexed statement (see attached annexure)

(xi) In the case of concrete mixers the contractors shall arrange to get the hopper cleaned and the drum washed at the close of the work each day or each occasion. a) In case rollers for consolidation are employed by the contractor himself, log book for such rollers shall be maintained in the same manner as is done in case of Departmental rollers, maximum quantity of any items to be consolidated for each roller-day shall also be same as in Annexure to Clause 34(x) For less use of rollers, recovery for the less roller days shall be made at the stipulated issue rate.

(xii) The contractor shall be responsible to return the plant and machinery in the condition in which it was handed over to him and he shall be responsible for all damage caused to the said plant and machinery at

the site of work or elsewhere in operation or otherwise or during transit including damage to or loss of parts, and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. Chairperson I-CDC, IPR shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.

(xiii) The Contractor will be exempted from levy of any hire charges for the number of the days he is called upon in writing by the Engineer-In-Charge to suspend execution of the work, provided Institute plant and machinery in question have, in fact, remained idle with the contractor because of suspension.

(xiv) In the event of the contractor not requiring any item of plant and machinery issued by Institute though not stipulated for issue in Schedule 'C' any time after taking delivery at the place of issue, he may return it after two days written notice or at any time without notice if he agrees to pay hire charges for two additional days without, in any way, affecting the right of the Engineer-in-Charge to use the said plant and machinery during the said period of two days as he likes including hiring out to a third party.

CLAUSE 35 (Condition relating to use of asphaltic material)

(i) The contractor undertakes to make arrangement for the supervision of the work by the firm supplying the tar or bitumen used.

(ii) The contractor shall collect the total quantity of tar or bitumen required for the work as per standard formula, before the process of painting is started and shall hypothecate it to the Engineer-in-Charge. If any bitumen or tar remains unused on completion of the work on account of lesser use of materials in actual execution for reasons other than authorized changes of specifications and abandonment of portion of work, a corresponding deduction equivalent to the cost of unused materials as determined by the Engineer-in-Charge shall be made and the material return to the contractors. Although the materials are hypothecated to Institute, the contractor undertakes the responsibility for their proper watch, safe custody and protection against all risks. The materials shall not be removed from site of work without the consent of the Engineer-in-Charge in writing.

(iii) The contractor shall be responsible for rectifying defects noticed within a year from the date of completion of the work and the portion of the security deposit relating to asphaltic work shall be refunded after the expiry of this period.

CLAUSE 36 (Employment of Employees Technical Staff and employees)

Contractors Superintendence, Supervision, Technical Staff and Employees

(i) The contractor shall provide all necessary superintendence during execution of the work and as along thereafter as may be necessary for proper fulfilling of the obligations under the contract.

The contractor shall immediately after receiving letter of acceptance of the tender and before commencement of the work, intimate in writing to the Engineer-in-Charge the name, qualifications, experience, age, address and other particulars along with certificates, of the principal technical representative to be in charge of the work and other technical representative(s) and their qualifications and experience shall not be lower than specified in Schedule 'F'. The Engineer-in-Charge shall within 3 days of receipt of such communication intimate in writing his approval or otherwise of such a representative to the contractor. Any such approval may at any time be withdrawn and in case of such withdrawal, the contractor shall appoint another such representative according to the provisions of this clause. Decision of the tender accepting authority shall be final and binding on the contractor in this respect. Such a principal

technical representative shall be appointed by the contractor soon after receipt of the approval from Engineer-in-charge and shall be available at Site before start of work.

All the provisions applicable to the principal technical representative under the clause will also be applicable to other technical representative(s). The principal technical representative and other technical representative(s) shall be present at site of work for supervision at all times when any construction activity is in progress and also present himself/ themselves, as required, to the Engineer in charge and/ or his designated representative to take instructions. Instructions given to the principal technical representative or other technical representative(s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative(s) shall be actually available the decision of the Engineer-in -Charge as recorded in the site order book and measurement recorded checked/ test checked in measurement books shall be final and binding on the contractor. Further if the contractor fails to appoint suitable technical principal technical representative and/ or other technical representative(s) and if such appoint person are not effectively present or are absent by more than two days without duly approved substitute or do not discharge their responsibilities satisfactorily, the Engineer-in-charge shall have full powers to suspend the execution of the work until such date as suitable other technical representative(s) is/ are appointed and the contractor shall be held responsible for the delay so caused to the work. The contractor shall submit a certificate of employment of the technical representative(s) along with every on account bill/ final bill and shall produce evidence if at any time so required by the Engineer-in-Charge at site fully during all stages of execution of work, during recording/ checking/ test checking of measurements of works and whenever so required by the Engineer In charge and shall also note down instructions conveyed by the Engineer-in-charge or his designated representative(s) in the site order book and shall affix his/ their signature in token of noting down the instructions and in token of acceptance of measurements/ checked measurements/ test checked measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Engineer-in-charge of the work in similar manner as aforesaid shall be provided in event of absence of any of the representative(s) by more than two days.

If the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative is/ are effectively appointed or is/ are effectively attending or fulfilling the provision of this clause, a recovery (non-refundable) shall be effected from the contractor as specified in Schedule 'F'. and the decision of the Engineer-In-Charge as recorded in the site order book and measurement recorded checked/ test checked in measurement books shall be final and binding on the contractor. Further , if the contractor fails appoint suitable technical Principal technical representative and/ or other technical representative(s) and if such appointed persons are not effectively present or are absent by more two days without duly approved substitute or donot discharge their responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of work until such date as suitable other technical representative(s)is /are appointed and the contractor shall be held responsible for the delay so caused to the work. The Contractor shall submit a certificate of employment of the technical representative (s) (in the form of copy Form -16 or CPF deduction issued to the Engineer employed by him) along with every on account bill final billand shall produce evidence if at any time so required by the Engineer-in-charge.

(ii) The contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work.

The contractor shall provide and employ skilled, semiskilled and unskilled labour as is necessary for proper and timely execution of the work.

The Engineer-in-Charge shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconducts himself, or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Engineer-in-Charge to be undesirable. Such person shall not be employed again at works site without the written permission of the Engineer-in-Charge and the persons so removed shall be replaced as soon as possible by competent substitutes.

CLAUSE 37 (Levy / Taxes payable by Contractor)

(i) GST, Building and other Construction Workers Welfare Cess or any other tax, levy or Cess in respect of input for or output by this contract shall be payable by the contractor and Government shall not entertain any claim whatsoever in this respect except as provided under Clause 38.

(ii) The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, stone, kankar, etc. from local authorities.

If pursuant to or under any law, notification or order any royalty cess or the like becomes payable by the Institute / Government of India and does not any time become payable by the contractor to the State Government, Local authorities in respect of any material used by the contractor in the works then in such a case, it shall be lawful to the Institute / Government of India and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor.

CLAUSE 38 (Conditions for reimbursement of levy / taxes if levied after receipt of tenders)

(i) All tendered rates shall be inclusive any tax, levy or cess applicable on last stipulated date of receipt of tender including extension if any. No adjustment i.e. increase or decrease shall be made for any variation in the rate of GST, Building and Other Construction Workers Welfare Cess or any tax, levy or cess applicable on inputs.

However, effect of variation in rates of GST or Building and Other Construction Workers Welfare Cess or imposition or repeal of any other tax, levy or cess applicable on output of the works contract shall be adjusted on either side, increase or decrease.

Provided further that for Building and Other Construction Workers Welfare Cess or any tax (other than GST), levy or cess varied or imposed after the last date of receipt of tender including extension if any, any increase shall be reimbursed to the contractor only if the contractor necessarily and properly pays such increased amount of taxes/levies/ cess.

Provided further that such increase including GST shall not be made in the extended period of contract for which the contractor alone is responsible for delay as determined by authority for extension of time under Clause 5 in Schedule F.

(ii) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the Institute and/or the Engineer-in-Charge and further shall furnish such other information/document as the Engineer-in-Charge may require from time to time.

(iii) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy or cess, , give a written notice thereof to the Engineer-in-Charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

CLAUSE 39 (Termination of Contract on death of contractor)

Without prejudice to any of the rights or remedies under this contract if the contractor dies, Chairperson I-CDC IPR on behalf of the Director, IPR shall have the option of terminating the contract without compensation to the contractor.

CLAUSE 40 (If Relative working in Institute then the contractor not allowed to tender)

The contractor shall not be permitted to tender for works in the Institute (Division in case of contractors of Horticulture/Nursery categories) responsible for award and execution of contracts) in which his near relative is posted as Accountant or as an officer in any capacity. He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any officer in the Institute. Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of Institute. If however the contractor is registered in any other department, he shall be debarred from tendering in Institute for any breach of this condition.

NOTE: By the term "near relatives" is meant wife, husband, parents and grandparents, children and grandchildren, brothers and sisters, uncles, aunts and cousins and their corresponding in-laws.

CLAUSE 41 (No Gazetted Engineer to work as Contractor within one years of retirement)

No engineer of gazette rank or other officer employed in engineering or administrative duties in an engineering department of Government of India shall work as a contractor or employee of a contractor for a period of one year after his retirement from government service without the previous permission of Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of Government of India as aforesaid, before submission of the tender or engagement in the contractor's service, as the case may be.

CLAUSE 42 (Return of material & recovery for excess material issued.)

(i) After completion of the work and also at any intermediate stage in the event of non-reconciliation of materials issued, consumed and in balance - (see Clause 10), theoretical quantity of materials issued by the Government for use in the work shall be calculated on the basis and method given hereunder:

(a) Quantity of cement & bitumen shall be calculated on the basis of quantity of cement & bitumen required for different items of work as shown in the Schedule of Rates mentioned in Schedule 'F'. In case any item is executed for which standard constants for the consumption of cement or bitumen are not available in the above mentioned schedule/statement or cannot be derived from the same shall be calculated on the basis of standard formula to be laid down by the Engineer-in-Charge.

(b) Theoretical quantity of steel reinforcement or structural steel sections shall be taken as the quantity required as per design or as authorized by Engineer-in-Charge, including authorized lappages, chairs etc. plus 3% wastage due to cutting into pieces, such theoretical quantity being determined and compared with the actual issues each diameter wise, section wise and category wise separately.

(c) Theoretical quantity of G.I. & Cl. or other pipes, conduits, wires and cables, pig lead and G. I./ M S. sheets shall be taken as quantity actually required and measured plus 5% for wastage due to cutting into

pieces (except in the case of G. I. / M. S. sheets it shall be 10%), such determination & comparison being made diameter wise & category wise.

(d) For any other material as per actual requirements.

(ii) Over the theoretical quantities of materials so computed a variation shall be allowed as specified in Schedule 'F'. The difference in the net quantities of material actually issued to the contractor and the theoretical quantities including such authorized variation, if not returned by the contractor or if not fully reconciled to the satisfaction of the Engineer - in - Charge within fifteen days of the issue of written notice by the Engineer- in-charge to this effect shall be recovered at the rates specified in Schedule 'F', without prejudice to the provision of the relevant conditions regarding return of materials governing the contract. Decision of Engineer-in-Charge in regard to theoretical quantities of materials which should have been actually used as per the Annexure of the standard schedule of rates and recovery at rates specified in Schedule 'F' shall be final & binding on the contractor.

For non scheduled items, the decision of the Chairperson I-CDC, IPR regarding theoretical quantities of materials which should have been actually used, shall be final and binding on the contractor.

(iii) The said action under this clause is without prejudice to the right of the Institute to take action against the contractor under any other conditions of contract for not doing the work according to the prescribed specifications.

CLAUSE 43 (Compensation during warlike situations)

The work (whether fully constructed or not) and all materials, machines, tools and plants, scaffolding, temporary buildings and other things connected therewith shall be at the risk of the contractor until the work has been delivered to the Engineer-in-Charge and a certificate from him to that effect obtained. In the event of the work or any materials properly brought to the site for incorporation in the work being damaged or destroyed in consequence of hostilities or warlike operation, the contractor shall when ordered (in writing) by the Engineer-in-Charge to remove any debris from the site, collect and properly stack or remove in store all serviceable materials salvaged from the damaged work and shall be paid at the contract rates in accordance with the provision of this agreement for the work of clearing the site of debris, stacking or removal of serviceable material and for reconstruction of all works ordered by the Engineer- in-Charge, such payments being in addition to compensation up to the value of the work originally executed before being damaged or destroyed and not paid for. In case of works damaged or destroyed but not already measured and paid for, the compensation shall be assessed by the Chairperson I-CDC, IPR up to Rs. 5000/- and by the Director concerned for a higher amount. The contractor shall be paid for the damages/destruction suffered and for the restoring the material at the rate based on analysis of rates tendered for in accordance with the provision of the contract. The certificate of the Engineer-in-Charge regarding the quality and quantity of materials and the purpose for which they were collected shall be final and binding on all parties to this contract.

Provided always that no compensation shall be payable for any loss in consequence of hostilities or warlike operations (a) unless the contractor had taken all such precautions against air raid as are deemed necessary by the Engineer-in-Charge (b) for any material etc. not on the site of the work or for any tools, plant, machinery, scaffolding, temporary building and other things not intended for the work.

In the event of the contractor having to carry out reconstruction as aforesaid, he shall be allowed such extension of time for its completion as is considered reasonable by the Chairperson I-CDC/ IPR.

CLAUSE 44 (Apprentices Act provisions to be complied with)

The contractor shall comply with the provisions of the Apprentices Act, 1961 and the rules and orders issued there under from time to time. If he fails to do so, his failure will be a breach of the contract and the Chairperson I-CDC, IPR may, in his discretion, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

CLAUSE 45 (Release of Security deposit after labour clearance)

Security Deposit of the work shall not be refunded till the contractor produces a clearance certificate from the Labour Officer. As soon as the work is virtually complete the contractor shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if otherwise due.

SECTION: 2 - (ii)(a) Integrity Pact.

To,

Subject : NIT No. _____ for the work _____

Dear Sir,

It is hereby declared that Institute For Plasma Research is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender is an invitation to offer made on the condition that the Bidder will sign the integrity Agreement, which is an integral part of tender/bid document, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of Integrity Agreement on the behalf of Institute for Plasma Research.

Yours faithfully,

Chairperson I-CDC, IPR

Integrity Pact

To,
Chairperson I-CDC IPR

Subject : Submission of Tender for the work of _____

Dear Sir,

I/We acknowledge that Institute for Plasma Research is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender /bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I /We will stand disqualified from the tendering process. I/We acknowledge that THE MAKING OF THE BID SHALL BE REARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE OF THIS CONDITION OF THE NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by Institute for Plasma Research. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my /our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, IPR shall have unqualified, absolute and unfettered right to disqualify the tenderer /bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully,

(Duly Authorized signatory of the Bidder)

To be signed by the bidder and same signatory competent / authorized to sign
the relevant contract on behalf of IPR

INTEGRITY AGREEMENT

This Integrity Agreement is made at on thisday of20.....

BETWEEN

Director,IPR represented through Chairperson I-CDC Institute for Plasma Research, Bhat Gandhinagar-382428....., (Hereinafter referred as the '**Principal/Owner**', which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

.....
(Name and Address of the Individual/firm/Company)

through(Hereinafter referred to as the
the
(Details of duly authorized signatory)

"Bidder/Contractor" and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns).

Preamble

WHEREAS the Principal / Owner has floated the Tender (NIT No.) (hereinafter referred to as "Tender/Bid") and intends to award, under laid down organizational procedure, contract for

.....
(Name of Work)

hereinafter referred to as the "Contract".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

Article 1: Commitment of the Principal/Owner

(1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

(a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

(b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

(c) The Principal/Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

(2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

Article 2: Commitment of the Bidder(s)/Contractor(s)

(1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the Government / Department all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

(2) The Bidder(s)/Contractor(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

(a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

(b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

(c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contractor(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

(d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases

where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.

(e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

(3) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

(4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.

(5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation in the tendering process).

Article 3: Consequences of Breach

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder/ Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

(1) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

(2) Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder/Contractor.

(3) Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of IPC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression

(1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.

(3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors

(1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/sub-vendors.

(2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

(3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

Article 6- Duration of the Pact

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, IPR.

Article 7- Other Provisions

(1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Head quarters of the Division of the Principal/Owner, who has floated the Tender.

(2) Changes and supplements need to be made in writing. Side agreements have not been made.

(3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

(4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

(5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

Article 8- LEGAL AND PRIOR RIGHTS

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

.....
(For and on behalf of Principal/Owner)

.....
(For and on behalf of Bidder/Contractor)

WITNESSES:

1.
(Signature, name and address)

2.
(Signature, name and address)

Place:

Dated:

SECTION: 2 - (iii) - SPECIAL CLAUSES OF CONTRACT (SCC)

1. GENERAL:

The following special clauses of contract shall be read in conjunction with general clauses of contract enclosed herein before. The following clauses shall be considered as an extension and not limitation of the obligations of the contractor. In case the discrepancy between these special clauses of contract and the General Clauses of contract, these Special Clauses shall take precedence over the General clauses of the Contract.

2. SCOPE AND LOCATION OF WORK: (Please refer to Schedule "A")

The contractor carrying out this works will be strictly abide by the Local /Municipal / Statutory Bodies/Police/ Institute's regulations as well as security regulations imposed by such authorities from time to time regarding transshipment of equipment ,operations, drainage, late hour working , working on holidays, bringing /taking away of materials ,disposal of debris , excavated /surplus materials etc. as and wherever applicable.

The contractor for this work shall co-ordinate for his work along with other contractors who will be simultaneously carrying out the work in same area.

All workmen working at height beyond 1st floor shall be provided with safety belts and the workers should be directed to wear safety belts as long as they are working. The instructions issued by the Engineer-In-Charge with regard to security of workmen from time to time to be strictly followed. All other safety measures stipulated in the tender document shall be strictly followed failing which the Engineer-In - Charge shall take immediate action deemed fit and the same shall be binding on the contractor.

The work shall be completed as per the detailed time schedule which shall be prepared after the issue of work order. However, the entire work shall be completed within the stipulated completion period as specified in the Tender Notice.

3. SITE INVESTIGATIONS:

The tenderer is advised to visit the site of work with prior permission of Chairperson I-CDC or his authorized representative of Institute for Plasma Research to acquaint themselves as to the nature and location of the work, access to the site, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labour, water, electric power and road, as also uncertainties of weather or similar physical conditions of the site, the formation and conditions of the ground, the character, quality and quantity of surface and sub-surface materials to be encountered, including subsoil water levels, the character of equipment and facilities needed preliminary to and during the progress of the work, and all other matters which can be, in any way, effect the work or the cost thereof under the contract.

4. STAKING OUT BASE LINES AND LEVELS:

The contractor shall establish at site the layout of the building/road etc. for the work from base lines and grids established by the Institute and shall be responsible for all measurements in connection therewith. The contractor shall, at his own expenses, furnish all stakes, templates, platform, equipments, ranges and labour that may be required in setting out or laying out any part of the work. The contractor to carry out the Centre lines of the proposed buildings with the total station (survey equipment) and to set out with no

extra cost. The contractor shall be held responsible for the proper execution of the work to such lines, levels and grids as may be established or indicated on the drawings and specifications, The contractor shall check the bench marks and stakes existing at the site for laying out lines and levels.

The contractor has to construct and maintain proper bench marks at all salient positions in order that the lines and levels may be accurately checked at all times.

Total Station, Theodolite, levels, prismatic compass, chain, steel and metallic tapes and all other surveying instruments found necessary on the works shall be provided by the contractors for use at site in connection with this work.

5. COMMENCEMENT AND COMPLETION OF WORK AND PROPER SCHEDULE:

The work shall be completed within the stipulated period of completion.

The Contractor shall submit detailed time schedule with in 15 days from the date of issue of work order, for completion of work, indicating all the important activities of execution of the work/ group of the items in sequence of its operation etc. including making ready the sample finishes / finished sample flat for building works, in consultation with Engineer-In-Charge and submit the same for approval of the work awarding authority. This time schedule, after approval, shall form part of the contract and the work in all respect shall be carried out as per this time schedule.

Time shall be the essence of the contract. The rate of progress of the whole work as well as for all the important individual items of work shall not be slower than as laid down in the attached progress schedule.

The contractor shall properly assess his capability and fully satisfy himself before tendering that he will be able to adhere the specified schedule. In this connection the attention of the tenderer is specially invited to clause 2 of the General Conditions of the Contract.

The contractor shall furnish to the Engineer-in-Charge weekly progress report in triplicate on Saturday of every week indicating the following:

Sr.No.	Item of work for the	Schedule progress week	Actual short fall if any	Reason for make-up the short fall	Steps taken to make up the short fall

5 (a) The contractor shall employ sufficient number of skilled and unskilled labour required for the work for maintaining the progress of work as stipulated in the time schedule. The trade -wise labour strength should be intimated to the Engineer-in-Charge everyday in writing. The skilled labour shall be increased if required by Engineer-in-Charge to maintain the progress of work.

6. SEQUENCE OF WORK:

The contractor shall execute the work as per the sequence given by the Engineer-in-Charge from time to time so that the other items of work to be executed by other agencies are completed progressively along with the main work.

7. CO-OPERATION WITH OTHER CONTRACTORS:

The contractor shall extend all facilities and give complete co-operation for the execution of various connected work if required to be carried out simultaneously by other agencies while his own work is in progress. The co-ordination will be effected in consultation with the Engineer-in-Charge of the work. Other contractors are also likely to be authorized by the Institute to work in the same area during the construction stage for work.

Since Electrical/Air-conditioning/other agencies will have to carry out their works such as installations of conduits, junction boxes, wiring, distribution boxes, switches, fittings and fixtures etc. in a planned manner in stages which will be in relation the status and progress of civil construction works, the civil contractor shall accept and take over the inventories of installation of Electrical/Air-conditioning/other agencies when their works are in part/full completion stage. The same inventory in the same condition will have to be handed over back to the electrical/air-conditioning/other agencies for carrying out their remaining works after the stage wise completion of the civil works. During final handing over of the building(s) to the Institute / Users, the civil contractor will again take over the installation/inventories of fittings and fixtures of electrical/air-conditioning/other agencies and will complete all his balance finishing works and hand over his works along with the installations of other agencies to Institute/Users.

The contractor shall afford all facilities:

- (a) For the installation of embedded parts, sleeves with its accessories in slabs, beams and walls by the other agencies before the reinforcement is placed necessary cut-outs in the shuttering will have to be provided by the civil contractor for purpose for which no extra payment will be admissible.
- (b) For the installation of various service lines in the walls, floors, slabs, ducts etc.
- (c) For using approach road etc. by the other contractors.

No extra claims on account of facilities provided for carrying out the work mentioned above will be entertained.

8. CO-ORDINATION:

The contractor will carry out the entire work in a planned manner by co-ordinating his work, with the other contractors, who will simultaneously carrying out the work in the same area and also co-ordinate in connection with the position of various fixtures, inserts, embedments and other allied work connected with the completion of building / subject work.

In case of any dispute between the contractors engaged on the same work, decision of Engineer-in-Charge shall be final and binding.

9. APPROACH ROADS AND TRANSPORTATION OF EQUIPMENT AND MATERIALS:

Contractor will be permitted to use the existing roads in the establishment area for the purpose of transporting equipment and materials and for use of labour etc. The Engineer-in-Charge, however, will not undertake to provide any approach roads to the actual site of work. It shall be the entire responsibility of the contractor to provide and maintain such temporary approach roads including cross drainage works if any at his own cost for the purpose of movement of men, materials and equipment. Layout of such approach roads shall be submitted to Engineer-in-Charge for his approval before undertaking the

construction of the same. Such approach roads shall be made available to other agencies for carrying out the work in the same area in consultation with the Engineer-in-Charge of the works without any cost.

10. OPERATIONS AND STORAGE AREAS:

All operations of the contractor shall be confined to areas authorized by the Engineer-in-Charge and storage of materials shall be over the areas specially indicated by the Engineer-in-Charge. Materials like sand and metal of different sizes shall be stored in properly constructed bins with hard floor to avoid inter mixing as well as mixing with objectionable materials. The contractor shall be obliged to keep the premises in hygienic conditions by proper drainages of the area provided with suitable approaches throughout the period of contract. He shall rectify all damages caused to the Institute property within the areas thus allotted. He shall be responsible to clear all rank, vegetation at site at his own cost.

11. CONTRACTOR'S STORAGE AND SITE OFFICE:

Suitable area near the site of work shall be allocated to the contractor, @ Re.1/- per month as token compensation for storing his equipment, plant, materials etc. and for his site office and cement godown. He will, however, be solely responsible for watching or guarding his property and materials issued to him by the Institute. Contractor shall cover all materials at site with requisite insurance against theft, larceny, dacoits, fire tempest and flood. He, however, will have to dismantle the shed and vacate the land after the receipt of due notice from the Engineer-in-Charge if the same is obstructing any work.

The tenderer should obtain necessary permission/approval from Statutory authorities of Local bodies for construction of temporary structures at site of work such as cement godown, stores, site office etc. It will be responsibility of the tenderers to prepare proper plans, to pay any requisite fees to statutory authorities and to execute the work for the temporary structure at their own cost as per the conditions and rules laid by statutory authorities.

12. TEMPORARY BUILDINGS:

Warehouse, shed, workshop and office facilities as required by the contractor shall be provided by him at his own expense. Area for the same will be made available by the Institute @ Re.1/- per month as token compensation. Prior approval of the Engineer-in-Charge shall be obtained in respect of location and layout and details of those buildings. After the work is over all these temporary facilities shall be removed by the contractor at his own expense to the satisfaction of the Engineer-in-Charge within 10 days from the date of completion.

No labour shall be permitted to stay at site or in the partly completed building at any time and no land for erection of temporary huts for labourers will be made available by the Institute. The contractor shall make his own arrangements for labour hutments elsewhere outside the Institute's premises/area at his own cost. Unauthorized occupation of any area/partly completed building by the contractor's labourer will be treated as trespass and action will be taken to evict them including termination of contract if deemed fit. Sanitary as well as water supply and drainage facilities as required by the labour laws in force, are to be provided by the contractor at his own cost.

13. TRAFFIC INTERFERENCE & INCONVENIENCE TO THE PUBLIC:

The contractor shall conduct his operations so as to interfere as little as possible with the traffic/public. When interfere to traffic is inevitable, a notice of such Interference shall be given to the Engineer-in-Charge well In advance (at least 2 days at any stage, if it becomes necessary to divert the traffic, the contractor shall obtain permission from the local traffic authorities at his own expense. The Institute will render reasonable

assistance in the matter. The contractor shall take all precaution and other measure, such as providing warning signals, temporary diversion etc. all as directed by the Engineer-in-Charge.

The Contractor shall not deposit materials anywhere at work site which will seriously inconvenience the public. The Engineer-In-Charge may require the contractor to remove any materials which are considered to be a danger or in convenience to the public or cause them to be removed at the contractor's cost.

The contractor shall exercise full care to ensure that no damage is caused by him or his workmen during the operation to the existing water supply and power lines. The cost of any such damage and risks arising out of this shall be entirely borne by the contractor.

14. DRAINAGE AROUND THE BUILDING AND FOUNDATION FOR OTHER WORKS:

The contractor shall be entirely responsible for the provision and maintenance of efficient drainage arrangements in the work site to lead of all water whatsoever pumped from the excavations on account of rains, floods, springs or any other source whatsoever. The foundation trenches shall be kept free from water while all the works below ground level are in progress.

Flooding or ponding of water in the work site shall not be permitted under any circumstances whatsoever and the contractor shall take all necessary precautions to prevent the same by providing suitable pumps and other dewatering arrangement.

The cost of repairing damages if any, to the work under execution or to any Institute property in and around the site shall be entirely borne by the contractor where such damages are due to his non compliance with the above conditions.

15. SPECIFICATIONS AND DRAWINGS:

15.1 The drawings furnished to the contractor for this work shall be interpreted by the use of given dimensions and nomenclature only and the drawings shall not be scaled. Drawings to a large scale shall have precedence over those to a smaller scale. Prior to the execution of the work, the contractor shall check all drawings, specifications and shall immediately report all errors, discrepancies and/or omissions discovered therein to the Engineer-in-Charge and obtain appropriate orders on same. Any adjustment made by the contractor without prior approval of the Engineer-in-Charge shall be at his own risk. Description of item in the schedule of quantities is brief and therefore, shall be read in conjunction with the relevant drawings and the specifications and the contractor's rate shall be deemed to be for such complete work unless otherwise specified by the contractor while tendering.

15.2 In case any difference or discrepancy between the description in the schedule of quantities and the specifications, the schedule of quantities shall take precedence.

In case any difference or discrepancy between the description in the schedule of quantities and the drawing, the description in schedule of quantities shall take precedence.

In case of any difference or discrepancy between drawing and specifications the specifications shall take precedence.

15.3 Prior to submission of drawing called for as per specifications or any other drawings, contractor may intend to submit for approval, the contractor shall be responsible for thoroughly checking of all drawings to ensure that they comply with the intend and the requirements of the contract specifications and that

they fit in with the overall layout. Drawing found to be inaccurate or otherwise in error will be returned to the contractor for corrections.

15.4 For all drawings to be submitted by the contractor, for the approval of the Engineer-in-Charge, the contractor shall submit 6 (six) copies of each drawing & soft copy (pdf as well as editable) of drawing.

15.5 The approval of the drawings by the Engineer-in-Charge shall not be construed as a complete dimensional check but will indicate only that the general method of construction as detailed is satisfactory. The contractor shall be responsible for the dimensions and designs of adequate connection supports, details and satisfactory construction of the work.

15.6 Cost of all shop drawings, fabrication drawings or formwork drawings and details to be furnished by the contractor shall be deemed to be included in his tendered rates. Approval of shop drawings shall not be construed as authorized additional work of increased costs to the Institute.

16. SAMPLES:

Samples of all materials to be incorporated in the work shall be submitted to the Engineer-in-Charge for his approval without any extra cost. The approved samples will be kept with Engineer-in-Charge till the completion of the work. Materials not conforming strictly to the approved samples will be rejected.

Samples of various materials required for testing shall be provided free of charge by the contractor. Testing charges if any shall be borne by the contractor. All other expenses required to be incurred for taking the samples; conveyance packing etc. shall be borne by the contractor.

16.1 in addition to submission of samples of materials, The contractor, shall make as sample flat (Sample finishing in case of Non-Residential buildings) ready in all respect, including finishing items of works of civil works including installation of fittings as well as those of water supply, plumbing and sanitation work and electrical work, internal fittings, fixtures and wiring etc. to determine the acceptable standard of material and workmanship. The sample flat with all final finishes items of work in the building (s). Each of these samples of items of work/ trade / materials approved by the Engineer-In Charge will be endorsed as " Guide line samples", as per which further works shall be executed in strict conformity with standard of materials and workmanship.

The Provision of co-ordination and co-operation with other agencies shall be mutatis-mutandis applicable to the above mentioned " Sample flat / sample finishing works" also.

17. EXECUTION OF WORK AND INSPECTION:

The work shall be conducted under the general direction of the Engineer-in-Charge and is subject to inspection by his appointed representative to ensure strict compliance with the terms of the contract. No failure of the Engineer-in-Charge or his designated representative during the progress of the work to discover or to reject materials, or work not in accordance with the requirement of this contract shall be deemed as an acceptance thereof or a waiver of defects therein and no payment by the Engineer-in-Charge or partial or entire occupancy of the premises shall be construed to be an acceptance of work or materials which are not strictly in accordance with the requirements of the contract. No changes whatsoever to any provision of specifications shall be made without authorization from the Engineer-in-Charge.

18. SUPPLY OF WATER FOR CONSTRUCTION PURPOSE:

Note : In case of non-stipulation of departmental (Institute) water supply as per Schedule -“B” of Schedules (Salient Governing features of Tender / work) the contractor shall make his own arrangement of water required for this work, at his own cost, subject to the approval of Engineer-In-Charge.

The contractor shall arrange to provide a minimum storage of 5000 Ltrs. (or two days requirement whichever is higher) of water at building location and all necessary pumps for storage of water shall be built by the contractor at his own cost at location to be approved by the Engineer-in Charge.

The water storage tanks should be leak proof and wastage and misuse of water is strictly prohibited. Contamination and pollution of water to be strictly avoided. Construction water should not be used for drinking or for domestic purpose. Contractor will make his own arrangement for water required for drinking purposes at site of work and for all purposes at the labour camp at his own cost.

19. SUPPLY OF ELECTRICITY FOR CONSTRUCTION PURPOSE:

In case of stipulation of departmental (Institute) supply of Electricity for construction purpose under Schedule “B” of Schedules (Salient Governing features of Tender /work) , the same shall be dealt with as under:

(In case of non-stipulation of departmental supply of Electricity for construction purpose in **Schedule “B”**, the contractor shall make his own arrangement for the same as required at his own cost.)

19.1 General:

Temporary electric power, if required by the contractor shall be provided for bonafide construction purpose required for the site job but limited to a total max. of **5 KW (connected) at 3 phase, 410 volts, 50 cps**. Some of the important conditions governing the power supply are as follows:

(a) The power will be supplied (on receipt of application in prescribed form) at one point within **1000 M.** of the building premises. The contractor shall install his own main switch, cables, electric cupboard/switch room etc. of adequate capacity of suitable type to receive, control and further distribute the power involved. The exact location and further details about supply point will on receipt of the contractor's application, be decided upon by the Institute, whose decision in the matter will be final and binding. The total final connected load and the anticipated maximum demand shall be furnished by the contractor about a month in advance of the actual initial requirement and for any addition in load subsequent to the initial supply, date, at least one week's notice from the date of submission of installation test report for the said additional load will be given.

(b) The contractor shall provide his own switches, a tested KWH Meter, earth station, earth leakage circuit breakers cable/lines of approved make and of adequate capacity from the aforesaid supply point to the various utilization points and also be responsible to maintain the same in good and safe condition at all times as per relevant codes and electricity rules. He will also be fully responsible at all times for any accident/mishap in his electrical installation/appliances etc. (including the consequential aspects) if the same are found to be due to defective construction/maintenance etc. of his installation or negligence in observation of rules, or safety precautions. The layout and other details of these lines shall be got approved in advance by the Institute and no change in the same shall be subsequently carried out without Institute prior approval. The Institute's Electrical Engineer may any time summarily disconnect, in the interest of safety, the power supply without notice, if any dangerous situation is seen in the contractor's installation or if the contractor has failed to maintain the installation satisfactorily inspite of a written notice served on

him. The responsibility for such a disconnection will always be with the contractor who will have no claim whatsoever in this respect on the Institute.

(c) The contractor's electrical installation shall conform in all respects to the relevant rules, regulations, statutory provision and codes of practice as also be in accordance with the rules of the local licensee Undertaking (as the case may be) as existing new or as may be amended/enforced from time to time in the future. Installation test reports shall invariably be furnished by the contractor before any load is connected. Periodical test reports by every 3 months for the complete installation shall also be submitted by the contractor in accordance with I.E.E Rules for temporary installation.

(d) Power will be supplied at the point mentioned in para (a) above at the usual 400 V, 3 Phase, 50 cycles. 4 wire or single phase 230 V, 2-wire system as the case may be subject to permissible variations in voltage and frequency. In case 3 phase supply the individual single phase loads if any shall be suitably connected so that the total load over three phases at the supply point is balanced as much as possible. No individual single phase equipment or a single phase system shall normally exceed a rating of 2 K.W.

(e) The Institute may install, depending on availability, in the covered space provided by the contractor at the aforesaid supply point necessary energy meter (additional) for registering the electricity (i.e. KWH) supplied. It may be necessary to install separate Institutes meter (rental amount as mentioned above) for lighting consumption and in that case the contractor shall have to provide separate lighting circuits.

(f) The supply of electricity shall be charged at the rates specified in the **Schedule "B"** at the rate fixed by the Institute from time to time which will be generally at par with the temporary/supply tariff of State Electricity Board. The contractor shall be responsible for the safety of the Institute's meter, cut outs etc. installed at his site.

NOTE:

The electricity will normally be billed once every month at the prevailing supply rate from time to time. In case if any increase in supply rate, the same shall be charged with an addition of departmental charges as per **Schedule -"B"**.

(g) The power supply shall be subject to all such restrictions, regulations etc., as are in existence now and as may be (enforced from time to time in future by the licensee/Government/Department or by any other competent authority for which the contractor have no claim whatsoever. Although all efforts shall be made to provide a continuous supply, the contractor shall have no claim whatsoever due to any breakdown or interruption etc. in the supply at any time.

19.2 CONSTRUCTION AND MAINTENANCE BY THE CONTRACTOR:

As mentioned above, the contractor shall maintain his entire electrical installation, appliances etc. in good and safe condition as required under relevant rules and codes of practice. However, the following precautions and directives shall be followed in addition to observing other essential rules:

(i) The minimum clearance (measured at the lowest sag point) to be maintained for all over head lines shall be 4 Mtrs. cross country or along roads and 6.1 meters across roads.

(ii) Metallic poles as a general rule should be avoided and if used should be earthed individually.

(iii) All loose hanging of wires and cables should be avoided. The line wires should be properly supported and an approved method of fixing shall be adopted.

- (iv) Installation shall not cause any hindrance to the normal movement of men and materials at site.
- (v) All cables and wires should be adequately protected against mechanical damage during construction activity of all contractors, working at site.
- (vi) In case the cable is required to be laid in ground, it should be adequately protected by covering the same with bricks, R.C.C. tiles or any other approved means and cable markers provided at suitable intervals as per approval of the Institute.
- (vii) Laying of cable and wires directly on floor shall not be allowed but if absolutely necessary for some very short lengths, the same shall be taken through suitable mechanical covering like G.I./M.S. Pipes etc.
- (viii) All the outdoor switch boards, equipments etc., should be adequately protected against rain or preferably they should not be exposed to weather.
- (ix) If overhead lines using bare conductors are installed, a guard wire system of adequate size shall run along the cables /wires and earthed effectively.
- (x) The connection for portable machines shall be taken only through suitably rated 3 pin socket points. Iron clad industrial type outlets are preferred. While taking supply through socket outlet a plug top must be used, avoiding inserting of loose wires in the sockets. The third pin of the plug shall invariably be earthed and 3 core wire of appropriate specifications and capacity shall be used.
- (xi) All three phase equipment shall be provided with duplicate earthing. All metallic frames, light fixtures, portable equipments etc. should be effectively earthed to main earthing.
- (xii) Duly authorized persons having valid wireman's license/competence certificate must be employed under the supervision of a qualified and experienced Electrical Supervisor for carrying out electrical work and repair of electrical equipments, installation and maintenance etc. at site.

19.3 Additional Power:

Power in excess of the limit stipulated above, may subject to availability, be provided if applied for by the contractor by installing additional cables/lines from the change over nearby. These additional lines along with necessary switches etc. shall be provided by the contractor.

20. TENDERED RATES:

The rates quoted by the tenderer in the schedule shall be inclusive of all taxes including GST, Sales Tax, VAT, Purchase Tax, workers welfare cess and other statutory levies imposed by the Government or other public bodies from time to time. The rates quoted shall also cover the cost of necessary protection including labour, materials and equipment to ensure safety and protection against risk or accident, compensation for injury to life and damage to property if any, caused by the contractor's operations connected with this work. The rates shall be firm and shall not be subject to change due to variations during the entire period of execution of the work in cost of materials, labour and conditions, or any other conditions whatsoever except for the provisions contained in clause 10 C, 10 CA and 10 CC of General conditions of contract as applicable for this work.

The rates quoted by the tenderer shall also be inclusive of State Sales Tax on the transfer of property in goods involved in execution of works contract Act (in other words WCT/ Turn over Tax), if any which is to be paid by the tenderer to the government from time to time during the execution of the contract/works. No separate claim on this account will be entertained by the Institute. Also no certificate(s) for exemption of Octroi / Entry tax shall be issued by the Institute.

Unless otherwise stated in schedule of quantities, rates for item quoted by the tenderer should be for the complete work including supply and fixing with all materials and should be for all heights and depths, lifts and leads, lengths and widths involved in the work.

Any cement slurry added over the base surface (or) for continuation of concreting , for better bond , is added to have been in-built in the item (unless otherwise explicitly stated and nothing extra shall be payable and no extra cement considered in consumption on this account.)

Rate for all items, in which use of cement is involved, shall include charges for curing.

The contractor when called for by the Institute should furnish detailed rate analysis in support of the rates quoted by him against each item of the tender. The Institute reserves the right to utilize the analysis thus supplied in setting any deviations or claims arising on this contract.

For any deviations or claims or extra items arising out of this contract, the contractor will be entitled for overheads and profits of 2.5% (Two and half) only towards handling, storing etc. of such materials which are supplied by the Institute under schedule 'B' at fixed issue rates/procurement rates in case of free issue materials.

21. CLAIMS AGAINST THE CONTRACTOR:

Whenever any claim against the contractor for the payment of a sum or money arises out of or under the contract, Institute shall be entitled to recover such sum by appropriating in part or whole, the security deposit of the contractor and to sell any Institute promissory notes etc. forming the whole or part of such security. In the event of the security deposit having been taken from the contractor, the balance or the total sum recoverable, as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due from the contractor, under this or any other contract with Institute, should this sum be not sufficient to cover the full amount recoverable, the contractor shall pay to Institute on demand the balance remaining due. Institute shall have the right to cause an audit and technical examination of the work and the final bill of the contractor including all supporting vouchers, abstracts etc. to be made after payment of the final bill and if as a result of the due audit and technical examination any sum is found to have been over paid in respect of any work done by the contractor under the contract or any work claimed by him to have been done under the contract and found not have been executed, the contractor shall be liable to refund the amount of the over payment and it shall be lawful for Institute to recover the same from him in the manner prescribed above of this clause or in any other manner legally permissible and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, amount of such under payment shall be duly paid by Institute to the contractor.

Provided that Institute shall not be entitled to recover any sum overpaid, nor the contractor shall be entitled to payment of any such paid short where such payment has been agreed upon between the Engineer-in-Charge on one hand and the contractor on the other, under any term of the contract permitting payment for work after assessment by the Engineer-in-Charge.

Provided further no recovery of an over payment and no payment of any sum paid short shall be made where such over payment or under payment has remained undiscovered for a period of three years after the date of payment of the final bill.

22. MODE OF MEASUREMENTS:

Measurements for all hidden items once taken jointly and so accepted by the tenderer in the bills, in writing shall be final and binding. No re-recording of measurements for hidden items of work be permitted.

The contractor shall provide at his own cost suitable weighing and measuring arrangements at site for checking the weight/ dimensions as may be necessary for execution of the work. All measuring tapes (of steel), scaffolding and ladders which may be required for taking measurements shall be supplied by the contractor.

If the contractor fails to accompany the Engineer-in-Charge of his authorized person to take measurements then he shall be bound by the measurements recorded by the Engineer-in-Charge or his representative.

23. STORES AND MATERIALS AT SITE:

Stores and materials required for the works are to be deposited by the contractor only in places to be indicated by the Engineer-in-Charge. The Engineer-in-Charge shall have a right at any time to inspect and examine any stores and materials intended to be used in or on the works either on the site or at any factory or workshops or other places where such stores or materials are being constructed or manufactured or processed or any place from where they are being obtained and the contractor shall give such facilities as required to be given for such inspection and examination.

The Engineer-in-Charge shall be entitled to have tests made without any extra cost to the Institute at an approved laboratory for any stores and or materials supplied by the Contractor, who shall provide at his own expense all the facilities which the Engineer-in-Charge may require for this purpose.

Any stores and materials brought to site for use on the work shall not be removed off the site without prior written approval of the Engineer-in-Charge, but on final completion of the work, the contractor shall at his own expenses remove from the site all surplus stores and materials originally brought by him.

24. PROPER DRAWINGS AND INSTRUCTIONS:

The Engineer-In-charge shall have full powers and authority to supply to the contractor from time to time during progress of the work such further drawings and instructions as shall be necessary for the purpose of proper and adequate execution and maintenance of the work and the contractor shall carry out the work and be bound by the same.

One copy each of the drawings furnished to the contractor shall be kept by the contractor at the site and the same shall at all reasonable times be made available for inspection and use by the Engineer-In-Charge and any other person authorized by the Engineer-In-charge

25. EMPLOYMENT OF STAFF FOR PLUMBING & ELECTRICAL WORKS:

25.1 Employment of certified plumber:

Certified plumbers should be employed by the contractor on the work for main sewer, filtered and unfiltered main.

25.2 Employment of licensed electrical foreman:

The contractor should employ a licensed electrical foreman to supervise the Electrical works.

26. GOVERNMENT LABOUR ACT:

The contractor has to follow strictly the Government labour Acts, which are and will be in force during the period of execution of work, all necessary arrangement for labourer's safety, insurance will have to be made by the contractor as per Municipal rules / Contractor's Labour regulations / other Central or Local statutory body / Institute' rules. **The Contractor shall insure his labourers with Insurance Policy and all risk insurance policies etc. at his own cost.**

27. DEDUCTION OF INCOME TAX:

As per Section 194-C of Income tax Act 1961, as amended from time to time the, income tax and Surcharge thereon will be deducted at the rate prescribed by Ministry of Finance , Department of Revenue, Central board of Direct Taxes from time to time , of the gross value of the work done from the bills. A certificate for the amount so deducted will be issued by the Institute.

28. URGENT REPAIRS:

If by reason of any accident or failure or other event occurring to or in connection with the work or any part thereof either during the period of maintenance, any remedial or other work or repair shall in the opinion of the Engineer-in-Charge be urgently necessary for security and the contractor is unable or unwilling, at once, to do such work or repair, the Engineer-in-Charge may be his own or other workmen do such work or repair as he may consider necessary. If the work or repair so done which in the opinion of the Engineer-in-Charge the contractor was liable to do at his own expenses under the contract and all cost and charges properly incurred by the Engineer-in-Charge in so doing shall on demand be paid by the contractor or may be deducted from any sum due or which may become due to the contractor provided always that the Engineer-in-Charge shall soon after the occurrence of any such emergency as may be reasonable, practicable, notify the contractor thereof in writing.

29. SECURITY REGULATIONS:

The contractors have to strictly follow the regulations of the Institute at the work site regarding entry of personnel, material etc. and any other regulation that might be enforced from time to time. All materials and articles brought by the contract to the work site shall have to declare at the security gate. Similarly no materials shall be taken out from the Institute premises without proper gate pass, which will be issued by the Engineer-in-Charge to the contractor on written request. It is to be noted that loading of contractor's materials in vehicles and trucks shall be done in the presence of Institute personnel. The contractor's representative will have to escort the materials till the security check is over.

The contractors, suppliers, vendors, workers engaged in work/business will be issued with renewable entry permit to avoid unauthorized entry in the Institute premises/site on scrutiny of applications in prescribed form.

For working on Saturdays,Sundays, Holidays and late hours even though permission will be accorded by the Engineer-in-Charge, the contractor will have to make application to the Institute and keep them informed well in advance.

The area where the proposed work is to be carried is area under the control of Security authorities of Institute. Entry to the site of work shall be through the main gate of Institute only. The contractor shall follow strictly the security regulations of the Institute at site of work regarding entry of personnel, materials etc. and other regulations of the Institute that might be enforced from time to time at the work site and also in the campus for smooth and efficient operation. The Contractor, his agents, representatives, workmen etc and his materials, carts, trucks or other means of transport etc, will be allowed to enter through and leave from such point of entry/exit at such times, the authorities in-charge of the area at their sole discretion may permit.

The contractor, his agents and representatives are required to be in possession of the individual identity /muster cards passes. The muster cards or passes are examined by the security staff at the time entry/exit inside the Institute area and also at any time or number of times within such area.

The contractor will have to apply for entry/muster permits of likely number of labour to be engaged during the week for the workers and authorize their representatives to collect the entry permits for labour from the Institute Authority.

It will be the responsibility of the contractor to maintain the list of labourers permitted to work inside the premises a register and the representative of contractor's labour will have to issue entry pass to each labour after making necessary entry in the registers.

The contractor, his agents, representatives, workmen shall strictly observe the orders pertaining to fire precautions prevailing within the area.

In addition to the above, other regulations as may be imposed by the security authorities / Engineer-In charge shall be complied with / observed by the contractor and his workmen.

Any breach of above security regulations and rules in force from time to time will be viewed seriously. No claim whatsoever will be entertained by the department on account of the observations of the Security regulations.

Special Notes:

(a) The Contractor should submit an undertaking to assume responsibility in respect of all the workers/ persons deployed by him at site. In case, if it is more than 15 days, a copy of police verification certificate in respect of those all labours/ persons to be deployed at site should be furnished along with undertaking well in advance.

(b) The entry and exit of contractor's labours/workers/ persons should be in presence of contractors authorized supervisor who will issue muster / entry passes/ identity card after proper entry in the muster at the main gate.

(c) It will be the responsibility of the contractor for proper safety and security of their materials including materials & laborer's for which secured advances have been given by the Institute at his own cost.

(d)The contractor should ensure that his workers / personnel should not enter in to the other area of Institute campus other than specified as site.

(e) No housing colony/labour colony will be permitted inside Institute campus. Any person/labour will not be allowed to stay inside the Institute campus after working hours.

(f) No staff or worker of the contractor will be permitted to enter the premises without valid photo Identity card / entry pass duly attested by the Administrative officer of IPR.

30. WATCH AND WARD AND LIGHTING:

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 as required by the Engineer-in-Charge and duly constituted authority for the protection of the workers or for safety and convenience of the public or others. The contractor shall be responsible for all damages and accidents caused due to negligence in this regard. It will be the entire responsibility of the contractor to protect the work(s) carried out by them including the fittings, fixtures and other accessories provided by them till the entire work is satisfactorily handed over to the users.

31. INSTITUTE'S DRAWINGS, SPECIFICATIONS, PROTO-TYPE ETC.:

All drawings, specifications, patterns, samples, models and proto-types furnished to the contractor by the Institute are intended to be complementary and to provide for and comprise everything necessary for the completion of work/supply and are the property of the Institute. These are not to be used for any work or purpose other than those for which these have been provided and shall be returned to the Institute immediately on completion of work/supply in good condition.

32. CONFIDENTIAL INFORMATION:

The drawings, specifications, proto-type, samples and such other information furnished to the contractor relating to the supply/work, sub-systems/equipment etc. are to be treated as confidential which shall be held by the contractor in confidence and shall not be divulged to any third party without the prior written consent of the Institute. The contractor, therefore, binds himself, his successors, heirs, executors, administrators, employees and the permitted assignees or such other persons or agents directly or indirectly concerned with the work/supply to the confidential nature of the drawings, specifications, proto-type samples etc. It is a further condition of the contract that the contractor shall not, without prior written permission from the Institute, transmit, transfer, exchange, gift or communicate any such confidential information, and also the component, sub assembly, products, by-products etc. pursuant to the fabrication under taken by the contractor, to any third party.

32. (a) Patents and Patent Rights Indemnification:

All specifications, drawings, patents and such other relevant information furnished to the contractor by the Institute shall be the property of the Institute. If, during the process of execution of the contract, any improvement, refinement or technical changes and modifications are affected by the contractor, such changes shall not affect the title to the property of the Institute and all the information, specifications, drawings etc. including the improvement/modifications, affected by the contractor shall continue to be the property of the Institute. The Institute shall also have the absolute right to assign, transfer, sublet, use and transmit all such information and details to the Institute's consultants, agents and collaborators and the contractor shall not have any claim or rights whatsoever in respect of the Institute's drawings, specifications, patents, prototypes etc. even where improvement, refinement, modifications etc. were affected by the contractor.

32. (b) Endorsement to be made by the Contractor on Fabrication Drawings for the protection of Institutes Interest:

This design/drawing is the property of Institute and it must be returned with quotation or upon delivery of the materials/equipment and must not be used except with the permission of the owner.

33. Jurisdiction:

This Contract/Agreement shall be subject to the jurisdiction of courts at Ahmedabad/Gandhinagar only.

34. Engagement of Specialized Agencies:

Contractor should submit the credentials of Water Proofing, Anti Termite Treatment, HVAC works , Fire fighting works & Electrical Work specialized agencies to be engaged (from the list of approved make / manufacturer / vendor) by the contractor for the approval of Engineer- In-Charge. For the approval the contractor should submit the complete details of agencies along with the credentials including their experience of similar works to be executed immediately on receipt of the work order.

35. Labour Colony / Labour camp:

No housing colony/labour colony will be permitted inside Institute campus. Any person/labour will not be allowed to stay inside the Institute campus.

36. Temporary Fencing around Site: (Not Applicable)

~~Contractor should erect a temporary GI corrugated sheet fencing with MS framing of at least 6.0 ft height on Periphery of the proposed construction site to restrict the entry of laborers in the existing campus from start of the work till the completion of entire work and same shall be removed after completion of work. The quoted total amount should be inclusive of the cost for the same.~~

37. Engagement of Construction Management Consultant (CMC/ PMC) for day to day supervision & project management:

Institute may engage project Management consultant (PMC) / Construction Management Consultant (CMC) for the day to day supervision , project management and other related activities pertaining to the project management and execution of work. In such case, PMC/ CMC shall be considered as an authorized representative of Engineer -in Charge. The contractor has to carry out as per instruction of PMC / CMC in addition to Engineer-In-Charge . Final Authority rests with the Engieneer-In-charge of the Institute.

38. Validity of quoted Tender:

The quoted tender by the Tenderers shall be valid for a minimum period of 120 days from the date of opening of tender.

39. Contractor to maintain Site records & Registers:

The Contractor should maintain all the records pertaining to the project at site such as Daily reports , Material registers& File, Drawing Register , Labour registers, site Instruction book, Test Registers , Test Report files etc. as per instructions of EIC.

The Contractor should submit the Daily report of site activities, Labours strength, Material inward ,etc in the approved format to the EIC through e-mail as well as duly singed in hard copy duly countersigned by

supervising agency of the Institute. The Contractors should also submit the photo Copy of material receipt Challans along with daily reports.

The said registers shall be handed over to EIC after the completion of works.

If the Institute demands the bill of any / all materials, the contractor should provide the photocopy of the bill (s) along with original bill for verification. Original bill shall be returned after verification.

40. Contractor to attend the meetings related to site progress:

The Contractor should attend all the periodical (Weekly or every Ten days or Fortnightly) site meetings and Progress Review meetings (Monthly) and any other the meetings related to the project as per the schedule decided by EIC at the Institute either at site / Institute for Plasma Research or at Architects office as and when decided upon at his own cost. The Necessary documents /data including progress of work etc. may be submitted by the Contractor as an when asked. The meeting shall be attended by the authorized person of Contractor.

41. INCONVENIENCE TO INSTITUTE'S ACTIVITIES:

The contractor shall not deposit materials on any site which will seriously inconvenience to any of the Institute's activities. The Engineer-in-Charge may require the contractor to remove any materials which are considered by him to be dangerous or inconvenient to the activities of the Institute or get them removed at the contractor's cost.

42. Employees Provident Funds:

The Contractor shall abide by the provisions of the Employees Provident Funds and misc. provisions act 1952. The Contractor should provide the copy of registration under the above act and ensure fulfillment of the said act in addition to all the regulations mentioned in the General Clauses of contract and contractor's Labour Regulations.

43 Environment Protection:

The Contractor should also comply following conditions related to environment protection during construction phase:

WATER:

- a) The Contractors shall make his own arrangement of water required for construction.
- b) Sewage generated during the construction phase shall be disposed off through the septic tank - soak pit.
- c) Water demand during construction shall be reduced by use of curing agents, super plasticizers and other best construction practices.

AIR:

- e) Peripheral barricading shall be done to prevent dust emission spreading outside the project premises.
- f) Water sprinkling shall be done in vulnerable areas for controlling fugitive emission.
- g) Material shall be covered during transportation to avoid the fugitive emission.

- h) The roads inside the project area and roads connected to the main road shall be paved or shall be water sprinkled to avoid the fugitive emissions during construction.
- i) The ambient air quality shall be monitored in and around the project area during construction phase.
- j) The construction materials and debris shall be properly stored and handled to avoid negative impacts such as air pollution and public nuisances by blocking the roads and public passages.

SAFETY:

- k) Structural design of the project shall strictly adhere to the seismic zone norms for earthquake resistant structures.
- l) During construction Personal Protective Equipment shall be provided to the construction workers and its usage shall be ensured and supervised.
- m) First Aid Box shall be made readily available in adequate quantity at all the times.
- n) Training shall be given to all workers on construction safety aspects.

NOISE:

- o) The overall noise level in and around the project area shall be kept well within the prescribed standards by providing noise control measures including acoustic insulation, hoods, silencers, enclosures vibration dampers etc. on all sources of noise generation. The ambient noise levels shall confirm to the standards prescribed under the Environment (Protection) Act and Rules.
- p) The noise generating equipments, machinery and vehicles shall not be operated during the night hours and shall be maintained properly to avoid generation of high noise due to lack of wear and tear.
- q) Use of diesel generator sets during construction phase shall be strictly with acoustic enclosure and shall confirm to EPA Rules for air and noise emission standards.

OTHER:

- r) The safe disposal of wastewater and solid wastes generated during the construction phase shall be ensured.
- s) Barricade of adequate height shall be provided on the periphery of the construction site with adequate signages.
- t) Vehicles hired for bringing construction material at site shall be in good conditions and confirm to applicable air and noise emission standards and shall be operated only during day time and non-peak hours.
- u) Necessary sanitary, hygiene and first aid measures shall be provided before starting the construction activities and to be maintained throughout the construction phase.
- v) Adequate accommodation, drinking water, sanitary facilities, first aid center, utensils and cooking fuel shall be provided for construction workers at the site.

44 Door-Window Hardware – The Contractor to procure all the Hardwares and accessories of same make from the list of approved makes.

45 SITE TO BE CLEAN:

The contractor undertakes to have the site clean, free from rubbish to the satisfaction of the Engineer-in-Charge. All surplus materials, rubbish, etc. will be removed to the place fixed by the Engineer-in-Charge and nothing extra will be paid. Mud or debris obtained during the course of construction by way of dismantling or on completion of the various items of work or otherwise, shall be disposed off by the

contractor at the low lying areas, anywhere in the project site/colony area without any extra cost to the Institute, as directed by the Engineer-in-Charge and the contractor shall not be permitted to take the dismantled materials/debris outside the Project site/Colony Area.

SECTION: 2 - (iv) PROFORMA OF SCHEDULES

Salient Governing Features of the Tender / Work

SCHEDULE 'A' :	Schedule of quantities		
Schedule of Quantities -	Attached	<i>As per price bid</i>	
Location : Institute for Plasma Research, Near Indira bridge, Bhat, Gandhinagar - 382 428			

SCHEDULE 'B' :		Schedule of Materials to be issued to the contractor - No materials to be supplied to the contractor.		
S. No	Description of item	Quantity	Rates in figures and words at which the material will be charged to the contractor.	Place of issue
1	2	3	4	5
1.	Grey Cement in bags		Contractor own arrangement.	-----
2.	Re-Bars for RCC		Contractor own arrangement.	-----
3.	Water for construction Purpose		Department supply on request as per conditions of contract - Free of Cost.	-----
4.	Electricity for construction purpose		Department supply on request as per conditions of contract @Rs. 6.50 per Unit./ - Free of Cost.	-----

SCHEDULE 'C' :		Tools and Plants to be hired to the contractor	
S.No	Description	Hire charges	Place of issue
1	2	3	4
	NIL	NIL	NIL
Note	Labour hutments / labour camp	No labour hutment permitted at site within campus	

SCHEDULE 'D'	
Extra schedule for specific requirements / documents for the work, if any	Particularly for Security Regulations as per Conditions of contract

SCHEDULE 'E' :	Reference to General Conditions of Contract.	As per Tender document
Name of Work: Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar.		
Estimated cost of work :		Rs. 21,11,951/-
i) Earnest money	<i>(To be returned after receiving performance bank guarantee)</i>	Rs. 42,239/-
ii) Performance Guarantee		5% of tendered value

iii) Security Deposit	2.5% of tendered value
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SCHEDULE 'F' :

General Rules & Directions :	
Officer inviting tender :	On the behalf of Director , IPR by Chairperson I-CDC Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar -382428 Contact Person : Mr Prashant. Singh Officer, In-charge e- Tender. Phone No : 079- 2396 2000, 2396 2069 Fax - 079- 2396 2377
Maximum percentage for quantity of Items of work to be executed beyond which rates are to be determined in accordance with Clauses 12.2 & 12.3.	See below

Definitions : Conditions of Contract		
15 2(v)	Engineer-in-charge	Engineer-in-Charge or or his representatives who shall supervise the work
16 2(viii)	Accepting Authority	Director, Institute for Plasma Research
17 2(x)	Percentage on cost of materials and labour to cover all overheads & profits	15% (Fifteen percent)
18 2(xi)	Standard Schedule of Rates (SOR)	Civil Engineering Division of Department of Space applicable at Ahmedabad (SAC SOR) - 2014-15
19 2(xii)	Department / Institute	Institute for Plasma Research
20 9(ii)	Standard Contract Form	Item Rate Tender as per tender document

Clause - 1	
i) Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance	15 days
ii) Maximum allowable extension with late fee @0.1% per day of Performance Guarantee amount beyond the period (provided in - i) above.	7 days

Clause - 2	Authority for fixing compensation under clause 2.	Chairperson I-CDC IPR
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Clause - 2A	Whether Clause 2A shall be applicable	NO
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Clause - 5	Number of days from the date of issue of WO for reckoning date of start.	7 days
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Mile stone(s) as per table given below:			
TABLE OF MILE STONE(S)			
Sl. No.	Description of Milestone (Physical)	Time Allowed in days (from date of start) Work order	Amount to be with-held in case of non achievement of milestone
	=	-	=
	-	-	=
	=	-	=
	-	-	=
TIME ALLOWED FOR EXECUTION OF WORK			120 Days (including monsoon period , if any)

Authority to decide:

- | | |
|--|--------------------------|
| (vi) Extension of time | : Chairperson I-CDC, IPR |
| (vii) Rescheduling of mile stones | : Chairperson I-CDC, IPR |
| (viii) Shifting of start in case of delay in handing over site | : Chairperson I-CDC, IPR |

Clause applicable - (6 or 6A):	Clause 6 for Manual Billing or Clause 6A for Computerized Billing	Clause 6A : Computerized Billing is applicable
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Clause - 7	Gross work to be done together with net payment / adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment.	Monthly Running Bill
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21 Clause - 10A:	List of testing equipments to be provided by the contractor at site lab
	<ol style="list-style-type: none"> 1. Vernier Caliper - 1 No. 2. Steel Tapes - 3 m & 30 m two nos each 3. Plumb bob 4. Sprit level 5. Auto level machine 6. Wire Gauge circular type 7. Plastic Bags for samples 8. Electrical tool kit

Clause - 10B(ii): Mobilization Advance	Not Applicable
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Clause - 10B(iii): Plant Machinery & Shuttering Material Advance	Not applicable
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Clause - 10C:	Component of labour expressed as percent of value of work	25%
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Clause - 10CA: Not applicable

Sr. No	Materials Covered under this Clause	Nearest Materials (other than cement* reinforcement bars ,the structural steel and POL) for which All India Wholesale Price Index is to be followed	Base price and its corresponding period of all the materials covered under clause 10CA*
	Not applicable	<i>Not applicable</i>	<i>Not applicable</i>

***Includes Cement component used in RMC brought at site from outside approved RMC Plants, if any.**

Note: Base price for materials given above are only for regulating operation of clause 10-CA. The tenderers are requested to consider prevailing market rates while quoting the rates.

Clause - 10CC:This CLAUSE NOT APPLICABLE			
Clause 10 CC to be applicable in contracts with stipulated period of completion exceeding the period shown in next column.			<i>This CLAUSE NOT APPLICABLE</i>
Schedule of component of other materials,labour etc. for price escalation.			
	Component of civil (except materials covered under clause 10CA) / Electrical construction value of work:	Xm	---%
	Component of Labour	Y	---%

Note: Xm percentage should be equal to (100) - (Materials covered under clause 10CA i.e. cement,still,POL and other materials specified in clause 10CA +component of Labour)

Clause - 11:	
Specifications to be followed for execution of this work	Tender Specifications

Clause - 12: Type of Work -Maintenance Work		
12.2 & 12.3	Deviation Limit beyond which clauses 12.2 & 12.3	
	(i) Superstructure & foundation work (except items mentioned in earthwork and related items)	30 %
	(ii) Items mentioned in earth work and related items.	100%

Clause - 16:	Competent Authority for deciding reduced rates :	Chairperson I-CDC, IPR
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Clause - 18:	List of mandatory machinery, tools & plants to be deployed by the contractor at site

Note: The list of machinery, tools & plants to be deployed by the contractor at site are minimum. The contractor shall deploy additional machinery, tool & plants in order to maintain the progress of the work without any extra cost to the department.

Clause 25	Constitute of Dispute Redressal Committee (DRC)	To be appointed by Director IPR as and when required.
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	Place of Arbitration	Institute For Plasma Research (IPR), Bhat Gandhinagar- 382428 (Gujarat)
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Clause - 36(i):			Requirement of Technical Representative(s) & recovery Rate			
Sl. No	Minimum Qualification of Technical Representative	Discipline	Designation (Principal Technical / Technical representative)	Min. Exp.	No.	Rate at which recovery shall be made from the contractor in the event of not fulfilling provision of clause 36(i).
1	Graduate (Degree)/ Diploma Engineer	Civil	Project Manager cum planning/ quality/Site/billing Engineer	2- 5	1	Rs. 15,000/-

Note : Assistant Engineer retired from Government services that are holding Diploma will be treated at par with Graduate Engineers

Clause - 42:		
(i)	(a) Schedule / statement for determining theoretical quantity of cement & bitumen on the basis of Delhi Schedule Rates----- Printed by CPWD:	Schedule/statement for determining theoretical quantity of cement & bitumen on the basis given in the tender
(ii)	Variations permissible on theoretical quantities.	
A	Cement	
	i) For works with estimated cost put to tender not more than Rs.5 Lakhs	3% plus / minus
	ii) for works with estimated cost put to tender more than Rs.5 Lakhs	2% plus / minus
b	Bitumen for All works	2.5% plus & only & nil on minus side
c	Steel reinforcement and structural steel sections for each diameter,section and category.	2.0% plus /minus
D	All other materials.	Nil

RECOVERY RATES			
S. No.	Description of Item	Rates in figures & words at which recovery shall be made from the Contractor	
		Excess beyond permissible variation	Less use Beyond permissible variation
1	Cement OPC	<i>Nil</i>	<i>Rs.554/- per bag of 50 kg</i>
2	Cement PPC	<i>NIL</i>	<i>Rs.532/- per bag of 50 kg</i>
3	Rebars	<i>Nil</i>	<i>Rs. 98/- per Kg.</i>

SECTION: 3

Safety Codes and labour Regulations

SECTION: 3 - (i) SAFETY CODE

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical.)
2. Scaffolding of staging more than 3.6 m (12ft.) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3ft.) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends there of with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
3. Working platforms, gangways and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m (12ft.) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) above.
4. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be 90 cm. (3ft.)
5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30ft.) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11½") for ladder up to and including 3 m. (10 ft.) in length. For longer ladders, this width should be increased at least 1/4" for each additional 30 cm. (1 foot) of length. Uniform step spacing of not more than 30 cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit, action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person.
6. (a) Excavation and Trenching - All trenches 1.2 m. (4ft.) or more in depth, shall at all times be supplied with at least one ladder for each 30 m. (100 ft.) in length or fraction thereof Ladder shall extend from bottom of the trench to at least 90 cm. (3ft.) above the surface of the ground. The side of the trenches which are 1 .5 m. (5ft.) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1 .5 m. (5ft.) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

(b) Safety measures for digging Boreholes:-
 - (i) if the bore well is successful .It should be safely capped to avoid caving and collapse of the bore well. The failed and the abandoned one should completely refilled to avoid caving and collapse;

(ii) During drilling, Sign boards should be erected near the site with the address of the drilling contractor and the Engineer-In-Charge of the work.

(iii) Suitable fencing should be erected around the well during the drilling and after the Installation of the rig on the point of drilling, flags shall be put 50m around the point of drilling to avoid entry of people;

(iv) After drilling the borewell , cement platform (0.50m x0.50 m x1.20 m) 0.60 m above ground level and 0.60 m below ground level should be constructed around well casing;

(v) After the completion of the borewell , the contractor should cap the bore well properly by welding steel plate,cover the bore well with drilled wet soil and fix thorny shrubs over the soil .This should be done even while repairing the pump;

(vi) After the borewell is drilled the entire site should be brought to the ground level.

7. Demolition - Before any demolition work is commenced and also during the progress of the work,

(i) All roads and open areas adjacent to the work site shall either be closed or suitably protected.

(ii) No electric cable or apparatus which is liable to be a source of danger or a cable or apparatus used by the operator shall remain electrically charged.

(iii) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

8. All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned:- The following safety equipment shall invariably be provided.

(i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

(ii) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes shall be provided with protective goggles.

(iii) Those engaged in welding works shall be provided with welder's protective eye-shields.

(iv) Stone breaker shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

(v) When workers are employed in sewers and manholes, which are in active use, the contractors shall ensure that the manhole covers are opened and ventilated atleast for an hour before the workers are allowed to get into the manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public. In addition, the contractor shall ensure that the following safety measure are adhered to :-

(a) Entry for workers into the line shall not be allowed except under supervision of the JE or any other higher officer.

- (b) At least 5 to 6 manholes upstream and downstream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manhole for working inside.
- (c) Before entry presence of Toxic gases should be tested by inserting wet lead acetate paper which changes colour in the presence of such gases and gives indication of their presence.
- (d) Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.
- (e) Safety belt with rope should be provided to the workers. While working inside the manholes such rope should be handled by two men standing outside to enable him to be pulled out during emergency.
- (f) The area should be barricaded or cordoned off by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.
- (g) No smoking or open flames shall be allowed near the blocked manhole being cleaned.
- (h) The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.
- (I) Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer-in-Charge may decide the time up to which a worker may be allowed to work continuously inside the manhole.
- (j) Gas masks with Oxygen Cylinder should be kept at site for use in emergency.
- (k) Air-blowers should be used for flow of fresh air through the manholes. Whenever called for portable air blowers are recommended for ventilating the manholes. The Motors for these shall be vapour proof and of totally enclosed type. Non sparking gas engines also could be used but they should be placed at least 2 metres away from the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.
- (l) The workers engaged for cleaning the manholes/sewers should be properly trained before allowing to work in the manhole.
- (m) The workers shall be provided with Gumboots or non sparking shoes bump helmets and gloves non sparking tools safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer lines.
- (n) Workmen descending a manhole shall try each ladder stop or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.
- (o) If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.
- (p) The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-in-Charge regarding the steps to be taken in this regard in an individual case will be final.

(vi) The Contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precaution should be taken:

(a) No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

(b) Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint is dry rubbed and scraped.

(c) Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during and on the cessation of work.

9. An additional clause (viii) (i) of Institute Safety Code (iv) the Contractor shall not employ women and men below the age of 18 on the work of painting with product containing lead in any form. Where ever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use:

(i) White lead, sulphate of lead or product containing these pigment, shall not be used in painting operation except in the form of pastes or paint ready for use.

(ii) Measures shall be taken, wherever required in order to prevent danger arising from the application of a paint in the form of spray.

(iii) Measures shall be taken, wherever practicable, to prevent danger arising out of from dust caused by dry rubbing down and scraping.

(iv) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

(v) Overall shall be worn by working painters during the whole of working period.

(vi) Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled by painting materials.

(vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man appointed by competent authority of Institute.

viii) Institute may require, when necessary medical examination of workers.

(ix) Instructions with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

10. When the work is done near any place where there is risk of drowning, all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision, should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.

11. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions

(i) (a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept repaired and in good working order.

(b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

(ii) Every crane driver or hoisting appliance operator, shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding winch or give signals to operator.

(iii) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load each safe working load and the condition under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

(iv) In case of departmental machines, the safe working load shall be notified by the Electrical Engineer-in-Charge. As regards contractor's machines the contractors shall notify the safe working load of the machine to the Engineer-in-Charge whenever he brings any machinery to site of work and get it verified by the Electrical Engineer concerned.

12. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings watches and carry keys or other materials which are good conductors of electricity

13 All scaffolds ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

14. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

15. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer or Engineer in Charge of the department or their representatives.

16. Notwithstanding the above clauses from (1) to (15) there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

SECTION: 3 - (ii) SAFETY WITH SCAFFOLDINGS:

INTRODUCTION:

1. Following paragraphs deals with the safety regulations and precautions to be followed in the construction use, maintenance, etc. of scaffolds. This will serve as a guide to users of scaffolds in the construction and maintenance operation.
2. Suitable scaffolds are used for performing work that cannot be done from the ground, part of a permanent structure a ladder or other available means of support.

Scaffolds are used in many construction and maintenance operations. Fall of person is the most common hazard accompanying the use of scaffolds because of the height usually involved.

1. General Requirements:

- 1.1 Every scaffold and its supporting members should be designed to support given load, with a safety factor of at least four. No alterations should be made that might impair the strength of such structures, no improvised, make-shift or substandard scaffold should be permitted even for the most temporary use.
- 1.2 All work in connection with such structures, including construction, alteration and removal should be carefully done under the direction and supervision of persons who have had experience in such works.

2. Materials of Construction:

- 2.1 Every scaffold and every part thereof, including supports, should be of good construction, sound material, of adequate strength for the purpose which it is meant to be used and should be properly maintained. Planks should be laid flat with an overlap, lengthwise, of at least 30 cm. with the center of the overlap directly over a bearer. Boards and planks used for the floors should be of uniform thickness, closely laid and securely fastened in place.
- 2.2 All lumber used in the construction of scaffolds should be sound, straight-grained, free from cross-grains, shakes and loose or dead knots. It should also be free from dry rot, large checks, worm holes, or other defects impairing its strength or durability.
- 2.3 All nails used in the construction of scaffolds, staging and supports should be of ample size and used in sufficient quantities at each connection to develop the designed strength of scaffold. Nails should penetrate to the holding piece to a depth of at least 12 times the diameter of nail.
- 2.4 Barrels, boxes, loose tile blocks, loose piles of bricks or other unstable objects should not be used to support planks used as working platforms.

3. Platforms, Railings and Tee-Boards:

- 3.1 The minimum uniformly distributed design load per Sq. m. of platforms should be 250 kg. Any concentrated load at any point in the span should not exceed the designed uniformly distributed load. Planks should not be less than 50 mm thick.
- 3.2 The rear of outer side of every scaffolding, platform and ramp more than 2M above the surrounding ground or solid' construction, or adjacent to deep holes, excavations, railroad tracks, high tension electrical wires, should be provided with a substantial guard rail of standard construction consisting of top and

intermediate rails, and toe-boards all supported by posts and securely connected to scaffold at intervals of not more than 2.4 M (See figure - 1).

3.3 The width of the scaffolds should be such as to provide a clear walkway 50 cm. wide. If part of the width of scaffold is to be used for keeping materials such as brick, mortar or lumber, the scaffold should be made wider so as to provide a walkway of the required width.

3.4 Where scaffolds are erected over sidewalks or over areas in which persons must work or pass, the space between the railing and toe-board should be fitted with side screens.

3.5 There should be a screen or other protection suspended from the scaffold to catch materials that may fall from above. Screens should extend beyond the edge of the scaffold to catch any materials that may fall over the edges.

4. Means of Access:

4.1 A safe and convenient means of access should be provided to the platform or scaffold. This requirement does not apply to swinging scaffolds or those with convenient access from adjacent floors (see figure - 2). Means of access may be a portable ladder. Fixed ladder, ramp or it may be a stairway. The use of cross braces or frame work as means of access to the working surface should not be permitted.

4.2 If scaffolds are to be used to a great extent or for a long period of time, a regular plank stairway, wide enough to allow two persons to pass, should be erected. Such stairways should have handrails on both sides.

4.2.1 No stairway or run of slope exceeding 2 in 3 should be used.

4.2.2 Where the slope of a stairway or run renders additional foot hold necessary, and in every case where the slope is more than 1 in 4, there should be provided proper stepping laths which should:

(a) have a minimum section of 50 x 30 mm and be placed at maximum interval of 45 cm and

(b) be of length to cover the full width of the stairway of run except that they may be interrupted over a width of not more than 10 cm to facilitate the movement of barrows.

5. Overhead Protection:

5.1 Overhead protection should be provided on the scaffold whenever persons are working at higher places. This protection should be not more than 3m above the scaffold floor and should be of planks or other suitable materials.

6. Use of Scaffolds:

6.1 Good housekeeping should be maintained at all times upon scaffolding, platforms and ramps. Excessive storage of materials thereon should be avoided. Care must be taken to avoid accumulating of small objects, such as boards, tools, pieces of reinforcing steel, waste concrete which may easily be disturbed or knock off. Hand rails should be kept in good repair and securely nailed or otherwise fastened down. Scaffold should be cleared of all tools, materials and rubbish at the end of each working day/shift.

6.2 Persons should not be permitted on scaffolds when the platform or guard rails are slippery. Persons should not be permitted to work on scaffolds during a storm or strong winds.

6.3 Suspended scaffolds should never be used for the storage of stone or heavy materials. Two or more swinging scaffolds should not at any time be combined into one by bridging the distance between them with planks or any other form of connection. Life lines securely fastened from above should be provided for each person working on a swinging scaffold. Safety belts should be tied to the life lines (See figure - 3).

7. Inspection:

7.1 As scaffolds have to remain in position normally for many weeks, they must be inspected at least once a week to make sure that nothing has gone wrong since erection. In addition, they must always be inspected after a spell of bad weather which might have affected their stability.

7.2 The inspections must be carried out by someone who knows the faults to look for and how they may be put right. It is important to know that the work of inspection has been completed and what faults have been found, the results of each Inspection must, therefore be recorded. Any scaffold damaged or weakened from any cause should be immediately repaired and persons should not be allowed to use it until repairs have been completed.

8. Dismantling:

8.1 The dismantling of scaffold should be carefully done under experienced supervision. Care should be taken not to drop small, loose objects when removing scaffold planks. All nails should be promptly removed from scaffold planks and the planks safely piled.

9. Precautions against particular Hazards:

9.1 Care should be taken to see that no un-insulated electric wire exists within 3M. of the working platform, stairway etc. of the scaffold.

9.2 While carrying bars, rods or pipes of any conducting material of length greater than 3 M. in the vicinity of electric wires, special care should be taken that these bars do not touch the electric wires.

9.3 Care should be taken against any possibility of wooden scaffold catching fire. In suspended scaffolds, if a blow torch or other flame is used for removing paints, only wire ropes not less than 10mm in diameter should be used.

9.4 Care should be taken to see that no part of a scaffold is struck by a truck or other heavy moving equipment and no material should be dumped against it.

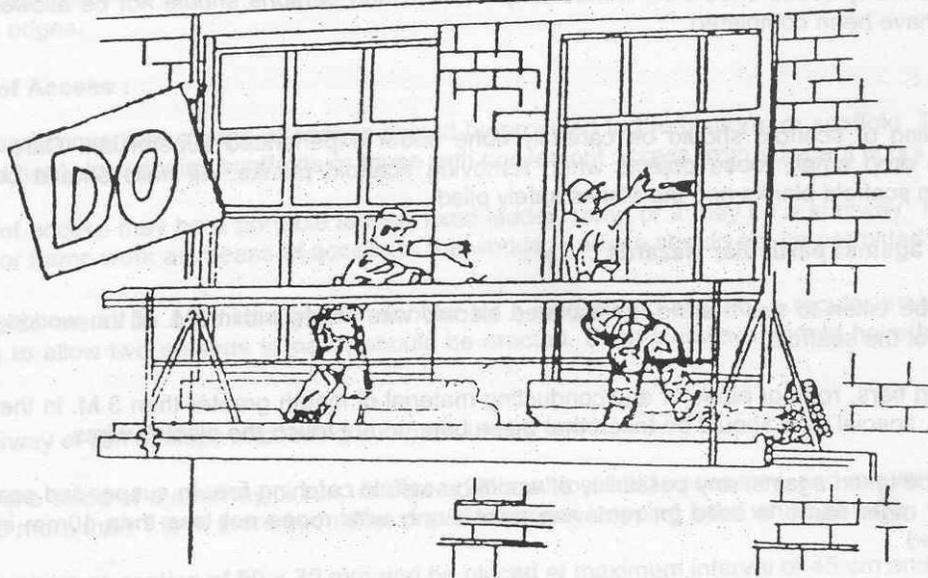
9.5 Scaffolds on thoroughfare should be provided with light.

9.6 Access to cable tunnels, hydrants, etc. should remain free at all times.

9.7 Care should be taken from damaging underground cables and equipment. This is especially important when parts of scaffolds for other fasteners have to be driven in the ground.

● GUARD RAILS ●

THE REAR ON OUTER SIDE OF THE SCAFFOLD SHOULD BE PROVIDED WITH A SUBSTANTIAL GUARD RAIL OF STANDARD CONSTRUCTION



PERSONS SHOULD NOT BE ALLOWED TO WORK ON SCAFFOLDS WHERE THE EDGES ARE UNGUARDED. A SLIGHT SLIP WILL RESULT IN SERIOUS INJURY OR EVEN DEATH

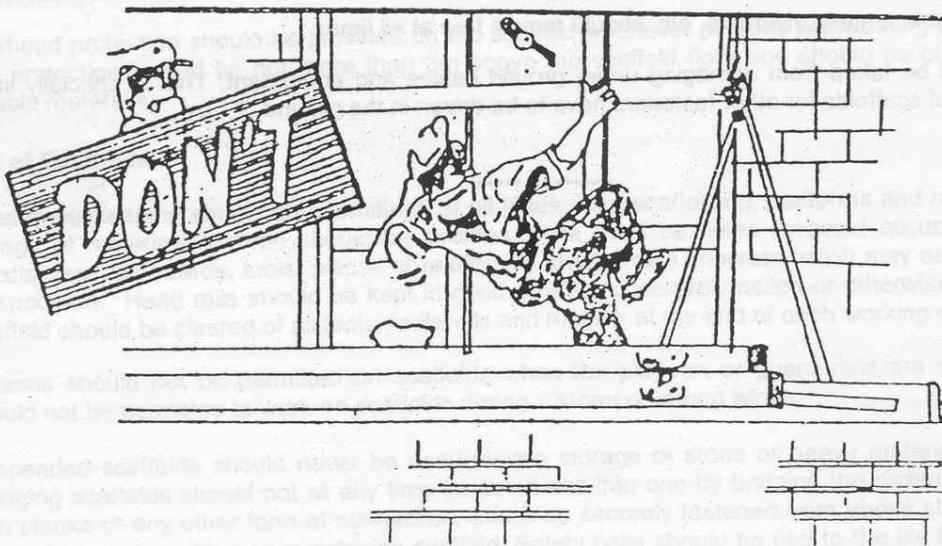
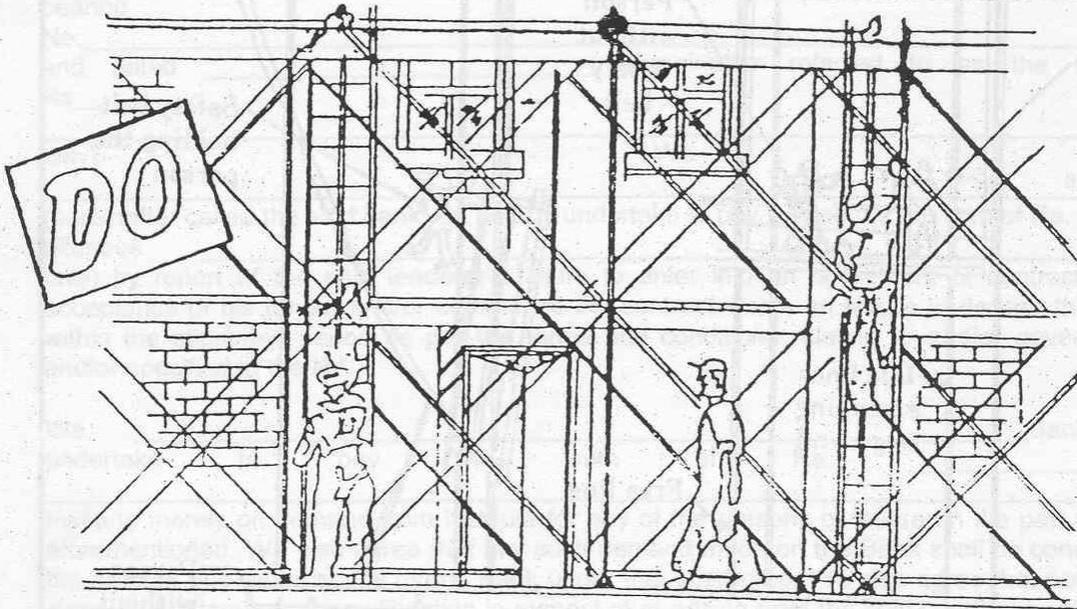


FIGURE — 1

FROM INDUSTRIAL SAFETY CHARTS-US DEPT. OF LABOUR.

• ACCESS •

A SAFE CONVENIENT MEANS OF ACCESS SHOULD BE PROVIDED TO THE SCAFFOLD



THE USE OF CROSS BRACES OR FRAME WORK AS MEANS OF ACCESS TO THE WORKING SURFACE SHOULD NOT BE PERMITTED

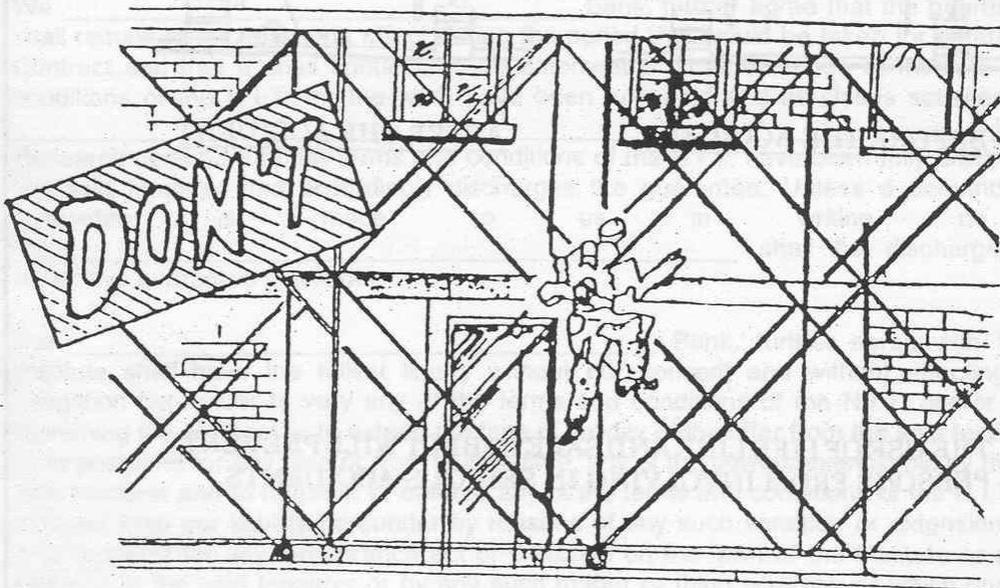
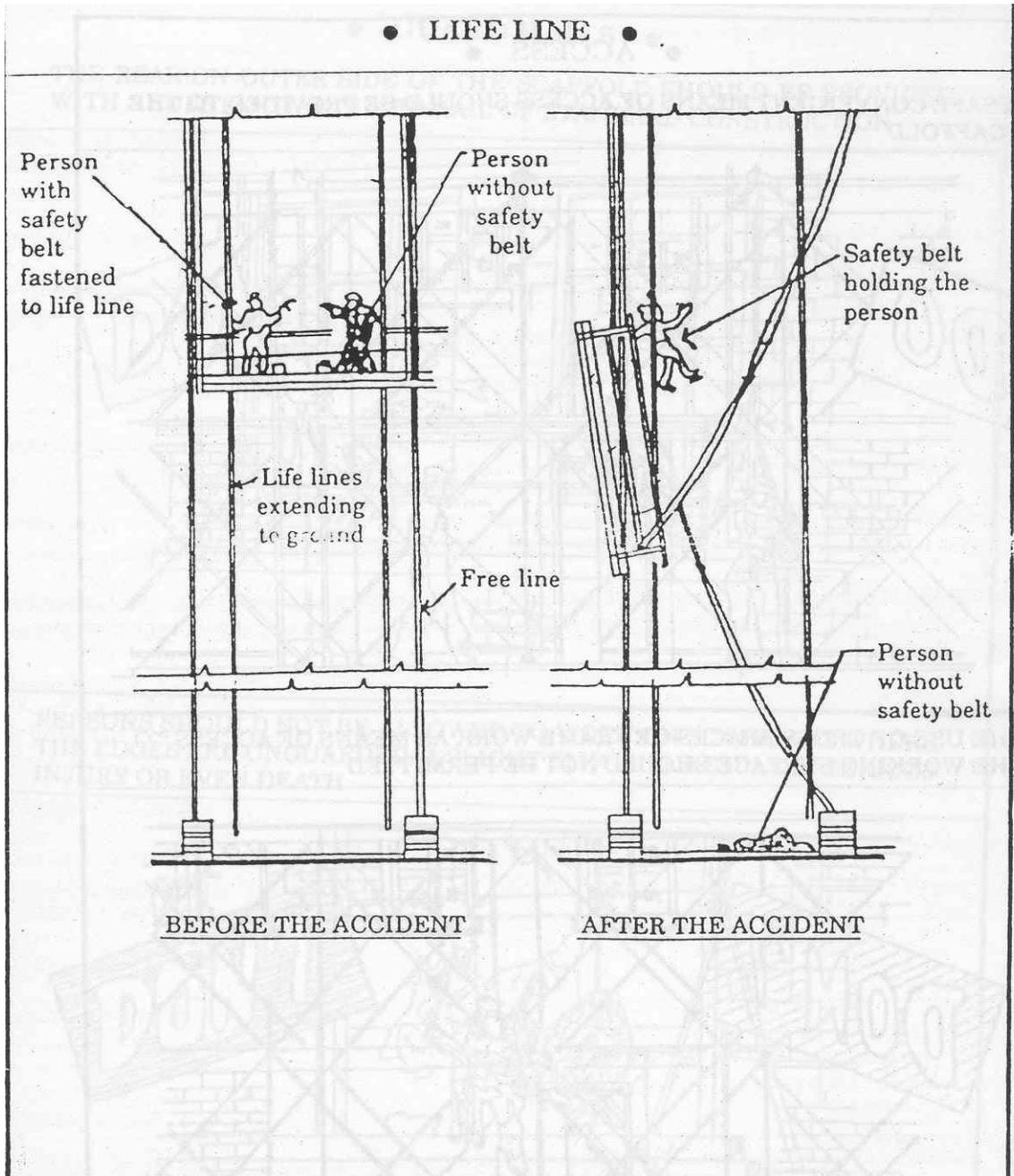


FIGURE — 2

FROM INDUSTRIAL SAFETY CHARTS-US DEPT. OF LABOUR.

● LIFE LINE ●



THE USE OF LIFE LINE AND SAFTEY BELT WILL PREVENT
PERSON FORM INVOLVING IN SERIOUS ACCIDINT

SECTION: 3 - (iii) IPR Additional Safety Code

Note: In case of discrepancy between Safety code, Safety with Scaffolding and IPR Additional Safety code, the stringent one shall be followed.

	INSTITUTE FOR PLASMA RESEARCH	Revision: 00
	SAFETY PROTOCOL FOR CONTRACTORS OF CIVIL/CONSTRUCTION AND OTHER RELATED ACTIVITIES	Eff. Date: 20.03.2014

1. PURPOSE:

The purpose of this protocol is to establish, implement and execute a safe and effective program for the prevention of incidents that may cause injury to persons or damage to the property. The specified responsibilities remain with the contractor for compliance.

1. SCOPE:

1.1 This protocol shall be considered minimum requirements necessary for all works performed inside the Institute for Plasma Research (IPR) and associated centres/units/departments.

1.2 All the contractor while at IPR and associated centres/units/departments work site are required to ensure that themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors, must comply with the provisions of this protocol.

1.3 The contractor shall review and educate their workers and employees about the stipulations of this protocol.

1.4 This protocol is in addition to the responsibility of the contractor towards safety, health and environmental compliance envisaged under law, code or statutory requirements.

2. PROTOCOL:

2.1 The contractor has to provide appropriate Personal Protective Equipments (PPE) like safety shoes, safety helmets, goggles, hand gloves, full body safety harnesses, etc. as required for safety of themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors at site. All PPE must conform to relevant Indian and/or International Standards. These should be maintained in recommended condition by suitable storage, maintenance and inspection. IPR shall have right to examine the PPE and determine their suitability, reliability, acceptability and adaptability.

2.2 The contractor shall provide and maintain proper illumination, fencing, guards, stairs, ladders, scaffolding, warning signs, caution boards, etc. as required to ensure safe working conditions at site.

2.3 The contractor shall ensure that all floor and wall openings are fixed and properly guarded/barricaded during the course of work and at the end of each day's work with appropriate caution board.

2.4 The contractor must adhere to the requirements of Safety, Health and Environment (SHE) Policy of IPR, salient features of which are:

- a. Continual improvement in its Safety, Health & Environment Performance,
- b. Conservation of natural resources,

- c. Waste minimization,
- d. Compliance with applicable statutory and regulatory requirements,
- e. Creating safety & environmental awareness to its employees and associates.

2.5 The contractor has to ensure to employ only persons who are medically fit and having sufficient skills for execution of work. The contractor must ensure efficient job supervision through educated, qualified, experienced and responsible supervisors to ensure safety at site.

2.6 All staff persons including workers must undergo Safety Induction Training prior to depute them at IPR and associated centres/units/departments for any kind of work. Training module may include video film, clippings, photographs etc. related to work execution. In addition to this, Job specific training must be imparted to the concerned workers periodically.

2.7 The contractor has to ensure that Daily Tool Box Talk shall be conducted at least for new workers by responsible work in-charge/supervisor for each activity and its record to be maintained.

2.8 The contractors themselves, their workers and employees, sub-contractors, if any, shall comply with the instructions given by the Safety Officer or his authorized nominee or IPR's representative regarding safety precautions, protective measures, housekeeping requirements, etc. IPR shall have the right at its sole discretion to stop the work, if the work is being carried out in such a way that it may cause accidents or harm to the workers or damage to the equipments. Contractor shall get the unsafe condition removed and report to IPR.

2.9 The contractor shall have no right to claim any damages/compensations for stoppage of work due to safety reasons as provided in para 3.8 .The period of such stoppage of work will not be taken as an extension of time for completion of work or exemption from liquidated damages/compensation delay.

2.10 The contractor should ensure that water, fuel and energy are used judiciously. The water & power points must be closed / put off when not in use.

2.11 Good housekeeping practices must be followed strictly.

2.12 All equipments used for construction, fabrication and assembly work, etc. by the contractor must meet Indian/International standards. In case such standards do not exist, the contractor must ensure these to be absolutely safe. All equipments shall be strictly operated and maintained in accordance with manufacturers' operation manual and safety instructions.

2.13 The contractor must not interfere or disturb electric, fuses, cables and other electrical equipments belonging to IPR or another agency under any circumstances whatsoever unless expressly permitted in writing by IPR.

2.14 Contractor shall arrange adequate facilities for first aid, medical aid and treatment for his staff and workers engaged at the work site.

2.15 The contractor has to fully be responsible for the behaviour and conduct of themselves, their workers and employees and sub-contractors. Any cost of loss or damage to client's property caused by contractor's employees or workers will be recovered from the contractor.

- 2.16 In case of any accident that occurs during the maintenance/ fabrication/erection or associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to themselves, their workers and employees, sub-contractors due to any reason, it shall be the responsibility of the contractor to promptly inform IPR's Work in-charge and Safety Officer in prescribed form of IPR. This should also be informed to statutory authority, if required, under the applicable laws. The contractor shall maintain a register of accidents.
- 2.17 In case the contractor fails to fulfill statutory requirements, IPR shall have the right to withhold contractors payments till the requirement are fulfilled.
- 2.18 The contractor shall plan his activities so as to avoid interference with the assignments of other departments and contractors at the site. In case of any interference, necessary coordination must be sought by the contractor from IPR for safe and smooth working.
- 2.19 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions or as recommended by Safety Officer of IPR must be made by the contractor to extinguish fires.
- 2.20 The contractor shall issue photo identity card for themselves, their workers and employees, sub-contractors to be deployed at site. They are required to be displayed prominently during the period of their stay within IPR and associated centres/units/departments.
- 2.21 The contractor shall obtain gate pass from IPR and associated centres/units/departments for entries and exists of all materials and equipments.
- 2.22 Smoking and eating/chewing of tobacco is strictly prohibited at site.
- 2.23 Any person under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted at work site.
- 2.24 Person below the age of 16 years must not be employed for any work at site. But, it is always suggested to employ the person of minimum 18 years old.
- 2.25 IPR may from time to time, add or amend to these protocols and issue directions.
- 2.26 The contractor shall comply with Safety Instructions as laid down in as per Annexure-I.



INSTITUTE FOR PLASMA RESEARCH

Revision: 00

**SAFETY INSTRUCTIONS
FOR CONTRACTORS OF
CIVIL/CONSTRUCTION AND
OTHER RELATED ACTIVITIES**

**Eff. Date:
20.03.2014**

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1. GENERAL INFORMATION

- 1.1 The purpose of safety instruction document is to establish, implement and execute a practical and effective method for preventing accidents, injuries and property damage.
- 1.2 This document will help contractors and their associates to recognize, evaluate and control hazardous activities within their areas of responsibility.
- 1.3 This document defines the procedure with which safety practice will be administered, identifies responsibilities and ensures control of work area safety.
- 1.4 Contract agreement signed with contractors and the provisions of this document are intended to complement each other to ensure safe working conditions.
- 1.5 The provisions of this document apply to IPR and associated centres/units/departments.
- 1.6 Throughout this document, reference to a contractor means the contractor's company and the associated subcontractors, consultants, vendors and suppliers. Reference to contractor's management means personnel responsible for managing, supervising or directing contract activities and employees.
- 1.7 Non-compliance of this document is treated as non-compliance of contract agreement that may result in warning/penalty. Willful or repeated non-compliance may result in contractor dismissal and contract termination.
- 1.8 This document for contractors is a supplementary document to statutory rules, codes and regulations having jurisdiction, and does not negate, abrogate or minimise any provisions of these rules, codes and regulations. It is intended to supplement and enforce the individual program of the contractor and to coordinate the overall safety effort. Contractors are responsible for the safety and health of their employees, subcontractors, consultants, vendors, suppliers, and visitors while in IPR and associated centres/units/departments.
- 1.9 Contractor's managers and supervisors are responsible for preventing incidents or conditions that could lead to incidents, injuries, illness or fatalities. The ultimate success of the safety program depends on the cooperation of everyone. The contractor's management must ensure that safety provisions are enforced and that effective training and education programs are employed.

2. ROLE OF THE CONTRACTOR

2.1 Top Management of the Contractor

The commitment of top management of the contractor towards safety is very important. Top management needs to ensure the following:

- 2.1.1 To implement safe methods and practices, deploy appropriate machineries, tools & tackles, experienced supervision and skilled workforce, etc. required for execution.
- 2.1.2 To ensure that employees and workers deployed are physically and mentally fit. They should possess requisite skill, qualification, experience etc.
- 2.1.3 To deploy qualified and trained safety supervisor, safety officers and/or safety manager reporting to site In-charge for supervision, co-ordination and liaison for the implementation of safety.
- 2.1.4 To ensure that the employees and workers have appropriate health and safety training. The certification of such training should be produced for verification, on demand.
- 2.1.5 To obtain all necessary and applicable licences, permits, and insurance policy of his employees and workers before executing any work. A copy of the same must be submitted to the relevant authority at IPR.
- 2.1.6 To ensure that all incidents (minor/major injuries, fatality, fire, property damage etc.) including near misses shall be reported to the relevant authority at IPR immediately verbally as well as in written format of IPR. Also, keep record for the same.

- 2.1.7 The liability for any compensation on account of injury sustained by an employee of the contractor will be exclusively that of the contractor.
- 2.1.8 To provide personal protective equipments required for the safety and first-aid kits at worksite.
- 2.1.9 To maintain appropriate records of all employees and workers deployed to carry out the work at site.
- 2.1.10 Contractor shall not employ any labour below 18 years of age.
- 2.1.11 A photo gate pass duly approved by IPR administration shall be issued by the contractor to their personnel, employees, subcontractors, etc.
- 2.1.12 To co-operate with all the security arrangements of IPR.
- 2.1.13 Contractor may ask for clarifications required in safety related issues, whenever a need arises.
- 2.1.14 To follow and implement all the safety rules and regulations of the local bodies, state, national and international. Contractor shall also comply with all the statutory requirements and notifications, as applicable, in relation to employment of his employees issued time to time by the concerned authorities.

2.2 Contractor Safety Officer, Safety Supervisor and/or Job Supervisor

The duties and responsibilities of the contractor safety officer, safety supervisor and/or job supervisor shall include the following:

- 2.2.1 To assess the hazards associated with work at site in consultation with all concerned and establish safe working procedure.
- 2.2.2 To establish a written records of factors that can cause injuries, illness or other safety related problems.
- 2.2.3 To undertake routine/surprise inspections of all work sites to ensure compliance with safety standards, codes, rules, regulations and orders applicable to the work concerned.
- 2.2.4 To check whether the proposed working arrangements/procedures are safe and satisfactory, particularly at the interface between contractors planned work and IPR facilities.
- 2.2.5 To ensure that required guards and protective equipment are provided, used and properly maintained.
- 2.2.6 To ensure that the workers understand the working procedures for carrying out the work safety and the hazards that may be encountered.
- 2.2.7 To take immediate actions to correct any violation of safety rules observed or reported.
- 2.2.8 To ensure that appropriate warning signboards and tags are displayed.
- 2.2.9 To report each incident and/or injury in accordance with established procedures and assists during investigation.
- 2.2.10 To arrange tool box meeting daily and shall continue this process to make workmen safety conscious. To keep a constant liaison with the relevant authority at IPR on safety issues.

2.3 Contractor Employees

The duties & responsibilities of the contractor employees should include the following:

- 2.3.1 The contractors' employees must be trained for safety standards, procedure to carry out high risk job (if involved), use of Personal Protective Equipments (PPEs) in general and specific for a particular job, emergency preparedness and fire extinguisher and medical first-aid.
- 2.3.2 To perform work safely as per the job requirements/instructions and wear appropriate PPEs.
- 2.3.3 To inform promptly to their management regarding all work related incidents resulting in personal injury, illness and/or property damage, etc.

2.3.4 To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

3. PENALTY FOR NON-COMPLIANCE

The following penalties shall be imposed on the contractor by the IPR and shall be deducted from his running/final bill.

Sr. No.	Non-Compliance/Violation of Safety Protocols/Rules/Norms	Penalty
1.	Non-use of PPE like Safety Helmet / Safety Shoes etc.	Rs. 100 per day/person
2.	Over speeding (> 30Km/Hr) / rash driving or improper parking	Rs. 100 per occasion
3.	Non-use ELCB/MCB, Use of non-standard socket, poor cable joint, laying wire/cables on floor, non-use of socket, electrical jobs by incompetent person	Rs. 200 per day/case
4.	Working at height without full body safety harness, using non-standard scaffolding and not arranging fallprotection arrangement	Rs. 500 per day/case
5.	Handling of compressed gas cylinders without trolley and double gauge regulator, Improper keeping/storage of gas cylinder	Rs. 200 per day/case
6.	Use of domestic LPG for cutting purpose.	Rs. 200 per day/case
7.	No fencing/barricadingof excavated/open areas.	Rs. 200 per day/case
8.	No provision of firefighting equipment during hot works. Use of firewater for purpose other than firefighting.	Rs. 200 per day/case
9.	No reporting of Nearmiss/First-aid/Injury/Property damage/Minor fire etc. incidents	Rs. 500 per case
10.	Poor Housekeeping	Rs. 200 per day/case
11.	No deployment of safety officer/safety supervisor responsible for safety at work site as mentioned in Chapter No. 5	Rs. 500 per day

Safety Officer or any other officer authorized by IPR will report safety violation to the concerned Engineer In-charge for imposing necessary penalty. Engineer-in-charge shall ensure that the penalty amount has been deducted from the running bill of contractor. Imposing any penalty for violation of safety norms does not absolve the contractors from their contractual obligation/ responsibility. Contractor shall be fully responsible for any accident and/or injury to their employees or property due to violation of safety norms.

4. PROVISION FOR SAFETY SUPERVISOR /SAFETY OFFICER OF CONTRACTOR

The contractor shall depute at least one Safety Supervisor / Safety Officer for critical activities as follows,

- i. Any excavation more than 1.5 mtr. depth
- ii. Work at height (working beyond 2.5 mtr. above ground)
- iii. Materials and Material Handling which includes movement of material by crane, movement of tractor trolley on slopes, etc.
- iv. Working near high voltage lines, electrical installations, etc.
- v. Painting at height (beyond 2.5 mtr. above ground) and painting at confined space

In addition to above list, IPR may also recommend for some specific tasks, which are not covered, to depute Safety Officer/Safety Supervisor.

Safety supervisor shall be qualified of minimum Diploma in Engineering/ Graduate in Science with approved course in the field of safety and/or fire. He shall able to read and understand English and speak regional/national language. He shall have experience as safety supervisor for a period of minimum one year.

Safety Officer shall be qualified of minimum Bachelor in Engineering/ Post Graduate in Science with approved course in the field of Safety and/or Fire. Safety Officer shall have good communication and written skill to liaison with the client. He shall have good command in English and regional/national language. He shall have experience for a period of minimum three years of supervisory level.

5. GENERAL SAFETY PROVISIONS

5.1 Personal Protective Equipment

The contractor is responsible to provide all necessary standard make (ISI marked) personal protective equipment (PPE) suitable to give sufficient protection against hazards involved in their work / job to their employees, as per the job requirement and insist/enforce their staff to put on the same while atworks and ensure that the PPEs are properly used and maintained in a condition suitable for immediate use. The contractor shall have sufficient stock of various PPEs to avoid any shortage of supply and shall take adequate steps to ensure proper use of equipment by those concerned. The ongoing work is liable to be stopped at any time if the contractor's staff is found working without PPEs.

- 5.1.1 All persons employed at site shall use safety helmets. For other types of works, persons working in that area shall also use safety helmets, if advised by Safety Engineer/Engineer-In-Charge.
- 5.1.2 Persons engaged in welding and gas-cutting works shall use suitable welding face shields. The persons who assist the welders shall use suitable goggles. Protective goggles shall be worn while chipping and grinding.
- 5.1.3 All persons working at heights more than 2.5 m above ground or floor and exposed to risk of falling down shall use full body safety harness, unless otherwise protected by cages, guard railings, etc. In places where the use of safety harness is impractical, suitable net of adequate strength fastened to substantial supports shall be employed.
- 5.1.4 When workers are employed in sewers and inside manholes, which are in use, the Contractor shall ensure that the manholes are opened and are adequately ventilated at least for an hour. After it has been well ventilated, the atmosphere inside the spaceshall be checked for the presence of any toxic gas or oxygen deficiency and recorded in the register before the workers are allowed to get into the manholes. The manholes opened shall be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There shall be proper illumination in the night.
- 5.1.5 The following is the list of various PPEs to be used for various works/worksites,

List of Safety Equipment's

Sr. No.	PPE	Purpose
01	Industrial Safety Helmet	For protection of head against falling objects or during fall of person from height.
02	Safety Goggles (Grinding, Welding, etc).	For protection of eyes against flying particles / dust, chemical splash, spark, arc, flashover etc.
03	Face shield	For protection of face against flying particles / dust, chemical splash, spark, arc, flashover etc.
04	Ear plug / Ear muffs	For ear / hearing system protection while working in high noise level area.
05	Apron (PVC / cryo / Cotton)	For body protection against chemicals, oils, cryogenics, sharp edged objects, heat, hot objects etc.
06	Gloves (Nitrile / Leather, cryo, Electrical shock proof)	For protection of hands against chemicals, oils, cryogenics, sharp edged objects, heat, hot metals / objects, electricity etc.
07	Safety Shoes	For protection of leg / feet against falling objects, sharp edged objects, heat, hot metals / objects, electricity etc.
08	Full body safety harness / I Rope / Life line / Fall prevention system etc.	For fall prevention while working at heights or in depth, working in vessel or in confined space.
09	Dust Respirator	Protection of respiratory system against dust.
10	Self-contained breathing apparatus (SCBA) set	Working in oxygen deficient areas.

5.2 Electricity

The following are provided for general guidance of the Contractor and shall be read as specific requirement, in addition to complying with Indian Electricity Act, Indian Electricity Rules and IS Specifications.

- 5.2.1 Only qualified electricians familiar with code requirements are allowed to perform electrical work.
- 5.2.2 Employees are not permitted to work near an unprotected electrical power circuit unless they are protected against electrical shock by de-energizing the circuit and grounding it, or are protected by effective insulation or other means, and are wearing required personal protective equipment.
- 5.2.3 The electric power supply will be generally made available at one point in the works site of the contractor by the IPR.
- 5.2.4 All three phase equipment shall be provided with double earthing. All light fixtures and portable equipment shall be effectively earthed to main earthing.
- 5.2.5 All earth terminals shall be visible. No gas pipes and water pipes shall be used for earth connection. Neutral conductor shall not be treated as earth wire.
- 5.2.6 The contractor shall not connect any additional load without prior permission of IPR.
- 5.2.7 Joints in earthing conductors shall be avoided. Loop earthing of equipment shall not be allowed. However tappings from an earth bus may be done.
- 5.2.8 Electrical equipment and installations shall be installed and maintained as to prevent danger from contact with live conductors and to prevent fires originating from electrical causes like short circuits, overheating etc. Installation shall not cause any hindrance to movement of men and materials.
- 5.2.9 Materials for all electrical equipment shall be selected with regard to working voltage, load and working environment. Such equipment shall conform to the relevant standards.

- 5.2.10 Electric fuses and/or circuit breakers installed in equipment circuits for short circuit protection shall be of proper rating. It is also recommended that high rupturing capacity (HRC) fuses be used in all circuits. For load of 5 KW or more earth leakage circuit breaker of proper rating shall be provided in the circuits.
- 5.2.11 Wires and cables shall be properly supported and approved method of fixing shall be adopted. Cables shall not be left on floor/ground. Loose hanging of wires & cables shall be avoided. Lightning and power circuits shall be kept distinct and separate.
- 5.2.12 Reinforcement rods or any metallic part of structure shall not be used for supporting wires and cables, fixtures, equipment, earthing etc.
- 5.2.13 All cables and wires shall be adequately protected mechanically against damages. In case, the cable required to be laid underground, it shall be adequately protected by covering the same with bricks, Plain Cement Concrete (PCC), tile or any other approved means.
- 5.2.14 All armoured cables shall be properly terminated by using suitable cable glands. Multi-stranded conductor cables shall be connected by using cable lugs/ sockets. Cable lugs shall preferably be crimped. They shall be of proper size and shall correspond to the current rating and size of the cable. Twisted connections will not be allowed.
- 5.2.15 All the Distribution Boards, Switch Fuse units, Bus bar chambers, ducts, cubicles etc. shall have MS enclosures and shall be dust, vermin and waterproof. The Distribution Boards, switches etc. shall be so fixed that they shall be easily accessible.
- 5.2.16 The Contractor shall provide proper enclosures/covers of approved size and shape for protection of all switch boards, equipment etc. against rain.
- 5.2.17 Isolating switches shall be provided close to equipment for easy disconnection of electrical equipment or conductors from the source of supply, when repair or maintenance work has to be done.
- 5.2.18 All connections to lighting fixtures, starters or other power supplies shall be provided with PVC insulated, PVC sheathed twin/three/four core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. Taped joints shall not be allowed and the connections may be made in looping system. Electric starter of motors, Switches shall not be mounted on .wooden boards. Only sheet steel mounting or iron framework shall be used.
- 5.2.19 Only PVC insulated and PVC sheathed wires or armored PVC insulated and sheathed cables shall be used for external power supply connections of temporary nature. Weatherproof rubber wires shall not be used for any temporary power supply connections. Taped joints in the wires shall not be used.
- 5.2.20 All portable appliances shall be provided with three-core cable and three-pin plug. The third pin of the plug shall invariably be earthed. It shall be ensured that the metal part of the equipment shall be effectively earthed.

5.3 House Keeping

- 5.3.1 The Contractor shall at all times keep his work spot, site office and surroundings clean and tidy from rubbish, scrap, surplus materials and unwanted tools and equipment so as not to create unsafe condition or fire hazard.
- 5.3.2 Welding and other electrical cables shall be properly routed.
- 5.3.3 No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
- 5.3.4 Cleaning of the work area at the end of the day and upon completion of work is a part of the job.
- 5.3.5 The Engineer-in-charge has the right to stop work if the Contractor fails to improve upon the housekeeping after having been notified.

5.4 Fire Safety

- 5.4.1 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions shall be made to extinguish fires, if it still breaks out.
- 5.4.2 Quantities of combustible materials like timber, bamboos, coal, paints, etc., shall be kept minimum in order to avoid unnecessary accumulation of combustibles at site.
- 5.4.3 Containers of paints, thinners and allied materials shall be stored in a separate room which shall be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint shall be kept covered or properly fitted with lid and shall not be kept open except while using.
- 5.4.4 Fire extinguishers shall be located at the site at appropriate places.
- 5.4.5 Adequate number of workmen shall be given education and training in firefighting and extinguishing methods.

5.5 Scaffolding

Accidents are also caused by the ladders falling or the climber losing his balance or failure of scaffolds. As such, utmost care should be taken as ladder and scaffolding are extensively used for maintenance and construction purpose. Some of the safe practices as listed below are to be observed before commencement of work.

- 5.5.1 Adequate and safe means of access and exit shall be provided for all work places, at all elevations. Using of scaffolding members (avoiding a ladder) for approach to high elevations shall not be permitted.
- 5.5.2 Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short duration work as can be done safely from ladders. Ladder shall be of rigid construction having sufficient strength for the intended loads and made either of good quality wood or metal and all ladders shall be maintained well for safe working condition.
- 5.5.3 Short ladder must not be tied together to give greater lengths. All ladders of 6 m or above should be tied to the structure on which they are resting to prevent from. An extra worker shall be engaged for holding the ladder if ladder is not securely fixed. If the ladder is used for carrying materials, suitable foot holds and handholds shall be provided on the ladder. The ladder shall be given an inclination not steeper than 1 in 4(1 horizontal and 4 vertical). Ladders shall not be used for climbing carrying materials in hands. While climbing both the hands shall not be free.
- 5.5.4 The free length must extend by 1.5 meters above the point of landing but should not be more than 1/4th of the ladder length. No portable single ladder shall be over 9 meter in length. Metal ladders may not be used for electrical work.
- 5.5.5 Scaffolding or staging more than 3.5 m above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a standard guard rail properly attached, bolted, braced or otherwise secured at least 1.0 m high above the floor or platform of such scaffolding or staging. The guard rail shall extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of materials. Standard railing shall have posts not more than 2 m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top rail. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure. Scaffolding and ladder shall conform to relevant IS specification (IS: 3696). Timber/Bamboo scaffolding shall not be used.
- 5.5.6 Working platforms of scaffolds shall have toe boards at least 15 cm in height to prevent materials from falling down.

- 5.5.7 Every part of scaffolding must be of sound construction. Steel planks used in scaffolds should be carefully inspected and should be tied on both sides with suitable fixing arrangements to the pipes. Scaffolding must not be overloaded.
- 5.5.8 The Steel pipe & clamp to be used must be of good quality. The spacing between the vertical & horizontal members of the scaffolding should not be more than 1.5m and 1 meter respectively. The scaffolding should be further strengthened with cross bracing and stays.
- 5.5.9 The scaffolds should be provided with short climbs ladders for safe ascending/ descending of workmen in the job. Only those workmen who are well trained/ experienced in erecting scaffolding should be engaged for scaffolding work. The men working in the actual erection/dismantling of the scaffolding and all persons using the scaffolding must use appropriate PPEs.
- 5.5.10 A sketch of the scaffolding proposed to be used shall be prepared and approved by the Engineer-in charge, prior to start of erection of scaffolding. All scaffolds shall be examined by Engineer-In-Charge before use.
- 5.5.11 Working platform, gangways and stairways shall be so constructed that they shall not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5 m above ground level or floor level, they shall be closely boarded, shall have adequate width for easy movement of persons and materials and shall be suitably guarded.
- 5.5.12 The planks used for working platform shall not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks shall be rigidly tied at both ends to prevent sliding and slippage. The thickness of the planks shall be adequate to take load of men and materials and shall not collapse.
- 5.5.13 Each opening in the floor of a building or at a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing.
- 5.5.14 Safe means of access shall be provided to all working platforms and other elevated working places. Every ladder shall be securely fixed. No single portable ladder shall be over 9 m in length. For ladders up to 3m in length the width between side rails in the ladder shall in no case be less than 300 mm. For longer ladders this width shall be increased by at least 20 mm for each additional meter of length. Step spacing shall be uniform and shall not exceed 300 mm.
- 5.5.15 Adequate precautions shall be taken to prevent danger from electrical lines and equipment. No scaffolding, ladder, working platform, gangway runs, etc. shall exist within 3 meters of any uninsulated electric wire. Whenever electric power and lighting cables are required to run through (pass on) the scaffolding or electrical equipments are used, such scaffolding structures shall have minimum two earth connections with earth continuity conforming to IS Code of Practice.

5.6 Excavation, Trenching and Earth Removal

All excavation work should be planned. The method of excavation and type of support work required should be decided considering the stability of the ground & effect on adjoining buildings, roads, underground pipes, cables or any other structures.

- 5.6.1 All excavation work should be supervised by responsible person and inspected for any defect regularly.
- 5.6.2 Safe angle of repose while excavating trenches exceeding 1.5m depth up to 3.0m should be maintained. Based on site conditions, provide proper slope, usually 45° and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock or provide proper shoring and strutting to prevent cave-in or slides. The excavated material shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench, whichever is more. Cutting shall be done from top to bottom. Under no circumstances mining or under-cutting shall be done.

- 5.6.3 All trenches 1.2 m or more in depth shall be supplied with at least one ladder for each spacing of 30m in length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 1.0 m above the surface of the ground.
- 5.6.4 Open excavations shall be fenced off by suitable railing and warning signals installed, so as to prevent persons slipping or falling into the excavations. Don't allow vehicles to operate too close to excavated area. Barricade should be provided.
- 5.6.5 The Contractor shall ensure the stability and safety of the excavation, adjacent structures, services and the works.

5.7 Concreting

Shuttering and supporting structures shall be of adequate strength and approved by Engineer-In-Charge. This shall be ensured before concrete is poured. The procedure approved by Engineer-In-Charge shall be followed for mixing, transporting and pouring of concrete.

5.8 Demolition

Before any demolition work is commenced and also during the progress of the work:

- 5.8.1 All roads and open area adjacent to the work site shall either be closed or suitably protected. Appropriate warning signs shall be displayed for cautioning approaching persons.
- 5.8.2 Before demolition operations begin, the Contractor shall ensure that the power on all electric service lines is shut off and the lines-cut or disconnected at or outside the demolition site. If it is necessary to maintain electric power during demolition operation, the required service lines shall be adequately protected against damage. Persons handling heavy materials/equipments shall wear safety shoes.
- 5.8.3 No floor, roof or other part of the building shall be overloaded with debris or materials as to render it unsafe.
- 5.8.4 Entries to the demolition area shall be restricted to authorized persons only.

5.9 Welding and Gas Cutting

- 5.9.1 Welding and gas cutting operations shall be done only by qualified and authorized persons and as per IS specifications and Code of Practice.
- 5.9.2 Welding and gas cutting shall not be carried out in places where flammable or combustible materials are kept and where there is danger of explosion due to presence of gaseous mixtures.
- 5.9.3 Welding and gas cutting equipment including hoses and cables shall be maintained in good condition.
- 5.9.4 Barriers shall be erected to protect other persons from harmful rays from the work. When welding or gas cutting is in elevated positions, precautions shall be taken to prevent sparks or hot metal falling on persons or flammable materials. Adequate ventilation shall be provided while welding in confined space.
- 5.9.5 Suitable type of protective clothing consisting of fire resistant gauntlet gloves, leggings, boots and aprons shall be provided to workers as protection from heat and hot metal splashes. Welding shields with filter glasses of appropriate shade shall be worn as face protection.
- 5.9.6 Welding and gas cutting shall not be done on drums, barrels, tanks or other containers unless they have been emptied, cleaned thoroughly and it is made certain that no flammable material is present.
- 5.9.7 Fire extinguisher shall be available near the location of welding operations. Prior permission shall be obtained from safety section for working at vulnerable areas and operating areas before flame cutting/welding is taken up.

- 5.9.8 Tarpaulin, if used should be of fire retardant.
- 5.9.9 For electric (Arc) welding the following additional safety precautions shall be taken:
- When electrical welding is undertaken near pipe lines carrying flammables, such pipe lines shall not be used as part of earth conductor but a separate earth conductor shall be connected to the machine directly from the job.
 - Personnel contact with the electrode or other live parts of electric welding equipment shall be avoided.
 - Extreme caution shall be exercised to prevent accidental contact of electrodes with ground.
- 5.9.10 The cylinders containing poisonous/toxic or inflammable / explosive gas like Oxygen, Acetylene, Hydrogen, Ammonia, Chlorine, CO₂ etc. shall be handled safely taking due cares. To handle / shift such cylinders a special trolley / cage meant for it must be used but in no case it should be rolled.
- 5.9.11 No domestic LPG cylinder is allowed for Hot Work such as Gas Welding / Gas Cutting.
- 5.9.12 A person must remain in the area for a minimum period of 30 minutes after hot work is completed to ensure the site is safe. Welding machine shall be switched off after the completion of work.

5.10 Grinding

- 5.10.1 All portable grinders shall be used only with their wheel guards in position to reduce the danger from flying fragments should the wheel break during the use.
- 5.10.2 Grinding wheels of specified diameter only shall be used on a grinder- portable or pedestal - in order not to exceed the prescribed peripheral speed.
- 5.10.3 Goggles shall be used during grinding operation.

5.11 Painting

- 5.11.1 The Contractor shall not employ women on the work of painting with products containing lead in any form. Only men above the age of 18 years shall be employed on the work with lead paint.
- 5.11.2 Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored, mixed or used. A caution board, with the instructions written in national/ regional language, "SMOKING - STRICTLY PROHIBITED" shall be displayed in the vicinity where painting is in progress or where paints are stored.
- 5.11.3 When painting work is done in a closed room or in a confined space, adequate ventilation shall be provided. If adequate ventilation cannot be provided, workers shall wear suitable respirators.
- 5.11.4 Epoxy resins and their formulations used for painting shall not be allowed to come in contact with the skin. The workers shall use plastic gloves and/or suitable barrier creams.
- 5.11.5 Workers shall thoroughly wash hands and feet before leaving the work. Work clothes shall be changed and laundered frequently.

6. REPORTING FORM

6.1 Near Miss Reporting Form

(This form may be filled and submitted to the Safety Section within 48 hours from the incident time)

1. Name of Person Affected/Observed Near miss:	2. Group/Division/Section:
3. Designation:	4. Location of Near Miss:
5. Date & Time of Near Miss:	6. Contact no:/Ext. No.:

<p>7. Near Miss Description: <i>(Describe fully, the protocol / procedure been followed including all substances, equipment and machinery being used which was related to the near miss.)</i></p> <p>-----</p> <p>-----</p> <p>-----</p> <p>-----</p> <p>-----</p>	
<p>8. Possible Damage that might have happened:</p> <p>(i)</p> <p>(ii)</p>	
<p>9. Corrective Actions Proposed to prevent reoccurrence of such near miss incident(s):</p>	

Submitted By:

Signature:

Name:

Date:

6.2 Incident Reporting Form

(This form is to be filled and submitted for all incidents except near miss to safety section within 72 hours from the incident time)

A. PERSONNEL INFORMATION

Name of Injured:		PR No.:
Group:		Contact No./ Ext. No.:
Incident Site:	Employee Category: <input type="checkbox"/> Permanent Employee <input type="checkbox"/> Project Employee <input type="checkbox"/> Contract <input type="checkbox"/> AMC <input type="checkbox"/> TPIA <input type="checkbox"/> Service Provider/Vendor <input type="checkbox"/> Other Category	

B. CATEGORY OF INCIDENT

First aid case	
Medical case	
Asset/Equipment/Property damage	
Vehicle incident	
Fire	
Fatal Accident	

C. INCIDENT INFORMATION

Date / Time of Incident	Date/Time Reported To Group Leader
Person Reporting Incident	
Incident Description:	
Injury / Illness Description:	

D. TREATMENT INFORMATION

Treatment Description		
Treatment Administered By	Date Of Treatment	Time Of Treatment
Phone No of clinic / hospital	Name of Clinic/Hospital:	
Pl. attach medical officer's prescription for medical treatment: -	Released from Hospital Date / Time: -	

E. INITIAL CORRECTIVE ACTION INFORMATION

Immediate Causes of incident:
Initial Corrective actions taken 1. 2. 3.

Prepared By:

Sign:
Name:
Designation:
Date:

Reviewed By:

Sign:
Name:
Designation:
Date:

	INSTITUTE FOR PLASMA RESEARCH	Revision: 00
	SAFETY PROTOCOL FOR CONTRACTORS OF ELECTRICAL/MAJOR INSTALLATION OF ELECTRICAL EQUIPMENTS/MACHINARIES AND OTHER RELATED ACTIVITIES	Eff. Date: 20.03.2014

1. PURPOSE

The purpose of this protocol is to establish, implement and execute a safe and effective program for the prevention of incidents that may cause injury to persons or damage to the property. The specified responsibilities remain with the contractor for compliance.

2. SCOPE

- 2.1 This protocol shall be considered minimum requirements necessary for all works performed inside the Institute for Plasma Research (IPR) and associated centres/units/departments.
- 2.2 All the contractor while at IPR and associated centres/units/departments work site are required to ensure that themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors, must comply with the provisions of this protocol.
- 2.3 The contractor shall review and educate their workers and employees about the stipulations of this protocol.
- 2.4 This protocol is in addition to the responsibility of the contractor towards safety, health and environmental compliance envisaged under law, code or statutory requirements.

3. PROTOCOL

- 3.1 The contractor has to provide appropriate Personal Protective Equipments (PPE) like safety shoes, safety helmets, goggles, hand gloves, full body safety harnesses, etc. as required for safety of themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors at site. All PPE must conform to relevant Indian and/or International Standards. These should be maintained in recommended condition by suitable storage, maintenance and inspection. IPR shall have right to examine the PPE and determine their suitability, reliability, acceptability and adaptability.
- 3.2 The contractor shall provide and maintain proper illumination, fencing, guards, stairs, ladders, scaffolding, warning signs, caution boards, etc. as required to ensure safe working conditions at site.
- 3.3 The contractor shall ensure that all floor and wall openings are fixed and properly guarded/barricaded during the course of work and at the end of each day's work with appropriate caution board.
- 3.4 The contractor must adhere to the requirements of Safety, Health and Environment (SHE) Policy of IPR, salient features of which are:
 - f. Continual improvement in its Safety, Health & Environment Performance,
 - g. Conservation of natural resources,
 - h. Waste minimization,
 - i. Compliance with applicable statutory and regulatory requirements,
 - j. Creating safety & environmental awareness to its employees and associates.

- 3.5 The contractor has to ensure to employ only persons who are medically fit and having sufficient skills for execution of work. The contractor must ensure efficient job supervision through educated, qualified, experienced and responsible supervisors to ensure safety at site.
- 3.6 All staff persons including workers must undergo Safety Induction Training prior to depute them at IPR and associated centres/units/departments for any kind of work. Training module may include video film, clippings, photographs etc. related to work execution. In addition to this, Job specific training must be imparted to the concerned workers periodically.
- 3.7 The contractor has to ensure that Daily Tool Box Talk shall be conducted at least for new workers by responsible work in-charge/supervisor for each activity and its record to be maintained.
- 3.8 The contractors themselves, their workers and employees, sub-contractors, if any, shall comply with the instructions given by the Safety Officer or his authorized nominee or IPR's representative regarding safety precautions, protective measures, housekeeping requirements, etc. IPR shall have the right at its sole discretion to stop the work, if the work is being carried out in such a way that it may cause accidents or harm to the workers or damage to the equipments. Contractor shall get the unsafe condition removed and report to IPR.
- 3.9 The contractor shall have no right to claim any damages/compensations for stoppage of work due to safety reasons as provided in para 3.8 .The period of such stoppage of work will not be taken as an extension of time for completion of work or exemption from liquidated damages/compensation delay.
- 3.10 The contractor should ensure that water, fuel and energy are used judiciously. The water & power points must be closed / put off when not in use.
- 3.11 Good housekeeping practices must be followed strictly.
- 3.12 All equipments used for electrical work, installation of electrical equipments/machineries and other related work by the contractor must meet Indian/International standards. In case such standards do not exist, the contractor must ensure these to be absolutely safe. All equipments shall be strictly operated and maintained in accordance with manufacturers' operation manual and safety instructions.
- 3.13 The contractor must not interfere or disturb electric, fuses, cables and other electrical equipments belonging to IPR or another agency under any circumstances whatsoever unless expressly permitted in writing by IPR.
- 3.14 Contractor shall arrange adequate facilities for first aid, medical aid and treatment for his staff and workers engaged at the work site.The contractor has to fully be responsible for the behaviour and conduct of themselves, their workers and employees and sub-contractors. Any cost of loss or damage to client's property caused by contractor's employees or workers will be recovered from the contractor.
- 3.15 In case of any accident that occurs during the maintenance/ fabrication/erection or associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to themselves, their workers and employees, sub-contractors due to any reason, it shall be the responsibility of the contractor to promptly inform IPR's Work in-charge and Safety Officer in prescribed form of IPR. This should also be informed to statutory authority, if required, under the applicable laws. The contractor shall maintain a register of accidents.In case the contractor fails to fulfil statutory requirements, IPR shall have the right to withhold contractors payments till the requirement are fulfilled.
- 3.16 The contractor shall plan his activities so as to avoid interference with the assignments of other departments and contractors at the site. In case of any interference, necessary coordination must be sought by the contractor from IPR for safe and smooth working.
- 3.17 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions or as recommended by Safety Officer of IPR must be made by the contractor to extinguish fires.

- 3.18 The contractor shall issue photo identity card for themselves, their workers and employees, sub-contractors to be deployed at site. They are required to be displayed prominently during the period of their stay within IPR and associated centres/units/departments.
- 3.19 The contractor shall obtain gate pass from IPR and associated centres/units/departments for entries and exists of all materials and equipments.
- 3.20 Smoking and eating/chewing of tobacco is strictly prohibited at site.
- 3.21 Any person under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted at work site.
- 3.22 Person below the age of 18 years must not be employed for any work at site
- 3.23 IPR may from time to time, add or amend to these protocols and issue directions.
- 3.24 The contractor shall comply with Safety Instructions as laid down in as per Annexure-I.



INSTITUTE FOR PLASMA RESEARCH
SAFETY INSTRUCTIONS
FOR CONTRACTORS OF ELECTRICAL/MAJOR
INSTALLATION OF ELECTRICAL EQUIPMENTS/
MACHINARIES AND OTHER RELATED ACTIVITIES

Revision: 00

Eff. Date:
20.03.2014

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1. GENERAL INFORMATION

- 1.1 The purpose of safety instruction document is to establish, implement and execute a practical and effective method for preventing accidents, injuries and property damage.
- 1.2 This document will help contractors and their associates to recognize, evaluate and control hazardous activities within their areas of responsibility.
- 1.3 This document defines the procedure with which safety practice will be administered, identifies responsibilities and ensures control of work area safety.
- 1.4 Contract agreement signed with contractors and the provisions of this document are intended to complement each other to ensure safe working conditions.
- 1.5 The provisions of this document apply to IPR and associated centres/units/departments.
- 1.6 Throughout this document, reference to a contractor means the contractor's company and the associated subcontractors, consultants, vendors and suppliers. Reference to contractor's management means personnel responsible for managing, supervising or directing contract activities and employees.
- 1.7 Non-compliance of this document is treated as non-compliance of contract agreement that may result in warning/penalty. Willful or repeated non-compliance may result in contractor dismissal and contract termination.
- 1.8 This document for contractors is a supplementary document to statutory rules, codes and regulations having jurisdiction, and does not negate, abrogate or minimise any provisions of these rules, codes and regulations. It is intended to supplement and enforce the individual program of the contractor and to coordinate the overall safety effort. Contractors are responsible for the safety and health of their employees, subcontractors, consultants, vendors, suppliers, and visitors while in IPR and associated centres/units/departments.
- 1.9 Contractor's managers and supervisors are responsible for preventing incidents or conditions that could lead to incidents, injuries, illness or fatalities. The ultimate success of the safety program depends on the cooperation of everyone. The contractor's management must ensure that safety provisions are enforced and that effective training and education programs are employed.

2. ROLE OF THE CONTRACTOR

2.1 Top Management of the Contractor

The commitment of top management of the contractor towards safety is very important. Top management needs to ensure the following:

- 2.1.1 To implement safe methods and practices, deploy appropriate machineries, tools & tackles, experienced supervision and skilled workforce, etc. required for execution.
- 2.1.2 To ensure that employees and workers deployed are physically and mentally fit. They should possess requisite skill, qualification, experience etc.
- 2.1.3 To deploy qualified and trained safety supervisor, safety officers and/or safety manager reporting to site In-charge for supervision, co-ordination and liaison for the implementation of safety.
- 2.1.4 To ensure that the employees and workers have appropriate health and safety training. The certification of such training should be produced for verification, on demand.
- 2.1.5 To obtain all necessary and applicable licences, permits, and insurance policy of his employees and workers before executing any work. A copy of the same must be submitted to the relevant authority at IPR.
- 2.1.6 To ensure that all incidents (minor/major injuries, fatality, fire, property damage etc.) including near misses shall be reported to the relevant authority at IPR immediately verbally as well as in written format of IPR. Also, keep record for the same.

- 2.1.7 The liability for any compensation on account of injury sustained by an employee of the contractor will be exclusively that of the contractor.
- 2.1.8 To provide personal protective equipments required for the safety and first-aid kits at worksite.
- 2.1.9 To maintain appropriate records of all employees and workers deployed to carry out the work at site.
- 2.1.10 Contractor shall not employ any labour below 18 years of age.
- 2.1.11 A photo gate pass duly approved by IPR administration shall be issued by the contractor to their personnel, employees, subcontractors, etc.
- 2.1.12 To co-operate with all the security arrangements of IPR.
- 2.1.13 Contractor may ask for clarifications required in safety related issues, whenever a need arises.
- 2.1.14 To follow and implement all the safety rules and regulations of the local bodies, state, national and international. Contractor shall also comply with all the statutory requirements and notifications, as applicable, in relation to employment of his employees issued time to time by the concerned authorities.

2.2 Contractor Safety Officer, Safety Supervisor and/or Job Supervisor

The duties and responsibilities of the contractor safety officer, safety supervisor and/or job supervisor shall include the following:

- 2.2.1 To assess the hazards associated with work at site in consultation with all concerned and establish safe working procedure.
- 2.2.2 To establish a written records of factors that can cause injuries, illness or other safety related problems.
- 2.2.3 To undertake routine/surprise inspections of all work sites to ensure compliance with safety standards, codes, rules, regulations and orders applicable to the work concerned.
- 2.2.4 To check whether the proposed working arrangements/procedures are safe and satisfactory, particularly at the interface between contractors planned work and IPR facilities.
- 2.2.5 To ensure that required guards and protective equipment are provided, used and properly maintained.
- 2.2.6 To ensure that the workers understand the working procedures for carrying out the work safety and the hazards that may be encountered.
- 2.2.7 To take immediate actions to correct any violation of safety rules observed or reported.
- 2.2.8 To ensure that appropriate warning signboards and tags are displayed.
- 2.2.9 To report each incident and/or injury in accordance with established procedures and assists during investigation.
- 2.2.10 To arrange tool box meeting daily and shall continue this process to make workmen safety conscious. To keep a constant liaison with the relevant authority at IPR on safety issues.

2.3 Contractor Employees

The duties & responsibilities of the contractor employees should include the following:

- 2.3.1 The contractors' employees must be trained for safety standards, procedure to carry out high risk job (if involved), use of Personal Protective Equipments (PPEs) in general and specific for a particular job, emergency preparedness and fire extinguisher and medical first-aid.
- 2.3.2 To perform work safely as per the job requirements/instructions and wear appropriate PPEs.
- 2.3.3 To inform promptly to their management regarding all work related incidents resulting in personal injury, illness and/or property damage, etc.

2.3.4 To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

3. PENALTY FOR NON-COMPLIANCE

The following penalties shall be imposed on the contractor by the IPR and shall be deducted from his running/final bill.

Sr. No.	Non-Compliance/Violation of Safety Protocols/Rules/Norms	Penalty
1.	Non-use of PPE like Safety Helmet / Safety Shoes etc.	Rs. 100 per day/person
2.	Over speeding (> 30Km/Hr) / rash driving or improper parking	Rs. 100 per occasion
3.	Non-use ELCB/MCB, Use of non-standard socket, poor cable joint, laying wire/cables on floor, non-use of socket, electrical jobs by incompetent person	Rs. 200 per day/case
4.	Working at height without full body safety harness, using non-standard scaffolding and not arranging fallprotection arrangement	Rs. 500 per day/case
5.	Handling of compressed gas cylinders without trolley and double gauge regulator, Improper keeping/storage of gas cylinder	Rs. 200 per day/case
6.	Use of domestic LPG for cutting purpose.	Rs. 200 per day/case
7.	No fencing/barricadingof excavated/open areas.	Rs. 200 per day/case
8.	No provision of firefighting equipment during hot works. Use of firewater for purpose other than firefighting.	Rs. 200 per day/case
9.	No reporting of Nearmiss/First-aid/Injury/Property damage/Minor fire etc. incidents	Rs. 500 per case
10.	Poor Housekeeping	Rs. 200 per day/case
11.	No deployment of safety officer/safety supervisor responsible for safety at work site as mentioned in Chapter No. 5	Rs. 500 per day

Safety Officer or any other officer authorized by IPR will report safety violation to the concerned Engineer In-charge for imposing necessary penalty. Engineer-in-charge shall ensure that the penalty amount has been deducted from the running bill of contractor. Imposing any penalty for violation of safety norms does not absolve the contractors from their contractual obligation/ responsibility. Contractor shall be fully responsible for any accident and/or injury to their employees or property due to violation of safety norms.

4. PROVISION FOR SAFETY SUPERVISOR/SAFETY OFFICER OF CONTRACTOR

The contractor shall depute at least one Safety Supervisor / Safety Officer for critical activities as follows,

- i. Work at height (working beyond 2.5 mtr. above ground).
- ii. Materials and Material Handling which includes movement of heavy material by crane, movement of tractor trolley on slopes, Manual lifting of heavy material to height, erection of heavy machinery, equipment, etc.
- iii. Loading and unloading of equipment, structural materials, machinaries, etc., Fabrication and erection work.
- iv. Working near high voltage lines, electrical installations, etc., charging of electrical system, transformers, switch yard, switch gears, etc.
- v. Work related to welding, gas cutting, grinding, etc.

In addition to above list, IPR may also recommend for some specific tasks, which are not covered, to depute Safety Officer/Safety Supervisor.

Safety supervisor shall be qualified of minimum Diploma in Engineering/ Graduate in Science with approved course in the field of safety and/or fire. He shall able to read and understand English and speak regional/national language. He shall have experience as safety supervisor for a period of minimum one year.

Safety Officer shall be qualified of minimum Bachelor in Engineering/ Post Graduate in Science with approved course in the field of Safety and/or Fire. Safety Officer shall have good communication and written skill to liaison with the client. He shall have good command in English and regional/national language. He shall have experience for a period of minimum three years of supervisory level.

5. GENERAL SAFETY PROVISIONS

5.1 Personal Protective Equipment

The contractor is responsible to provide all necessary standard make (ISI marked) personal protective equipment (PPE) suitable to give sufficient protection against hazards involved in their work / job to their employees, as per the job requirement and insist/enforce their staff to put on the same while atworks and ensure that the PPEs are properly used and maintained in a condition suitable for immediate use. The contractor shall have sufficient stock of various PPEs to avoid any shortage of supply and shall take adequate steps to ensure proper use of equipment by those concerned. The ongoing work is liable to be stopped at any time if the contractor's staff is found working without PPEs.

- 5.1.1 All persons employed at site shall use safety helmets. For other types of works, persons working in that area shall also use safety helmets, if advised by Safety Engineer/Engineer-In-Charge.
- 5.1.2 Persons engaged in welding and gas-cutting works shall use suitable welding face shields. The persons who assist the welders shall use suitable goggles. Protective goggles shall be worn while chipping and grinding.
- 5.1.3 All persons working at heights more than 2.5 m above ground or floor and exposed to risk of falling down shall use full body safety harness, unless otherwise protected by cages, guard railings, etc. In places where the use of safety harness is impractical, suitable net of adequate strength fastened to substantial supports shall be employed.
- 5.1.4 When workers are employed in sewers and inside manholes, which are in use, the Contractor shall ensure that the manholes are opened and are adequately ventilated at least for an hour. After it has been well ventilated, the atmosphere inside the spaceshall be checked for the presence of any toxic gas or oxygen deficiency and recorded in the register before the workers are allowed to get into the manholes. The manholes opened shall be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There shall be proper illumination in the night.
- 5.1.5 The following is the list of various PPEs to be used for various works/worksites,

List of Safety Equipments

Sr. No.	PPE	Purpose
01	Industrial Safety Helmet	For protection of head against falling objects or during fall of person from height.
02	Safety Goggles (Grinding, Welding, etc).	For protection of eyes against flying particles / dust, chemical splash, spark, arc, flashover etc.
03	Face shield	For protection of face against flying particles / dust, chemical splash, spark, arc, flashover etc.
04	Ear plug / Ear muffs	For ear / hearing system protection while working in high noise level area.
05	Apron (PVC / cryo/ Cotton)	For body protection against chemicals, oils, cryogenics, sharp edged objects, heat, hot objects etc.
06	Gloves (Nitrile/Leather, cryo, Electrical shock proof)	For protection of hands against chemicals, oils, cryogenics, sharp edged objects, heat, hot metals/objects, electricity etc.
07	Safety Shoes	For protection of leg/feet against falling objects, sharp edged objects, heat, hot metals/objects, electricity etc.
08	Full body safety harness/ I Rope/Life line/ Fall prevention system etc.	For fall prevention while working at heights or in depth, working in vessel or in confined space.
09	Dust Respirator	Protection of respiratory system against dust.
10	Self-contained breathing apparatus (SCBA) set	Working in oxygen deficient areas.

5.2 Electricity

The following are provided for general guidance of the Contractor and shall be read as specific requirement, in addition to complying with Indian Electricity Act, Indian Electricity Rules and IS Specifications.

- 5.2.1 Only qualified electricians familiar with code requirements are allowed to perform electrical work.
- 5.2.2 Employees are not permitted to work near an unprotected electrical power circuit unless they are protected against electrical shock by de-energizing the circuit and grounding it, or are protected by effective insulation or other means, and are wearing .required personal protective equipment.
- 5.2.3 The electric power supply will be generally made available at one point in the works site of the contractor by the IPR.
- 5.2.4 All three phase equipment shall be provided with double earthing. All light fixtures and portable equipment shall be effectively earthed to main earthing.
- 5.2.5 All earth terminals shall be visible. No gas pipes and water pipes shall be used for earth connection. Neutral conductor shall not be treated as earth wire.
- 5.2.6 The contractor shall not connect any additional load without prior permission of IPR.
- 5.2.7 Joints in earthing conductors shall be avoided. Loop earthing of equipment shall not be allowed. However tappings from an earth bus may be done.
- 5.2.8 Electrical equipment and installations shall be installed and maintained as to prevent danger from contact with live conductors and to prevent fires originating from electrical causes like short circuits, overheating etc. Installation shall not cause any hindrance to movement of men and materials.
- 5.2.9 Materials for all electrical equipment shall be selected with regard to working voltage, load and

working environment. Such equipment shall conform to the relevant standards.

- 5.2.10 Electric fuses and/or circuit breakers installed in equipment circuits for short circuit protection shall be of proper rating. It is also recommended that high rupturing capacity (HRC) fuses be used in all circuits. For load of 5 KW or more earth leakage circuit breaker of proper rating shall be provided in the circuits.
- 5.2.11 Wires and cables shall be properly supported and approved method of fixing shall be adopted. Cables shall not be left on floor/ground. Loose hanging of wires & cables shall be avoided. Lightning and power circuits shall be kept distinct and separate.
- 5.2.12 Reinforcement rods or any metallic part of structure shall not be used for supporting wires and cables, fixtures, equipment, earthing etc.
- 5.2.13 All cables and wires shall be adequately protected mechanically against damages. In case, the cable required to be laid underground, it shall be adequately protected by covering the same with bricks, Plain Cement Concrete (PCC), tile or any other approved means.
- 5.2.14 All armoured cables shall be properly terminated by using suitable cable glands. Multi-stranded conductor cables shall be connected by using cable lugs/ sockets. Cable lugs shall preferably be crimped. They shall be of proper size and shall correspond to the current rating and size of the cable. Twisted connections will not be allowed.
- 5.2.15 All the Distribution Boards, Switch Fuse units, Bus bar chambers, ducts, cubicles etc. shall have MS enclosures and shall be dust, vermin and waterproof. The Distribution Boards, switches etc. shall be so fixed that they shall be easily accessible.
- 5.2.16 The Contractor shall provide proper enclosures/covers of approved size and shape for protection of all switch boards, equipment etc. against rain.
- 5.2.17 Isolating switches shall be provided close to equipment for easy disconnection of electrical equipment or conductors from the source of supply, when repair or maintenance work has to be done.
- 5.2.18 All connections to lighting fixtures, starters or other power supplies shall be provided with PVC insulated, PVC sheathed twin/three/four core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. Taped joints shall not be allowed and the connections may be made in looping system. Electric starter of motors, Switches shall not be mounted on .wooden boards. Only sheet steel mounting or iron framework shall be used.
- 5.2.19 Only PVC insulated and PVC sheathed wires or armored PVC insulated and sheathed cables shall be used for external power supply connections of temporary nature. Weatherproof rubber wires shall not be used for any temporary power supply connections. Taped joints in the wires shall not be used.
- 5.2.20 All portable appliances shall be provided with three-core cable and three-pin plug. The third pin of the plug shall invariably be earthed. It shall be ensured that the metal part of the equipment shall be effectively earthed.

5.3 House Keeping

- 5.2.1 The Contractor shall at all times keep his work spot, site office and surroundings clean and tidy from rubbish, scrap, surplus materials and unwanted tools and equipment so as not to create unsafe condition or fire hazard.
- 5.2.2 Welding and other electrical cables shall be properly routed.
- 5.2.3 No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
- 5.2.4 Cleaning of the work area at the end of the day and upon completion of work is a part of the job.
- 5.2.5 The Engineer-in-charge has the right to stop work if the Contractor fails to improve upon the housekeeping after having been notified.

5.3 Fire Safety

- 5.2.6 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions shall be made to extinguish fires, if it still breaks out.
- 5.2.7 Quantities of combustible materials like timber, bamboos, coal, paints, etc., shall be kept minimum in order to avoid unnecessary accumulation of combustibles at site.
- 5.2.8 Containers of paints, thinners and allied materials shall be stored in a separate room which shall be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint shall be kept covered or properly fitted with lid and shall not be kept open except while using.
- 5.2.9 Fire extinguishers shall be located at the site at appropriate places.
- 5.2.10 Adequate number of workmen shall be given education and training in firefighting and extinguishing methods.

5.4 Scaffolding:

- 5.2.11 Accidents are also caused by the ladders falling or the climber losing his balance or failure of scaffolds. As such, utmost care should be taken as ladder and scaffolding are extensively used for maintenance and construction purpose. Some of the safe practices as listed below are to be observed before commencement of work.
- 5.2.12 Adequate and safe means of access and exit shall be provided for all work places, at all elevations. Using of scaffolding members (avoiding a ladder) for approach to high elevations shall not be permitted.
- 5.2.13 Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short duration work as can be done safely from ladders. Ladder shall be of rigid construction having sufficient strength for the intended loads and made either of good quality wood or metal and all ladders shall be maintained well for safe working condition.
- 5.2.14 Short ladder must not be tied together to give greater lengths. All ladders of 6 m or above should be tied to the structure on which they are resting to prevent from. An extra worker shall be engaged for holding the ladder if ladder is not securely fixed. If the ladder is used for carrying materials, suitable foot holds and handholds shall be provided on the ladder. The ladder shall be given an inclination not steeper than 1 in 4(1 horizontal and 4 vertical). Ladders shall not be used for climbing carrying materials in hands. While climbing both the hands shall not be free.
- 5.2.15 The free length must extend by 1.5 meters above the point of landing but should not be more than 1/4th of the ladder length. No portable single ladder shall be over 9 meter in length. Metal ladders may not be used for electrical work.
- 5.2.16 Scaffolding or staging more than 3.5 m above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a standard guard rail properly attached, bolted, braced or otherwise secured at least 1.0 m high above the floor or platform of such scaffolding or staging. The guard rail shall extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of materials. Standard railing shall have posts not more than 2 m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top rail. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure. Scaffolding and ladder shall conform to relevant IS specification (IS: 3696). Timber/Bamboo scaffolding shall not be used.
- 5.5.1 Working platforms of scaffolds shall have toe boards at least 15 cm in height to prevent materials from falling down.

- 5.5.2 Every part of scaffolding must be of sound construction. Steel planks used in scaffolds should be carefully inspected and should be tied on both sides with suitable fixing arrangements to the pipes. Scaffolding must not be overloaded.
- 5.5.3 The Steel pipe & clamp to be used must be of good quality. The spacing between the vertical & horizontal members of the scaffolding should not be more than 1.5m and 1 meter respectively. The scaffolding should be further strengthened with cross bracing and stays.
- 5.5.4 The scaffolds should be provided with short climbs ladders for safe ascending/ descending of workmen in the job. Only those workmen who are well trained/ experienced in erecting scaffolding should be engaged for scaffolding work. The men working in the actual erection/dismantling of the scaffolding and all persons using the scaffolding must use appropriate PPEs.
- 5.5.5 A sketch of the scaffolding proposed to be used shall be prepared and approved by the Engineer-in charge, prior to start of erection of scaffolding. All scaffolds shall be examined by Engineer-In-Charge before use.
- 5.5.6 Working platform, gangways and stairways shall be so constructed that they shall not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5 m above ground level or floor level, they shall be closely boarded, shall have adequate width for easy movement of persons and materials and shall be suitably guarded.
- 5.5.7 The planks used for working platform shall not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks shall be rigidly tied at both ends to prevent sliding and slippage. The thickness of the planks shall be adequate to take load of men and materials and shall not collapse.
- 5.5.8 Each opening in the floor of a building or at a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing.
- 5.5.9 Safe means of access shall be provided to all working platforms and other elevated working places. Every ladder shall be securely fixed. No single portable ladder shall be over 9 m in length. For ladders up to 3m in length the width between side rails in the ladder shall in no case be less than 300 mm. For longer ladders this width shall be increased by at least 20 mm for each additional meter of length. Step spacing shall be uniform and shall not exceed 300 mm.
- 5.5.10 Adequate precautions shall be taken to prevent danger from electrical lines and equipment. No scaffolding, ladder, working platform, gangway runs, etc. shall exist within 3 meters of any uninsulated electric wire. Whenever electric power and lighting cables are required to run through (pass on) the scaffolding or electrical equipments are used, such scaffolding structures shall have minimum two earth connections with earth continuity conforming to IS Code of Practice.

5.5 Lifting/Hoisting Equipment and Erection

Accidents do happen while working overhead or due to failure or unsafe use of hoisting equipment. As such, adequate care must be taken to prevent it. The following are some of the precautions to ensure safety of the workmen engaged by the contractor:

- 5.5.1 Contractors involved in handling of any material overhead must install necessary barricades, warning signs or take any other steps necessary to prevent others from walking/standing beneath the load.
- 5.5.2 Hoisting machines, tackles including their attachments, anchorage and supports must conform to the good mechanical construction, sound materials and adequate strength and free from patent defect and shall be preserved in good condition.
- 5.5.3 All equipments like crane, chain blocks, sling, rope including all other material handling

equipments must have valid load test certificates.

- 5.5.4 Thorough inspection and load testing of lifting machines and tackles shall be done by a competent person at least once every 12 months and records of such inspection and testing shall be maintained.
- 5.5.5 Every crane driver or hoisting appliances operator shall be properly qualified and no person below the age 21 years should be in charge of any hoisting machine.
- 5.5.6 Every hoisting machine and all gears shall be plainly marked with the safe working load. No part of any machine or gear shall be loaded beyond the safe working load (SWL).
- 5.5.7 In case of IPR's machines, the safe working load shall be notified by Engineer-in-charge. For contractor's machines, the contractor shall notify the safe working load to Engineer-in-charge.
- 5.5.8 Motors, gearing transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with safe guards.
- 5.5.9 No cranes shall be left unattended with hanging load and on completion of work, the boom/jib of the crane may be brought down and kept in horizontal condition.
- 5.5.10 No crane including hydra crane shall be allowed to move on road with suspended load.

5.6 Welding and Gas Cutting

- 5.6.1 Welding and gas cutting operations shall be done only by qualified and authorized persons and as per IS specifications and Code of Practice.
- 5.6.2 Welding and gas cutting shall not be carried out in places where flammable or combustible materials are kept and where there is danger of explosion due to presence of gaseous mixtures.
- 5.6.3 Welding and gas cutting equipment including hoses and cables shall be maintained in good condition.
- 5.6.4 Barriers shall be erected to protect other persons from harmful rays from the work. When welding or gas cutting is in elevated positions, precautions shall be taken to prevent sparks or hot metal falling on persons or flammable materials. Adequate ventilation shall be provided while welding in confined space.
- 5.6.5 Suitable type of protective clothing consisting of fire resistant gauntlet gloves, leggings, boots and aprons shall be provided to workers as protection from heat and hot metal splashes. Welding shields with filter glasses of appropriate shade shall be worn as face protection.
- 5.6.6 Welding and gas cutting shall not be done on drums, barrels, tanks or other containers unless they have been emptied, cleaned thoroughly and it is made certain that no flammable material is present.
- 5.6.7 Fire extinguisher shall be available near the location of welding operations. Prior permission shall be obtained from safety section for working at vulnerable areas and operating areas before flame cutting/welding is taken up.
- 5.6.8 Tarpaulin, if used should be of fire retardant.
- 5.6.9 For electric (Arc) welding the following additional safety precautions shall be taken:
 - When electrical welding is undertaken near pipe lines carrying flammables, such pipe lines shall not be used as part of earth conductor but a separate earth conductor shall be connected to the machine directly from the job.
 - Personnel contact with the electrode or other live parts of electric welding equipment shall be avoided.
 - Extreme caution shall be exercised to prevent accidental contact of electrodes with ground.
- 5.6.10 The cylinders containing poisonous/toxic or inflammable / explosive gas like Oxygen, Acetylene, Hydrogen, Ammonia, Chlorine, CO₂ etc. shall be handled safely taking due cares. To handle / shift such cylinders a special trolley / cage meant for it must be used but in no case it should be rolled.
- 5.6.11 No domestic LPG cylinder is allowed for Hot Work such as Gas Welding / Gas Cutting.
- 5.6.12 A person must remain in the area for a minimum period of 30 minutes after hot work is completed to ensure the site is safe. Welding machine shall be switched off after the completion of work.

5.7 Grinding

- 5.7.1 All portable grinders shall be used only with their wheel guards in position to reduce the danger from flying fragments should the wheel break during the use.
- 5.7.2 Grinding wheels of specified diameter only shall be used on a grinder- portable or pedestal - in order not to exceed the prescribed peripheral speed.
- 5.7.3 Goggles shall be used during grinding operation.

5.8 Electrical Equipment - Installation and/or Maintenance

- 5.8.1 Consider all the equipment as live before touching until they are proved to be dead.
- 5.8.2 Before attempting maintenance on electrical equipment, ensure electrical isolation & earthing. Follow "permit to work on electrical system" procedures.
- 5.8.3 Be sure about isolation by physical verification. Check isolation tags on feeders/breakers.
- 5.8.4 Keep electrical insulating mat/paint in front of electrical panel/ switches.
- 5.8.5 Inspect the equipment thoroughly before normalization.
- 5.8.6 Follow SIDE rule before starting maintenance work on electrical equipment. (S=Switch off, I=Isolate, D=Discharge, E=Earthing).
- 5.8.7 Have minimum number of cable joints and insulate properly all the cable joints.
- 5.8.8 If water cooling is used, ensure that water connections are fitted correctly with no chance of leakage onto HV system.
- 5.8.9 Supply of energy to every electrical installation, other than low voltage installation below 5 kW, shall be controlled by an earth leakage protective device so as to disconnect the supply instantly on the occurrence of earth fault or leakage current.
- 5.8.10 Don't work alone in and around high voltage system.
- 5.8.11 Lifting of electrical equipment as per manufacturer's instructions.
- 5.8.12 Do not allow visitors to enter into high voltage zones without escorting by an authorized person.
- 5.8.13 Never depend on verbal communication for isolation of electrical equipment.
- 5.8.14 Do not wear metallic ornament while working on electrical equipment.
- 5.8.15 Do not overload the power cable beyond its current carrying capacity.
- 5.8.16 Do not insert bare wires of appliances in the plug socket.
- 5.8.17 Only trained, experience and authorized personnel should carrying out maintenance, repair, adjustment etc.
- 5.8.18 Identified tools should be used to carry out such works.
- 5.8.19 Eli Chips and debris must be swept up and properly disposed.

6. REPORTING FORM

6.1 Near Miss Reporting Form

(This form may be filled and submitted to the Safety Section within 48 hours from the incident time)

1. Name of Person Affected/Observed Near miss:	2. Group/Division/Section:
3. Designation:	4. Location of Near Miss:
5. Date & Time of Near Miss:	6. Contact no:/Ext. No.:
7. Near Miss Description: <i>(Describe fully, the protocol / procedure been followed including all substances, equipment and machinery being used which was related to the near miss.)</i> ----- ----- ----- ----- ----- ----- ----- -----	
8. Possible Damage that might have happened: (i) (ii)	
9. Corrective Actions Proposed to prevent reoccurrence of such near miss incident(s):	

Submitted By:

Signature:

Name:

Date:

6.2 Incident Reporting Form

(This form is to be filled and submitted for all incidents except near miss to safety section within 72 hours from the incident time)

B. PERSONNEL INFORMATION

Name of Injured:		PR No.:
Group:		Contact No./ Ext. No.:
Incident Site:	Employee Category: () Permanent Employee () Project Employee () Contract () AMC () TPIA () Service Provider/Vendor () Other Category	

B. CATEGORY OF INCIDENT

First aid case	
Medical case	
Asset/Equipment/Property damage	
Vehicle incident	
Fire	
Fatal Accident	

C. INCIDENT INFORMATION

Date / Time of Incident	Date/Time Reported To Group Leader
Person Reporting Incident	
Incident Description:	
Injury / Illness Description:	

F. TREATMENT INFORMATION

Treatment Description		
Treatment Administered By	Date Of Treatment	Time Of Treatment
Phone No of clinic / hospital	Name of Clinic/Hospital:	
Pl. attach medical officer's prescription for medical treatment: -	Released from Hospital Date / Time: -	

G. INITIAL CORRECTIVE ACTION INFORMATION

Immediate Causes of incident:

Initial Corrective actions taken

- 1.
- 2.
- 3.

Prepared By:

Sign:

Name:

Designation:

Date:

Reviewed By:

Sign:

Name:

Designation:

Date:

	INSTITUTE FOR PLASMA RESEARCH	Revision: 00
	SAFETY PROTOCOL FOR CONTRACTORS OF MECHANICAL/ MAINTENANCE/ FABRICATION/ERECTION AND OTHER RELATED ACTIVITIES	Eff. Date: 20.03.2014

1. PURPOSE

The purpose of this protocol is to establish, implement and execute a safe and effective program for the prevention of incidents that may cause injury to persons or damage to the property. The specified responsibilities remain with the contractor for compliance.

2. SCOPE

- 2.1 This protocol shall be considered minimum requirements necessary for all works performed inside the Institute for Plasma Research (IPR) and associated centres/units/departments.
- 2.2 All the contractor while at IPR and associated centres/units/departments work site are required to ensure that themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors, must comply with the provisions of this protocol.
- 2.3 The contractor shall review and educate their workers and employees about the stipulations of this protocol.
- 2.4 This protocol is in addition to the responsibility of the contractor towards safety, health and environmental compliance envisaged under law, code or statutory requirements.

3. PROTOCOL

- 3.1 The contractor has to provide appropriate Personal Protective Equipments (PPE) like safety shoes, safety helmets, goggles, hand gloves, full body safety harnesses, etc. as required for safety of themselves, their workers and employees, sub-contractors, suppliers, vendors and visitors at site. All PPE must conform to relevant Indian and/or International Standards. These should be maintained in recommended condition by suitable storage, maintenance and inspection. IPR shall have right to examine the PPE and determine their suitability, reliability, acceptability and adaptability.
- 3.2 The contractor shall provide and maintain proper illumination, fencing, guards, stairs, ladders, scaffolding, warning signs, caution boards, etc. as required to ensure safe working conditions at site.
- 3.3 The contractor shall ensure that all floor and wall openings are fixed and properly guarded/barricaded during the course of work and at the end of each day's work with appropriate caution board.
- 3.4 The contractor must adhere to the requirements of Safety, Health and Environment (SHE) Policy of IPR, salient features of which are:
 - k. Continual improvement in its Safety, Health & Environment Performance,
 - l. Conservation of natural resources,
 - m. Waste minimization,
 - n. Compliance with applicable statutory and regulatory requirements,
 - o. Creating safety & environmental awareness to its employees and associates.

- 3.5 The contractor has to ensure to employ only persons who are medically fit and having sufficient skills for execution of work. The contractor must ensure efficient job supervision through educated, qualified, experienced and responsible supervisors to ensure safety at site.
- 3.6 All staff persons including workers must undergo Safety Induction Training prior to depute them at IPR and associated centres/units/departments for any kind of work. Training module may include video film, clippings, photographs etc. related to work execution. In addition to this, Job specific training must be imparted to the concerned workers periodically.
- 3.7 The contractor has to ensure that Daily Tool Box Talk shall be conducted at least for new workers by responsible work in-charge/supervisor for each activity and its record to be maintained.
- 3.8 The contractors themselves, their workers and employees, sub-contractors, if any, shall comply with the instructions given by the Safety Officer or his authorized nominee or IPR's representative regarding safety precautions, protective measures, housekeeping requirements, etc. IPR shall have the right at its sole discretion to stop the work, if the work is being carried out in such a way that it may cause accidents or harm to the workers or damage to the equipments. Contractor shall get the unsafe condition removed and report to IPR.
- 3.9 The contractor shall have no right to claim any damages/compensations for stoppage of work due to safety reasons as provided in para 3.8 .The period of such stoppage of work will not be taken as an extension of time for completion of work or exemption from liquidated damages/compensation delay.
- 3.10 The contractor should ensure that water, fuel and energy are used judiciously. The water & power points must be closed / put off when not in use.
- 3.11 Good housekeeping practices must be followed strictly.
- 3.12 All equipments used for maintenance, fabrication and assembly work, etc. by the contractor must meet Indian/International standards. In case such standards do not exist, the contractor must ensure these to be absolutely safe. All equipments shall be strictly operated and maintained in accordance with manufacturers' operation manual and safety instructions.
- 3.13 The contractor must not interfere or disturb electric, fuses, cables and other electrical equipments belonging to IPR or another agency under any circumstances whatsoever unless expressly permitted in writing by IPR.
- 3.14 Contractor shall arrange adequate facilities for first aid, medical aid and treatment for his staff and workers engaged at the work site.
- 3.15 The contractor has to fully be responsible for the behaviour and conduct of themselves, their workers and employees and sub-contractors. Any cost of loss or damage to client's property caused by contractor's employees or workers will be recovered from the contractor.
- 3.16 In case of any accident that occurs during the maintenance/ fabrication/erection or associated activities undertaken by the contractor thereby causing any minor or major or fatal injury to themselves, their workers and employees, sub-contractors due to any reason, it shall be the responsibility of the contractor to promptly inform IPR's Work in-charge and Safety Officer in prescribed form of IPR. This should also be informed to statutory authority, if required, under the applicable laws. The contractor shall maintain a register of accidents.
- 3.17 In case the contractor fails to fulfil statutory requirements, IPR shall have the right to withhold contractors payments till the requirement are fulfilled.
- 3.18 The contractor shall plan his activities so as to avoid interference with the assignments of other departments and contractors at the site. In case of any interference, necessary coordination must be sought by the contractor from IPR for safe and smooth working.
- 3.19 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions or as recommended by Safety Officer of IPR must be made by the contractor to extinguish fires.
- 3.20 The contractor shall follow the stipulated procedure regarding work in the radiation area and other works related with radiography. The contractor shall be fully responsible for the safe storage and

handling of his and his sub-contractor's radio-active sources in accordance with AERB rules and other applicable provisions.

- 3.21 The contractor shall issue photo identity card for themselves, their workers and employees, sub-contractors to be deployed at site. They are required to be displayed prominently during the period of their stay within IPR and associated centres/units/departments.
- 3.22 The contractor shall obtain gate pass from IPR and associated centres/units/departments for entries and exists of all materials and equipments.
- 3.23 Smoking and eating/chewing of tobacco is strictly prohibited at site.
- 3.24 Any person under the influence of any intoxicating beverage, even to the slightest degree shall not be permitted at work site.
- 3.25 Person below the age of 18 years must not be employed for any work at site
- 3.26 IPR may from time to time, add or amend to these protocols and issue directions.
- 3.27 The contractor shall comply with safety instructions as laid down in as per Annexure-I.

	INSTITUTE FOR PLASMA RESEARCH	Revision: 00
	SAFETY INSTRUCTIONS FOR CONTRACTORS OF MECHANICAL/MAINTENANCE/FABRICATION/ ERECTION AND OTHER RELATED ACTIVITIES	Eff. Date: 20.03.2014

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1. GENERAL INFORMATION

- 1.1 The purpose of safety instruction document is to establish, implement and execute a practical and effective method for preventing accidents, injuries and property damage.
- 1.2 This document will help contractors and their associates to recognize, evaluate and control hazardous activities within their areas of responsibility.
- 1.3 This document defines the procedure with which safety practice will be administered, identifies responsibilities and ensures control of work area safety.
- 1.4 Contract agreement signed with contractors and the provisions of this document are intended to complement each other to ensure safe working conditions.
- 1.5 The provisions of this document apply to IPR and associated centres/units/departments.
- 1.6 Throughout this document, reference to a contractor means the contractor's company and the associated subcontractors, consultants, vendors and suppliers. Reference to contractor's management means personnel responsible for managing, supervising or directing contract activities and employees.
- 1.7 Non-compliance of this document is treated as non-compliance of contract agreement that may result in warning/penalty. Willful or repeated non-compliance may result in contractor dismissal and contract termination.
- 1.8 This document for contractors is a supplementary document to statutory rules, codes and regulations having jurisdiction, and does not negate, abrogate or minimise any provisions of these rules, codes and regulations. It is intended to supplement and enforce the individual program of the contractor and to coordinate the overall safety effort. Contractors are responsible for the safety and health of their employees, subcontractors, consultants, vendors, suppliers, and visitors while in IPR and associated centres/units/departments.
- 1.9 Contractor's managers and supervisors are responsible for preventing incidents or conditions that could lead to incidents, injuries, illness or fatalities. The ultimate success of the safety program depends on the cooperation of everyone. The contractor's management must ensure that safety provisions are enforced and that effective training and education programs are employed.

2. ROLE OF THE CONTRACTOR

2.1 Top Management of the Contractor

The commitment of top management of the contractor towards safety is very important. Top management needs to ensure the following:

- 2.1.1 To implement safe methods and practices, deploy appropriate machineries, tools & tackles, experienced supervision and skilled workforce, etc. required for execution.
- 2.1.2 To ensure that employees and workers deployed are physically and mentally fit. They should possess requisite skill, qualification, experience etc.
- 2.1.3 To deploy qualified and trained safety supervisor, safety officers and/or safety manager reporting to site In-charge for supervision, co-ordination and liaison for the implementation of safety.
- 2.1.4 To ensure that the employees and workers have appropriate health and safety training. The certification of such training should be produced for verification, on demand.
- 2.1.5 To obtain all necessary and applicable licences, permits, and insurance policy of his employees and workers before executing any work. A copy of the same must be submitted to the relevant authority at IPR.
- 2.1.6 To ensure that all incidents (minor/major injuries, fatality, fire, property damage etc.) including near misses shall be reported to the relevant authority at IPR immediately verbally as well as in written format of IPR. Also, keep record for the same.

- 2.1.7 The liability for any compensation on account of injury sustained by an employee of the contractor will be exclusively that of the contractor.
- 2.1.8 To provide personal protective equipments required for the safety and first-aid kits at worksite.
- 2.1.9 To maintain appropriate records of all employees and workers deployed to carry out the work at site.
- 2.1.10 Contractor shall not employ any labour below 18 years of age.
- 2.1.11 A photo gate pass duly approved by IPR administration shall be issued by the contractor to their personnel, employees, subcontractors, etc.
- 2.1.12 To co-operate with all the security arrangements of IPR.
- 2.1.13 Contractor may ask for clarifications required in safety related issues, whenever a need arises.
- 2.1.14 To follow and implement all the safety rules and regulations of the local bodies, state, national and international. Contractor shall also comply with all the statutory requirements and notifications, as applicable, in relation to employment of his employees issued time to time by the concerned authorities.

2.2 Contractor Safety Officer, Safety Supervisor and/or Job Supervisor

The duties and responsibilities of the contractor safety officer, safety supervisor and/or job supervisor shall include the following:

- 2.2.1 To assess the hazards associated with work at site in consultation with all concerned and establish safe working procedure.
- 2.2.2 To establish a written records of factors that can cause injuries, illness or other safety related problems.
- 2.2.3 To undertake routine/surprise inspections of all work sites to ensure compliance with safety standards, codes, rules, regulations and orders applicable to the work concerned.
- 2.2.4 To check whether the proposed working arrangements/procedures are safe and satisfactory, particularly at the interface between contractors planned work and IPR facilities.
- 2.2.5 To ensure that required guards and protective equipment are provided, used and properly maintained.
- 2.2.6 To ensure that the workers understand the working procedures for carrying out the work safety and the hazards that may be encountered.
- 2.2.7 To take immediate actions to correct any violation of safety rules observed or reported.
- 2.2.8 To ensure that appropriate warning signboards and tags are displayed.
- 2.2.9 To report each incident and/or injury in accordance with established procedures and assists during investigation.
- 2.2.10 To arrange tool box meeting daily and shall continue this process to make workmen safety conscious. To keep a constant liaison with the relevant authority at IPR on safety issues.

2.3 Contractor Employees

The duties & responsibilities of the contractor employees should include the following:

- 2.3.1 The contractors' employees must be trained for safety standards, procedure to carry out high risk job (if involved), use of Personal Protective Equipments (PPEs) in general and specific for a particular job, emergency preparedness and fire extinguisher and medical first-aid.
- 2.3.2 To perform work safely as per the job requirements/instructions and wear appropriate PPEs.
- 2.3.3 To inform promptly to their management regarding all work related incidents resulting in personal injury, illness and/or property damage, etc.

2.3.4 To take all necessary and appropriate safety precautions to protect themselves, other personnel and the environment.

3. PENALTY FOR NON-COMPLIANCE

The following penalties shall be imposed on the contractor by the IPR and shall be deducted from his running/final bill.

Sr. No.	Non-Compliance/Violation of Safety Protocols/Rules/Norms	Penalty
1.	Non-use of PPE like Safety Helmet / Safety Shoes etc.	Rs. 100 per day/person
2.	Over speeding (> 30Km/Hr) / rash driving or improper parking	Rs. 100 per occasion
3.	Non-use ELCB/MCB, Use of non-standard socket, poor cable joint, laying wire/cables on floor, non-use of socket, electrical jobs by incompetent person	Rs. 200 per day/case
4.	Working at height without full body safety harness, using non-standard scaffolding and not arranging fallprotection arrangement	Rs. 500 per day/case
5.	Handling of compressed gas cylinders without trolley and double gauge regulator, Improper keeping/storage of gas cylinder	Rs. 200 per day/case
6.	Use of domestic LPG for cutting purpose.	Rs. 200 per day/case
7.	No fencing/barricadingof excavated/open areas.	Rs. 200 per day/case
8.	No provision of firefighting equipment during hot works. Use of firewater for purpose other than firefighting.	Rs. 200 per day/case
9.	No reporting of Nearmiss/First-aid/Injury/Property damage/Minor fire etc. incidents	Rs. 500 per case
10.	Poor Housekeeping	Rs. 200 per day/case
11.	No deployment of safety officer/safety supervisor responsible for safety at work site as mentioned in Chapter No. 5	Rs. 500 per day

Safety Officer or any other officer authorized by IPR will report safety violation to the concerned Engineer In-charge for imposing necessary penalty. Engineer-in-charge shall ensure that the penalty amount has been deducted from the running bill of contractor. Imposing any penalty for violation of safety norms does not absolve the contractors from their contractual obligation/ responsibility. Contractor shall be fully responsible for any accident and/or injury to their employees or property due to violation of safety norms.

4. PROVISION FOR SAFETY SUPERVISOR/SAFETY OFFICER OF CONTRACTOR

The contractor shall depute at least one Safety Supervisor / Safety Officer for critical activities as follows,

- i. Work at height (working beyond 2.5 mtr. above ground)
- ii. Materials and Material Handling which includes movement of heavy material by crane, movement of tractor trolley on slopes, Manual lifting of heavy material to height, erection of heavy machinery, equipment, etc.
- iii. Loading and unloading of equipment, structural materials, machineries, etc., Fabrication and erection work
- iv. Working near high voltage lines, electrical installations, etc., charging of electrical system,

- transformers, switch yard, switch gears, etc.
- v. Work on pressure vessels/lines.
- vi. Work in confined space
- vii. Radiography work
- viii. Work related to welding, gas cutting, grinding, etc.
- ix. Work with pneumatic tools/compressed air
- x. Leak detection testing / Hydraulic testing

In addition to above list, IPR may also recommend for some specific tasks, which are not covered, to depute Safety Officer/Safety Supervisor.

Safety supervisor shall be qualified of minimum Diploma in Engineering/ Graduate in Science with approved course in the field of safety and/or fire. He shall able to read and understand English and speak regional/national language. He shall have experience as safety supervisor for a period of minimum one year.

Safety Officer shall be qualified of minimum Bachelor in Engineering/ Post Graduate in Science with approved course in the field of Safety and/or Fire. Safety Officer shall have good communication and written skill to liaison with the client. He shall have good command in English and regional/national language. He shall have experience for a period of minimum three years of supervisory level.

5. GENERAL SAFETY PROVISIONS

5.1 Personal Protective Equipment

The contractor is responsible to provide all necessary standard make (ISI marked) personal protective equipment (PPE) suitable to give sufficient protection against hazards involved in their work / job to their employees, as per the job requirement and insist/enforce their staff to put on the same while atworks and ensure that the PPEs are properly used and maintained in a condition suitable for immediate use. The contractor shall have sufficient stock of various PPEs to avoid any shortage of supply and shall take adequate steps to ensure proper use of equipment by those concerned. The ongoing work is liable to be stopped at any time if the contractor's staff is found working without PPEs.

- 5.1.1 All persons employed at site shall use safety helmets. For other types of works, persons working in that area shall also use safety helmets, if advised by Safety Engineer/Engineer-In-Charge.
- 5.1.2 Persons engaged in welding and gas-cutting works shall use suitable welding face shields. The persons who assist the welders shall use suitable goggles. Protective goggles shall be worn while chipping and grinding.
- 5.1.3 All persons working at heights more than 2.5 m above ground or floor and exposed to risk of falling down shall use full body safety harness, unless otherwise protected by cages, guard railings, etc. In places where the use of safety harness is impractical, suitable net of adequate strength fastened to substantial supports shall be employed.
- 5.1.4 When workers are employed in sewers and inside manholes, which are in use, the Contractor shall ensure that the manholes are opened and are adequately ventilated at least for an hour. After it has been well ventilated, the atmosphere inside the-spaceshall be checked for the presence of any toxic gas or oxygen deficiency and recorded in the register before the workers are allowed to get into the manholes. The manholes opened shall be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There shall be proper illumination in the

night.

5.1.5 The following is the list of various PPEs to be used for various works/worksites,

List of Safety Equipments

Sr. No.	PPE	Purpose
01	Industrial Safety Helmet	For protection of head against falling objects or during fall of person from height.
02	Safety Goggles (Grinding, Welding, etc).	For protection of eyes against flying particles / dust, chemical splash, spark, arc, flashover etc.
03	Face shield	For protection of face against flying particles / dust, chemical splash, spark, arc, flashover etc.
04	Ear plug / Ear muffs	For ear / hearing system protection while working in high noise level area.
05	Apron(PVC / cryo/Cotton)	For body protection against chemicals, oils, cryogenics, sharp edged objects, heat, hot objects etc.
06	Gloves (Nitrile/Leather, cryo, Electrical shock proof)	For protection of hands against chemicals,oils,cryogenics, sharp edged objects, heat, hot metals/objects, electricity etc.
07	Safety Shoes	For protection of leg/feet againstfallingobjects,sharpedged objects, heat, hot metals/objects, electricity etc.
08	Full body safety harness/ IRope /Life line/ Fallprevention system etc.	For fall prevention while working at heights or in depth, working in vessel or in confined space.
09	Dust Respirator	Protection of respiratory system against dust.
10	Self-contained breathing apparatus (SCBA) set	Working in oxygen deficient areas.

5.2 Electricity

The following are provided for general guidance of the Contractor and shall be read as specific requirement, in addition to complying with Indian Electricity Act, Indian Electricity Rules and IS Specifications.

- 5.2.1 Only qualified electricians familiar with code requirements are allowed to perform electrical work.
- 5.2.2 Employees are not permitted to work near an unprotected electrical power circuit unless they are protected against electrical shock by de-energizing the circuit and grounding it, or are protected by effective insulation or other means, and are wearing .required personal protective equipment.
- 5.2.3 The electric power supply will be generally made available at one point in the works site of the contractor by the IPR.
- 5.2.4 All three phase equipment shall be provided with double earthing. All light fixtures and portable equipment shall be effectively earthed to main earthing.
- 5.2.5 All earth terminals shall be visible. No gas pipes and water pipes shall be used for earth connection. Neutral conductor shall not be treated as earth wire.
- 5.2.6 The contractor shall not connect any additional load without prior permission of IPR.
- 5.2.7 Joints in earthing conductors shall be avoided. Loop earthing of equipment shall not be allowed. However tappings from an earth bus may be done.

- 5.2.8 Electrical equipment and installations shall be installed and maintained as to prevent danger from contact with live conductors and to prevent fires originating from electrical causes like short circuits, overheating etc. Installation shall not cause any hindrance to movement of men and materials.
- 5.2.9 Materials for all electrical equipment shall be selected with regard to working voltage, load and working environment. Such equipment shall conform to the relevant standards.
- 5.2.10 Electric fuses and/or circuit breakers installed in equipment circuits for short circuit protection shall be of proper rating. It is also recommended that high rupturing capacity (HRC) fuses be used in all circuits. For load of 5 KW or more earth leakage circuit breaker of proper rating shall be provided in the circuits.
- 5.2.11 Wires and cables shall be properly supported and approved method of fixing shall be adopted. Cables shall not be left on floor/ground. Loose hanging of wires & cables shall be avoided. Lightning and power circuits shall be kept distinct and separate.
- 5.2.12 Reinforcement rods or any metallic part of structure shall not be used for supporting wires and cables, fixtures, equipment, earthing etc.
- 5.2.13 All cables and wires shall be adequately protected mechanically against damages. In case, the cable required to be laid underground, it shall be adequately protected by covering the same with bricks, Plain Cement Concrete (PCC), tile or any other approved means.
- 5.2.14 All armoured cables shall be properly terminated by using suitable cable glands. Multi-stranded conductor cables shall be connected by using cable lugs/ sockets. Cable lugs shall preferably be crimped. They shall be of proper size and shall correspond to the current rating and size of the cable. Twisted connections will not be allowed.
- 5.2.15 All the Distribution Boards, Switch Fuse units, Bus bar chambers, ducts, cubicles etc. shall have MS enclosures and shall be dust, vermin and waterproof. The Distribution Boards, switches etc. shall be so fixed that they shall be easily accessible.
- 5.2.16 The Contractor shall provide proper enclosures/covers of approved size and shape for protection of all switch boards, equipment etc. against rain.
- 5.2.17 Isolating switches shall be provided close to equipment for easy disconnection of electrical equipment or conductors from the source of supply, when repair or maintenance work has to be done.
- 5.2.18 All connections to lighting fixtures, starters or other power supplies shall be provided with PVC insulated, PVC sheathed twin/three/four core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. Taped joints shall not be allowed and the connections may be made in looping system. Electric starter of motors, Switches shall not be mounted on wooden boards. Only sheet steel mounting or iron framework shall be used.
- 5.2.19 Only PVC insulated and PVC sheathed wires or armored PVC insulated and sheathed cables shall be used for external power supply connections of temporary nature. Weatherproof rubber wires shall not be used for any temporary power supply connections. Taped joints in the wires shall not be used.
- 5.2.20 All portable appliances shall be provided with three-core cable and three-pin plug. The third pin of the plug shall invariably be earthed. It shall be ensured that the metal part of the equipment shall be effectively earthed.

5.3 House Keeping

- 5.3.1 The Contractor shall at all times keep his work spot, site office and surroundings clean and tidy from rubbish, scrap, surplus materials and unwanted tools and equipment so as not to create unsafe condition or fire hazard.
- 5.3.2 Welding and other electrical cables shall be properly routed.
- 5.3.3 No materials on any of the sites of work shall be so stacked or placed as to cause danger or

inconvenience to any person or the public.

- 5.3.4 Cleaning of the work area at the end of the day and upon completion of work is a part of the job.
- 5.3.5 The Engineer-in-charge has the right to stop work if the Contractor fails to improve upon the housekeeping after having been notified.

5.4 Fire Safety

- 5.4.1 All necessary precautions shall be taken to prevent outbreak of fires at the site. Adequate provisions shall be made to extinguish fires, if it still breaks out.
- 5.4.2 Quantities of combustible materials like timber, bamboos, coal, paints, etc., shall be kept minimum in order to avoid unnecessary accumulation of combustibles at site.
- 5.4.3 Containers of paints, thinners and allied materials shall be stored in a separate room which shall be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint shall be kept covered or properly fitted with lid and shall not be kept open except while using.
- 5.4.4 Fire extinguishers shall be located at the site at appropriate places.
- 5.4.5 Adequate number of workmen shall be given education and training in firefighting and extinguishing methods.

5.5 Scaffolding

- 5.5.1 Accidents are also caused by the ladders falling or the climber losing his balance or failure of scaffolds. As such, utmost care should be taken as ladder and scaffolding are extensively used for maintenance and construction purpose. Some of the safe practices as listed below are to be observed before commencement of work.
- 5.5.2 Adequate and safe means of access and exit shall be provided for all work places, at all elevations. Using of scaffolding members (avoiding a ladder) for approach to high elevations shall not be permitted.
- 5.5.3 Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short duration work as can be done safely from ladders. Ladder shall be of rigid construction having sufficient strength for the intended loads and made either of good quality wood or metal and all ladders shall be maintained well for safe working condition.
- 5.5.4 Short ladder must not be tied together to give greater lengths. All ladders of 6 m or above should be tied to the structure on which they are resting to prevent from. An extra worker shall be engaged for holding the ladder if ladder is not securely fixed. If the ladder is used for carrying materials, suitable foot holds and handholds shall be provided on the ladder. The ladder shall be given an inclination not steeper than 1 in 4(1 horizontal and 4 vertical). Ladders shall not be used for climbing carrying materials in hands. While climbing both the hands shall not be free.
- 5.5.5 The free length must extend by 1.5 meters above the point of landing but should not be more than 1/4th of the ladder length. No portable single ladder shall be over 9 meter in length. Metal ladders may not be used for electrical work.
- 5.5.6 Scaffolding or staging more than 3.5 m above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a standard guard rail properly attached, bolted, braced or otherwise secured at least 1.0 m high above the floor or platform of such scaffolding or staging. The guard rail shall extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of materials. Standard railing shall have posts not more than 2 m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top rail. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure. Scaffolding and ladder shall conform to relevant IS

specification (IS: 3696). Timber/Bamboo scaffolding shall not be used.

- 5.5.7 Working platforms of scaffolds shall have toe boards at least 15 cm in height to prevent materials from falling down.
- 5.5.8 Every part of scaffolding must be of sound construction. Steel planks used in scaffolds should be carefully inspected and should be tied on both sides with suitable fixing arrangements to the pipes. Scaffolding must not be overloaded.
- 5.5.9 The Steel pipe & clamp to be used must be of good quality. The spacing between the vertical & horizontal members of the scaffolding should not be more than 1.5m and 1 meter respectively. The scaffolding should be further strengthened with cross bracing and stays.
- 5.5.10 The scaffolds should be provided with short climbs ladders for safe ascending/ descending of workmen in the job. Only those workmen who are well trained/ experienced in erecting scaffolding should be engaged for scaffolding work. The men working in the actual erection/dismantling of the scaffolding and all persons using the scaffolding must use appropriate PPEs.
- 5.5.11 A sketch of the scaffolding proposed to be used shall be prepared and approved by the Engineer-in-charge, prior to start of erection of scaffolding. All scaffolds shall be examined by Engineer-In-Charge before use.
- 5.5.12 Working platform, gangways and stairways shall be so constructed that they shall not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5 m above ground level or floor level, they shall be closely boarded, shall have adequate width for easy movement of persons and materials and shall be suitably guarded.
- 5.5.13 The planks used for working platform shall not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks shall be rigidly tied at both ends to prevent sliding and slippage. The thickness of the planks shall be adequate to take load of men and materials and shall not collapse.
- 5.5.14 Each opening in the floor of a building or at a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing.
- 5.5.15 Safe means of access shall be provided to all working platforms and other elevated working places. Every ladder shall be securely fixed. No single portable ladder shall be over 9 m in length. For ladders up to 3m in length the width between side rails in the ladder shall in no case be less than 300 mm. For longer ladders this width shall be increased by at least 20 mm for each additional meter of length. Step spacing shall be uniform and shall not exceed 300 mm.
- 5.5.16 Adequate precautions shall be taken to prevent danger from electrical lines and equipment. No scaffolding, ladder, working platform, gangway runs, etc. shall exist within 3 meters of any uninsulated electric wire. Whenever electric power and lighting cables are required to run through (pass on) the scaffolding or electrical equipments are used, such scaffolding structures shall have minimum two earth connections with earth continuity conforming to IS Code of Practice.

5.6 Lifting/Hoisting Equipment and Erection

Accidents do happen while working overhead or due to failure or unsafe use of hoisting equipment. As such, adequate care must be taken to prevent it. The following are some of the precautions to ensure safety of the workmen engaged by the contractor:

- 5.6.1 Contractors involved in handling of any material overhead must install necessary barricades, warning signs or take any other steps necessary to prevent others from walking/standing beneath the load.
- 5.6.2 Hoisting machines, tackles including their attachments, anchorage and supports must conform to the good mechanical construction, sound materials and adequate strength and free from patent defect and shall be preserved in good condition.
- 5.6.3 All equipments like crane, chain blocks, sling, rope including all other material handling

equipments must have valid load test certificates.

- 5.6.4 Thorough inspection and load testing of lifting machines and tackles shall be done by a competent person at least once every 12 months and records of such inspection and testing shall be maintained.
- 5.6.5 Every crane driver or hoisting appliances operator shall be properly qualified and no person below the age 21 years should be in charge of any hoisting machine.
- 5.6.6 Every hoisting machine and all gears shall be plainly marked with the safe working load. No part of any machine or gear shall be loaded beyond the safe working load (SWL).
- 5.6.7 In case of IPR's machines, the safe working load shall be notified by Engineer-in-charge. For contractor's machines, the contractor shall notify the safe working load to Engineer-in-charge.
- 5.6.8 Motors, gearing transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with safe guards.
- 5.6.9 No cranes shall be left unattended with hanging load and on completion of work, the boom/jib of the crane may be brought down and kept in horizontal condition.
- 5.6.10 No crane including hydra crane shall be allowed to move on road with suspended load.

5.7 Welding and Gas Cutting

- 5.7.1 Welding and gas cutting operations shall be done only by qualified and authorized persons and as per IS specifications and Code of Practice.
- 5.7.2 Welding and gas cutting shall not be carried out in places where flammable or combustible materials are kept and where there is danger of explosion due to presence of gaseous mixtures.
- 5.7.3 Welding and gas cutting equipment including hoses and cables shall be maintained in good condition.
- 5.7.4 Barriers shall be erected to protect other persons from harmful rays from the work. When welding or gas cutting is in elevated positions, precautions shall be taken to prevent sparks or hot metal falling on persons or flammable materials. Adequate ventilation shall be provided while welding in confined space.
- 5.7.5 Suitable type of protective clothing consisting of fire resistant gauntlet gloves, leggings, boots and aprons shall be provided to workers as protection from heat and hot metal splashes. Welding shields with filter glasses of appropriate shade shall be worn as face protection.
- 5.7.6 Welding and gas cutting shall not be done on drums, barrels, tanks or other containers unless they have been emptied, cleaned thoroughly and it is made certain that no flammable material is present.
- 5.7.7 Fire extinguisher shall be available near the location of welding operations. Prior permission shall be obtained from safety section for working at vulnerable areas and operating areas before flame cutting/welding is taken up.
- 5.7.8 Tarpaulin, if used should be of fire retardant.
- 5.7.9 For electric (Arc) welding the following additional safety precautions shall be taken:
 - When electrical welding is undertaken near pipe lines carrying flammables, such pipe lines shall not be used as part of earth conductor but a separate earth conductor shall be connected to the machine directly from the job.
 - Personnel contact with the electrode or other live parts of electric welding equipment shall be avoided.
 - Extreme caution shall be exercised to prevent accidental contact of electrodes with ground.
- 5.7.10 The cylinders containing poisonous/toxic or inflammable / explosive gas like Oxygen, Acetylene, Hydrogen, Ammonia, Chlorine, CO₂ etc. shall be handled safely taking due cares. To handle / shift such cylinders a special trolley / cage meant for it must be used but in no case it should be rolled.
- 5.7.11 No domestic LPG cylinder is allowed for Hot Work such as Gas Welding / Gas Cutting.

5.7.12 A person must remain in the area for a minimum period of 30 minutes after hot work is completed to ensure the site is safe. Welding machine shall be switched off after the completion of work.

5.8 Grinding

5.8.1 All portable grinders shall be used only with their wheel guards in position to reduce the danger from flying fragments should the wheel break during the use.

5.8.2 Grinding wheels of specified diameter only shall be used on a grinder- portable or pedestal - in order not to exceed the prescribed peripheral speed.

5.8.3 Goggles shall be used during grinding operation.

5.9 Painting

5.9.1 The Contractor shall not employ women on the work of painting with products containing lead in any form. Only men above the age of 18 years shall be employed on the work with lead paint.

5.9.2 Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored, mixed or used. A caution board, with the instructions written in national/regional language, "SMOKING - STRICTLY PROHIBITED" shall be displayed in the vicinity where painting is in progress or where paints are stored.

5.9.3 When painting work is done in a closed room or in a confined space, adequate ventilation shall be provided. If adequate ventilation cannot be provided, workers shall wear suitable respirators.

5.9.4 Epoxy resins and their formulations used for painting shall not be allowed to come in contact with the skin. The workers shall use plastic gloves and/or suitable barrier creams.

5.9.5 Workers shall thoroughly wash hands and feet before leaving the work. Work clothes shall be changed and laundered frequently.

5.10 Radiography

5.10.1 Only properly trained, qualified personnel shall be allowed to use radiation producing equipment or handle radioactive source.

5.10.2 Radiography works may be carried out preferably after office hours or on holidays.

5.10.3 The following are some basic rules to be followed:

- The ionisation radiation source shall not be left unattended.
- Radiation film and dose meter shall be used.
- The exposed area shall be clearly identified, barricaded by rope or other effective means and internationally recognized symbol for radiation shall be placed around the perimeter of any area which may be affected by radiation.
- Contractor shall coordinate with safety officer to ensure that the dose rate at barricade does not exceed 0.75 milirems per hour.

5.11 Maintenance of Equipment

5.11.1 Disconnect the electrical power before starting the mechanical maintenance of the equipment/machine.

5.11.2 During the maintenance of equipment/machine, it should be doubly ensured that the machine does not move unexpectedly causing injury to the person involved.

5.11.3 Full proof lockout system or power lock off system should be followed. Power lock off system shall include the electrical power, energy stored in springs, suspended parts or any other potential power sources.

5.11.4 A highly legible information plate should be kept near the equipment/ machine under

maintenance giving the details of work being carried-out, warning instructions etc., to enable the workers, supervisors or any visitors to keep away.

- 5.11.5 Removal of such plates immediately after the maintenance, repair etc., shall be -insured.
- 5.11.6 Instructions from the machine manufacturers' service/installation book should be followed during maintenance of the equipment.
- 5.11.7 Only trained personnel should be employed for carrying out maintenance, repair, adjustment etc.
- 5.11.8 Identified tools should be used to carry out such works.
- 5.11.9 Guards should be replaced immediately after the maintenance work.
- 5.11.10 Eli Chips and debris must be swept up and properly disposed.

6. REPORTING FORM

6.1 Near Miss Reporting Form

(This form may be filled and submitted to the Safety Section within 48 hours from the incident time)

1. Name of Person Affected/Observed Near miss:	2. Group/Division/Section:
3. Designation:	4. Location of Near Miss:
5. Date & Time of Near Miss:	6. Contact no./Ext. No.:
7. Near Miss Description: <i>(Describe fully, the protocol / procedure been followed including all substances, equipment and machinery being used which was related to the near miss.)</i> ----- ----- ----- ----- ----- ----- -----	
8. Possible Damage that might have happened: (i) (ii)	
9. Corrective Actions Proposed to prevent reoccurrence of such near miss incident(s): 	

Submitted By:

Signature:

Name:

Date:

6.3 Incident Reporting Form

(This form is to be filled and submitted for all incidents except near miss to safety section within 72 hours from the incident time)

C. PERSONNEL INFORMATION

Name of Injured:		PR No.:
Group:		Contact No./ Ext. No.:
Incident Site:	Employee Category: <input type="checkbox"/> Permanent Employee <input type="checkbox"/> Project Employee <input type="checkbox"/> Contract <input type="checkbox"/> AMC <input type="checkbox"/> TPIA <input type="checkbox"/> Service Provider/Vendor <input type="checkbox"/> Other Category	

B. CATEGORY OF INCIDENT

First aid case	
Medical case	
Asset/Equipment/Property damage	
Vehicle incident	
Fire	
Fatal Accident	

C. INCIDENT INFORMATION

Date / Time of Incident	Date/Time Reported To Group Leader
Person Reporting Incident	
Incident Description:	
Injury / Illness Description:	

H. TREATMENT INFORMATION

Treatment Description		
Treatment Administered By	Date Of Treatment	Time Of Treatment
Phone No of clinic / hospital	Name of Clinic/Hospital:	
Pl. attach medical officer's prescription for medical treatment: -	Released from Hospital Date / Time: -	

I. INITIAL CORRECTIVE ACTION INFORMATION

Immediate Causes of incident:

Initial Corrective actions taken

- 1.
- 2.
- 3.

Prepared By:

Sign:

Name:

Designation:

Date:

Reviewed By:

Sign:

Name:

Designation:

Date:

SECTION: 3 - (iv) Model Rules for the Protection of Health and Sanitary Arrangements for Workers Employed by Institute or its Contractors

1. APPLICATION

These rules shall apply to all buildings and construction works in charge of Institute For Plasma Research in which twenty or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the contract work is in progress.

2. DEFINITION

Work place means a place where twenty or more workers are ordinarily employed in connection with construction work on any day during the period during which the contract work is in progress.

3. FIRST-AID FACILITIES

(i) At every work place there shall be provided and maintained, so as to be easily accessible during working hours, first-aid boxes at the rate of not less than one box for 150 contract labour or part thereof ordinarily employed.

(ii) The first-aid box shall be distinctly marked with a red cross on white back ground and shall contain the following equipment:

(a) For work places in which the number of contract labour employed does not exceed 50 - Each first-aid box shall contain the following equipments :-

1. 6 small sterilized dressings.
2. 3 medium size sterilized dressings.
3. 3 large size sterilized dressings.
4. 3 large sterilized burn dressings.
5. 1 (30 ml.) bottle containing a two per cent alcoholic solution of iodine.
6. 1 (30 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
7. 1 snakebite lancet.
8. 1 (30 gms.) bottle of potassium permanganate crystals.
9. 1 pair scissors.
10. 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
11. 1 bottle containing 100 tablets (each of 5 gms.) of aspirin.
12. Ointment for burns.
13. A bottle of suitable surgical antiseptic solution.

(b) For work places in which the number of contract labour exceed 50. Each first-aid box shall contain the following equipments.

1. 12 small sterilized dressings.
2. 6 medium size sterilized dressings.
3. 6 large size sterilized dressings.

4. 6 large size sterilized burn dressings.
5. 6 (15 gms.) packets sterilized cotton wool.
6. 1 (60 ml.) bottle containing a two per cent alcoholic solution iodine.
7. 1 (60 ml.) bottle containing salvolatile having the dose and mode of administration indicated on the label.
8. 1 roll of adhesive plaster.
9. 1 snake bite lancet.
10. 1 (30 gms.) bottle of potassium permanganate crystals.
11. 1 pair scissors.
12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institutes/Government of India.
13. A bottle containing 100 tablets (each of 5 gms.) of aspirin.
14. Ointment for burns.
15. A bottle of suitable surgical antiseptic solution.

(iii) Adequate arrangements shall be made for immediate recoument of the equipment when necessary.

(iv) Nothing except the prescribed contents shall be kept in the First-aid box.

(v) The first-aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

(vi) A person in charge of the First-aid box shall be a person trained in First-aid treatment, in the work places where the number of contract labour employed is 150 or more.

(vii) In work places where the number of contract labour employed is 500 or more and hospital facilities are not available within easy distance from the works. First-aid posts shall be established and run by a trained compounder. The compounder shall be on duty and shall be available at all hours when the workers are at work.

(viii) Where work places are situated in places which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or person suddenly taken ill to the nearest hospital.

4. DRINKING WATER

(i) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

(ii) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

(iii) Every water supply or storage shall be at a distance of not less than 50 feet from any latrine drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap door which shall be dust and waterproof.

(iv) A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

5. WASHING FACILITIES

(i) In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of contract labour employed therein.

(ii) Separate and adequate cleaning facilities shall be provided for the use of male and female workers.

(iii) Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

6. LATRINES AND URINALS

(i) Latrines shall be provided in every work place on the following scale namely:-

(a) Where female are employed there shall be at least one latrine for every 25 females.

(b) Where males are employed, there shall be at least one latrine for every 25 males.

Provided that where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females as the case may be up to the first 100, and one for every 50 thereafter.

(ii) Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.

(iii) Construction of latrines: The inside walls shall be constructed of masonry or some suitable heat-resisting materials and shall be cement washed inside and outside at least once a year, Latrines shall not be of a standard lower than borehole system.

(iv)(a) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women Only" as the case may be.

(b) The notice shall also bear the figure of a man or of a woman, as the case may be.

(v) There shall be at least one urinal for male workers up to 50 and one for female workers up to fifty employed at a time, provided that where the number of male or female workmen, as the case may be exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 and one for every 100 or part thereafter.

(vi)(a)The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

(b) Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the Public Health Authorities.

(vii) Water shall be provided by means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.

(viii) Disposal of excreta :-Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternately excreta may be disposed of by putting a layer of night soil at the bottom of a pucca

tank prepared for the purpose and covering it with a 15 cm. layer of waste or refuse and then covering it with a layer of earth for a fortnight (when it will turn to manure).

(ix) The contractor shall at his own expense, carry out all instructions issued to him by the Engineer-in-Charge to effect proper disposal of night soil and other conservancy work in respect of the contractor's workmen or employees on the site. The contractor shall be responsible for payment of any charges which may be levied by Municipal or Cantonment Authority for execution of such on his behalf.

7. PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for meals and the other two for rest separately for the use of men and women labour. The height of each shelter shall not be less than 3 metres (10 ft.) from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sq.m. (6 sq. ft) per head.

Provided that the Engineer-in-Charge may permit subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

8. CRECHES

(i) At every work place, at which 20 or more women worker are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of six years. One room shall be used as a play room for the children and the other as their bedroom. The rooms shall be constructed with specifications as per clause 19H (ii) a, b & c.

(ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

(iii) The contractor shall supply adequate number of toys and games in the play room and sufficient number of cots and beddings in the bed room.

(iv) The contractor shall provide one ayaa to look after the children in the crèche when the number of women workers does not exceed 50 and two when the number of women workers exceeds 50.

(v) The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

9. CANTEENS

(i) In every work place where the work regarding the employment of contract labour is likely to continue for six months and where in contract labours numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such contract labour.

(ii) The canteen shall be maintained by the contractor in an efficient manner.

(iii) The canteen shall consist of at least a diningHall , kitchen, storeroom, pantry and washing places separately for workers and utensils.

(iv) The canteen shall be sufficiently lighted at all times when any person has access to it.

(v) The floor shall be made of smooth and impervious materials and inside walls shall be lime-washed or colour washed at least once in each year. Provided that the inside walls of the kitchen shall be lime-washed every four months.

(vi) The premises of the canteen shall be maintained in a clean and sanitary condition.

(vii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

(viii) Suitable arrangements shall be made for the collection and disposal of garbage.

(ix) The dining hall shall accommodate at a time 30 per cent of the contract labour working at a time.

(x) The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chairs shall not be less than one square meter (10 sft) per diner to be accommodated as prescribed in sub-Rule 9.

(xi) (a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers in proportion to their number.

(b) Washing places for women shall be separate and screened to secure privacy.

(xii) Sufficient tables stools, chair or benches shall be available for the number of diners to be accommodated as prescribed in sub-Rule 9.

(xiii) (a)1. There shall be provided and maintained sufficient utensils crockery, furniture and any other equipments necessary for the efficient running of the canteen.

2. The furniture utensils and other equipment shall be maintained in a clean and hygienic condition.

(b)1. Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.

2. A service counter, if provided, shall have top of smooth and impervious material.

3. Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipments.

(xiv) The food stuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.

(xv) The charges for food stuffs, beverages and any other items served in the canteen shall be based on No profit, No loss" and shall be conspicuously displayed in the canteen.

(xvi) In arriving at the price of foodstuffs, and other article served in the canteen, the following items shall not be taken into consideration as expenditure namely:

(a) The rent of land and building.

(b) The depreciation and maintenance charges for the building and equipments provided for the canteen.

(c) The cost of purchase, repairs and replacement of equipments including furniture, crockery, cutlery and utensils.

(d) The water charges and other charges incurred for lighting and ventilation.

(e) The interest and amounts spent on the provision and maintenance of equipments provided for the canteen.

(xvii) The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors.

10. ANTI-MALARIAL PRECAUTIONS

The contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer-in-Charge including the filling up of any borrow pits which may have been dug by him.

11. The above rules shall be incorporated in the contracts and in notices inviting tenders and shall form an integral part of the contracts.

12. AMENDMENTS

Institute may, from time to time, add to or amend these rules and issue directions, it may consider necessary for the purpose of removing any difficulty which may arise in the administration thereof.

SECTION: 3 - (v) Contractor's Labour Regulations with Annexures.

1. SHORT TITLE

These regulations may be called the Institute Contractors Labour Regulations.

2. DEFINITIONS

(i) **Workman** means any person employed by Institute or its contractor directly or indirectly through a subcontractor with or without the knowledge of the Institute to do any skilled, semiskilled or unskilled manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment are expressed or implied but does not include any person:-

(a) Who is employed mainly in a managerial or administrative capacity :or

(b) Who, being employed in a supervisory capacity draws wages exceeding five hundred rupees per mensem or exercises either by the nature of the duties attached to the office or by reason of powers vested in him, functions mainly of managerial nature : or

(c) Who is an out worker, that is to say, person to whom any article or materials are given out by or on behalf of the principal employers to be made up cleaned, washed, altered, ornamental finished, repaired adopted or otherwise processed for sale for the purpose of the trade or business of the principal employers and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the control and management of the principal employer. No person below the age of 18 years shall be employed to act as a workman.

(ii) **Fair Wages** means wages whether for time or piece work fixed and notified under the provisions of the Minimum Wages Act from time to time.

(iii) **Contractors** shall include every person who undertakes to produce a given result other than a mere supply of goods or articles of manufacture through contract labour or who supplies contract labour for any work and includes a subcontractor.

(iv) **Wages** shall have the same meaning as defined in the Payment of Wages Act.

3(i) Normally working hours of an adult employee should not exceed 9 hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

(ii) When an adult worker is made to work for more than 9 hours on any day or for more than 48 hours in any week, he shall be paid over time for the extra hours put in by him at double the ordinary rate of wages.

(iii)(a) Every worker shall be given a weekly holiday normally on a Sunday, in accordance with the provisions of the Minimum Wages (Central) Rules 1960 as amended from time to time irrespective of whether such worker is governed by the Minimum Wages Act or not.

b) Where the minimum wages prescribed by the Government under the Minimum Wages Act are not inclusive of the wages for the weekly day of rest, the worker shall be entitled to rest day wages at the rate applicable to the next preceding day, provided he has worked under the same contractor for a continuous period of not less than 6 days.

(c) Where a contractor is permitted by the Engineer-in-Charge to allow a worker to work on a normal weekly holiday, he shall grant a substituted holiday to him for the whole day on one of the five days immediately before or after the normal weekly holiday and pay wages to such worker for the work performed on the normal weekly holiday at overtime rate.

4. DISPLAY OF NOTICE REGARDING WAGES ETC.

The contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clear and legible condition in conspicuous places on the work, notices in English and in the local Indian languages spoken by the majority of the workers giving the minimum rates of wages fixed under Minimum Wages Act, the actual wages being paid, the hours of work for which such wage are earned, wages periods, dates of payments of wages and other relevant information as per Appendix 'III'.

5. PAYMENT OF WAGES

- (i) The contractor shall fix wage periods in respect of which wages shall be payable.
- (ii) No wage period shall exceed one month.
- (iii) The wages of every person employed as contract labour in an establishment or by a contractor where less than one thousand such persons are employed shall be paid before the expiry of seventh day and in other cases before the expiry of tenth day after the last day of the wage period in respect of which the wages are payable.
- (iv) Where the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.
- (v) All payment of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.
- (vi) Wages due to every worker shall be paid to him direct or to other person authorised by him in this behalf.
- (vii) All wages shall be paid in current coin or currency or in both.
- (viii) Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the Payment of Wages Act 1956.
- (ix) A notice showing the wages period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Engineer-in-Charge under acknowledgment.
- (x) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Junior Engineer or any other authorised representative of the Engineer in-Charge who will be required to be present at the place and time of disbursement of wages by the contractor to workmen.
- (xi) The contractor shall obtain from the Junior Engineer or any other authorised representative of the Engineer-in-Charge as the case may be, a certificate under his signature at the end of the entries in the "Register of Wages" or the "Wage-cum Muster Roll" as the case may be in the following form:
"Certified that the amount shown in column No..... has been paid to the workman concerned in my presence on..... at....."

6. FINES AND DEDUCTIONS WHICH MAY BE MADE FROM WAGES

- (i) The wages of a worker shall be paid to him without any deduction of any kind except the following
- (a) Fines
 - (b) Deductions for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.
 - (c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody, or for loss of money or any other deduction which he is required to account, where such damage or loss is directly attributable to his neglect or default.
 - (d) Deduction for recovery of advances or for adjustment of overpayment of wages, advances granted shall be entered in a register.
 - (e) Any other deduction which the Central Government may from time to time allow.
- (ii) No fines should be imposed on any worker save in respect of such acts and omissions on his part as have been approved of by the Chief Labour Commissioner. Note :- An approved list of Acts and Omissions for which fines can be imposed is enclosed at Appendix-X
- (iii) No fine shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.
- (iv) The total amount of fine which may be imposed in any one wage period on a worker shall not exceed an amount equal to three paise in a rupee of the total wages, payable to him in respect of that wage period.
- (v) No fine imposed on any worker shall be recovered from him by installment, or after the expiry of sixty days from the date on which it was imposed.
- (vi) Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.

7. LABOUR RECORDS

- (i) The contractor shall maintain a **Register of persons employed** on work on contract in Form XIII of the CL (R&A) Central Rules 1971 (Appendix IV)
- (ii) The contractor shall maintain a **Muster Roll** register in respect of all workmen employed by him on the work under Contract in Form XVI of the CL (R&A) Rules 1971 (AppendixV).
- (iii) The contractor shall maintain a **Wage Register** in respect of all workmen employed by him on the work under contract in Form XVII of the CL (R&A) Rules 1971 (Appendix VI)
- (iv) **Register of accidents** - The contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:
- a) Full particulars of the labourers who met with accident.
 - b) Rate of Wages.
 - c) Sex
 - d) Age
 - e) Nature of accident and cause of accident.
 - f) Time and date of accident.
 - g) Date and time when admitted in Hospital.

- h) Date of discharge from the Hospital.
- i) Period of treatment and result of treatment.
- j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
- k) Claim required to be paid under Workmen's Compensation Act.
- l) Date of payment of compensation.
- m) Amount paid with details of the person to whom the same was paid.
- n) Authority by whom the compensation was assessed.
- o) Remarks

(v) The contractor shall maintain a **Register of Fines** in the Form XII. of the CL (R&A) Rules 1971 (Appendix-XI)

The contractor shall display in a good condition and in a conspicuous place of work the approved list of acts and omissions for which fines can be imposed (Appendix-X)

(vi) The contractor shall maintain a **Register of deductions for damage or loss** in Form XX of the CL (R&A) Rules 1971 (Appendix-XII)

(vii) The contractor shall maintain a **Register of Advances** in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIII)

(viii) The contractor shall maintain a **Register of Overtime** in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIV)

8. ATTENDANCE CARD-CUM-WAGE SLIP

(i) The contractor shall issue an **Attendance card-cum-wage slip** to each workman employed by him in the specimen format (Appendix-VII)

(ii) The card shall be valid for each wage period.

(iii) The contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after the rest interval, before he actually starts work.

(iv) The card shall remain in possession of the worker during the wage period under reference..

(v) The contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the wage period under reference.

(vi) The contractor shall obtain the signature or thumb impression of the worker on the wage slip at the time of disbursement of wages and retain the card with himself.

9. EMPLOYMENT CARD

The contractor shall issue an **Employment Card** in Form XIV of the CL (R&A) Central Rules 1971 to each worker within three days of the employment of the worker (Appendix-VIII).

10. SERVICE CERTIFICATE

On termination of employment for any reason whatsoever the contractor shall issue to the workman whose services have been terminated, a **Service certificate** in Form XV of the CL (R&A) Central Rules 1971 (Appendix-IX)

11. PRESERVATION OF LABOUR RECORDS

All records required to be maintained under Regulations Nos. 6&7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by the Engineer-in-Charge or Labour Officer or any other officers authorised by the Ministry of Urban Development in this behalf.

12. POWER OF LABOUR OFFICER TO MAKE INVESTIGATIONS OR ENQUIRY

The Labour Officer or any person authorised by Central Government on their behalf shall have power to make enquires with a view to ascertaining and enforcing due and proper observance of Fair Wage Clauses and the Provisions of these Regulations. He shall investigate into any complaint regarding the default made by the contractor or subcontractor in regard to such provision.

13. REPORT OF LABOUR OFFICER

The Labour Officer or other persons authorized as aforesaid shall submit a report of result of his investigation or enquiry to the Executive Engineer concerned indicating the extent, if any, to which the default has been committed with a note that necessary deductions from the contractors bill be made and the wages and other dues be paid to the labourers concerned. In case an appeal is made by the contractor under Clause 13 of these regulations, actual payment to labourers will be made by the Engineer in Charge after the Chaiperson I-CDC IPR has given his decision on such appeal.

i) The Chief Administrative Officer shall arrange payments to the labour concerned within 45 days from the receipt of the report from the Labour Officer or the Chaiperson I-CDC IPR as the case may be.

14. APEAL AGAINST THE DECISION OF LABOUR OFFICER

Any person aggrieved by the decision and recommendations of the Labour Officer or other person so authorised may appeal against such decision to the Chaiperson I-CDC IPR within 30 days from the date of decision, forwarding simultaneously a copy of his appeal to the Chief Administrative Officer but subject to such appeal, the decision of the officer shall be final and binding upon the contractor.

15. PROHIBITION REGARDING REPRESENTATION THROUGH LAWYER

(i) A workman shall be entitled to be represented in any investigation or enquiry under these regulations by:

- a) An officer of a registered trade union of which he is a member.
- b) An officer of a federation of trade unions to which the trade union referred to in clause (a) is affiliated.
- c) Where the employer is not a member of any registered trade union, by an officer of a registered trade union, connected with the industry in which the worker is employed or by any other workman employed in the industry in which the worker is employed.

(ii) An employer shall be entitled to be represented in any investigation or enquiry under these regulations by :-

a) An officer of an association of employers of which he is a member.

b) An officer of a federation of associations of employers to which association referred to in clause (a) is affiliated.

c) Where the employer is not a member of any association of employers, by an officer of association of employer connected with the industry in which the employer is engaged or by any other employer, engaged in the industry in which the employer is engaged.

(iii) No party shall be entitled to be represented by a legal practitioner in any investigation or enquiry under these regulations.

16. INSPECTION OF BOOKS AND SLIPS

The contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour Officer or any other person, authorised by the Central Government on his behalf.

17. SUBMISSIONS OF RETURNS

The contractor shall submit periodical returns as may be specified from time to time.

18. AMENDMENTS

The Institute / Government may from time to time add to or amend the regulations and on any question as to the application/Interpretation or effect of those regulations the decision of the Chairperson I-CDC , IPR shall be final.

PROFORMA OF REGISTERS

Appendix 'I' Register of Maternity Benefits (Clause 19F)

1. Name and address of the contractor:

2. Name and location of the work:-

Name of the Employ	Father's / Husband's Name	Nature of employment	Period of actual employment	Date on which notice of confinement given
1	2	3	4	5

Date of delivery /miscarriage	Date on which maternity leave commenced and ended			
	In case of Delivery		in case of mis-carrriage	
	Commenced	Ended	Commenced	Ended
	7	8	9	10

Leave pay paid to the employee

In case of delivery		In case of miscarriage		Remarks
Rate of leave pay	Amount paid	Rate of leave pay	Pay amount paid	
11	12	13	14	15

Appendix 'II'

SPECIMEN FORM OF THE REGISTER, REGARDING MATERNITY BENEFIT ADMISSIBLE TO THE CONTRACTOR'S LABOUR

Name and address of the contractor

Name and location of the work

1. Name of the woman and her husband's name:
2. Designation:
3. Date of appointment:
4. Date with months and year in which she is employed:
5. Date of discharge / dismissal, if any:
6. Date of Production of certificates in respect of pregnancy:
7. Date on which woman informs about the expected delivery:
8. Date of delivery / miscarriage/ death:
9. Date of production of certificate in respect of delivery / miscarriage:
10. Date with amount of maternity / death benefit paid in advance of expected delivery:
11. Date with amount of subsequent payment of maternity benefit:
12. Name of person nominated by the women to receive the payment of the maternity benefit after her death:
13. If the woman dies, the date of her death, the name of the person to whom maternity benefit amount was paid, the month thereof and the date of payment:
14. Signature of the contractor authenticating entries in the register:
15. Remark column for the use of inspecting officer:

Appendix 'III'

Labour Board

1. Name of Work:
2. Name of Contractor:
3. Address of contractor
4. Name of Labour Officer of institute:
5. Name of Labour Enforcement Officer:
6. Address of Enforcement officer;

SI.N o	Category	Minimum Wage fixed	Actual Wagepaid	Number Present	Remarks

Weekly Holiday:

Wage Period:

Date of Payment of wages:

Working Hours:

Rest interval:

Appendix ' IV'

Form XIII (See Rule 75)

Register of workmen employed by contractor

Name and Address of contractor

Name and address of establishment under which contract is carried on.

Nature and location of work.

Name and address of principal Employer.

Si. No.	Name and surname of workmen	Age as on	Father's / Husband's name	Nature of employment / designation	Permanent home address of workmen (Village and Tehsil, Taluk and District)	Local Address	Date of commencement of employment	Signature or thumb impression of Workmen	Date of termination of employment	Reason for terminations	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Appendix 'V'

Form XVI

Muster Roll

Name and Address of contractor:

Name and address of establishment under which contract is carried on.

Nature and location of work.

Name and address of Principal Employer.

For the month of / fortnight:

Si. No	Name of Workmen	Father's / Husband's Name	Sex	Dates					Remarks
				1	2	3	4	5	
1	2	3	4						6

Appendix 'VI'

Form XVII (see rule 78(2)(a))

REGISTER OF WAGES

Name and Address of contractor:

Name and address of establishment under which contract is carried on.

Nature and location of work.

Name and address of Principal Employer.

Wages period ----- Monthly/fortnight

Sl. No	Name of workmen	Serial No. in the register of workmen	Designation/nature of work done	No. of days worked	Units of work done	Daily rate of wages price rate	Amount of wages earned						Net amount paid	Signature or thumb impression of the workmen	Initial of contractor or his representative
							Basic Wage	Dearness allowance	Over Time	Other Cash payments (Indicate nature)	Tax	Deduction (If any Indicate nature)			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Appendix 'VII'

(Observe)

Wage Card No.

WAGE CARD

Name and address of contractor

Date of Issue

Name and location of work

Designation

Name of workmen

Month/Fortnight

Rate of wages

1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Morning:

Rate:

Evening:

Amount

Initial:

Received from

the sum of Rs.

On amount of my wages

The wages card is valid for one month from the date of issue.

Signature

Appendix 'VII'

(Reserve)

FORM XIX

(See Rule 78(2)(b))

WAGES SLIP

Name and address of contractor:

Name and Father's/Husband's name of workman:

Nature and location of work:

For the week/Fortnight/Month ending:

1. No. of days worked:
2. No. of units worked in case of piece:
3. Rate of daily wages/piece rate:
4. Amount of overtime wages:
5. Gross wages payable:
6. Deduction, if any:
7. Net amount of waged paid:

Initial of the contractor or his representative

Appendix 'VIII'

FORM XIV

(See Rule 76)

EMPLOYMENT CARD

Name and address of Contractor:

Name and address of establishment in under:

Name of work and location of work:

Name and address of principal employer:

1. Name of the workmen:
2. SI.No. in the register of workman:
3. Nature of employment/designation
4. Wage rate (with particulars of unit in:
Case of piece work)
5. Wage period
6. Tenure of employment
7. Remark:

Signature of Contactor

Appendix 'IX'

FORM XV

(See Rule 77)

SERVICE CERTIFICATE

Name and Address of contractor:

Nature and location of work:

Name and address of establishment under which contract is carried on.

Name and address of workmen.

Name and address of principal employer

Age or date of birth.

Identification Mark.

Father's / Husband's Name.

Sl.No	Total period for which employed		Nature of work	Rate of wage (with particulars of unit in case of piece work)	Remark
	From	To			
1	2	3	4	5	6

Signature:

Appendix 'X'

LIST OF ACTS AND OMISSIONS FOR WHICH FINES CAN BE IMPOSED

In accordance with rule 7 (v) of the Contractor's Labour Regulations to be displayed prominently at the site of work both in English and local Language

1. Wilful insubordination or disobedience, whether alone or in combination with other.
2. Theft fraud or dishonesty in connection with the contractors beside a business or property of Institute
3. Taking or giving bribes or any illegal gratifications
4. Habitual late attendance.
5. Drunkenness lighting, riotous or disorderly or indifferent behavior.
6. Habitual negligence.
7. Smoking near or around the area where combustible or other materials are locked.
8. Habitual indiscipline.
9. Causing damage to work in the progress or to property of the Institute or of the contractor.
10. Sleeping on duty.
11. Malingering or slowing down work.
12. Giving of false information regarding name, age father's name, etc.
13. Habitual loss of wage cards supplied by the employers.
14. Unauthorized use of employer's property of manufacturing or making of unauthorized particles at the workplace.
15. Bad workmanship in construction and maintenance by skilled workers which is not approved by the Department and for which the contractors are compelled to undertake rectifications.
16. Making false complaints and / or misleading statements.
17. Engaging on trade within the premises of the establishments.
18. Any unauthorized divulgence of business affairs of the employees.
19. Collection or canvassing for the collection of any money within the premises of an establishment unless authorized by the employer.
20. Holding meeting inside the premises without previous sanction of the employers.
21. Threatening or intimating any workman or employer during the working hours within the premises.

Appendix 'XI'

FORM XII

(See Rule 78(2)(d))

REGISTER FINE

Name and Address of contractor:

Name and address of establishment under which contract is carried on.

Name and location of work.

Name and address of principal employer

Sl. No.	Name of workmen	Father's/Husband's name	Designation/nature of employment	Act/omission of which fine imposed	Date of Offence	Whether Workmen showed cause against fine	Name of person in whose presence explanation was heard	Wage period and wage payable	Amount of fine imposed	Date on which fine released	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Appendix 'XII'

FORM XX

(See Rule 78(2)(b))

REGISTER OF DEDUCTION FOR DAMAGE OR LOSS

Name and Address of contractor:

Name and address of establishment in/under which contract is carried on.

Name and location of work.

Name and address of principal employer

Sl. No.	Name of workmen	Father's/Husband's name	Designation/nature of employment	Particular of damage or loss	Date of damage or loss	Whether Workmen shown as cause against deduction	Name of person whose presence employees explanation was heard	Amount of deduction imposed	No. of Installment	Date Of Recovery		Remarks
										First Installment	Last Installment	
1	2	3	4	5	6	7	8	9	10	11	12	13

Appendix 'XIII'

FORM XXII

(See Rule 78(2)(d))

REGISTER OF ADVANCES

Name and Address of contractor:

Name and address of establishment in under which contract is carried on.

Name and location of work.

Name and address of principal employer

Sl. No.	Name of work men	Father's/Husband's name	Designation /nature of employment	Wage period and wages payable	Date of amount of advance given	Purpose for which advance made	No. of installment by which advance to be paid	Date and amount of each installment Repaid	Date on which last installment was repaid	Remarks
1	2	3	4	5	6	7	8	9	10	11

Appendix 'XIV'

FORM XXIII

(See Rule 78(2)(d))

REGISTER OF OVERTIME

Name and Address of contractor:

Name and address of establishment under which contract is carried on.

Name and location of work.

Name and address of principal employer

Sl. No.	Name of work men	Father's/Husband's name	Sex	Designation/nature of employment	Dates on which overtime worked	Total overtime worked on production in case of price rated	Normal rates of wages	Overtime rates of wages	Overtime earning	Rates on which overtime paid	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

APPENDIX XV

Note for appointment of Arbitrator[Refer Clause 25]

To
The Director, Institute For Plasma Research,Bhat, Gandhinagar -382 428

Dear Sir,

In terms of clause 25 of SECTION -2-(ii)-CLAUSES OF CONTRACT, GENERAL CLAUSES OF CONTRACT (GCC) of the agreement, particulars of which are given below, I/we hereby give notice to you to appoint an arbitrator for settlement of disputes mentioned below:

1. Name of applicant
2. Whether applicant is Individual/Prop. Firm/Partnership Firm/Ltd. Co.
3. Full address of applicant
4. Name of the work and contract number in which arbitration sought
5. Name of the Division which entered into contract
6. Contract amount in the work
7. Date of contract
8. Date of initiation of work
9. Stipulated date of completion of work
10. Actual date of completion of work (if completed)
11. Total number of claims made
12. Total amount claimed
13. Date of intimation of final bill (if work is completed)
14. Date of payment of final bill (if work is completed)
15. Amount of final bill (if work is completed)
16. Date of request made to Chaiperson I-CDC for decision
17. Date of receipt of Chaiperson I-CDC decision
18. Date of appeal to you
19. Date of receipt your decision.

Specimen signatures of the applicant
signed the contract should sign)

(only the person/authority who

I/we certify that the information given above is true to the best of my/our knowledge, I/we enclose following documents.

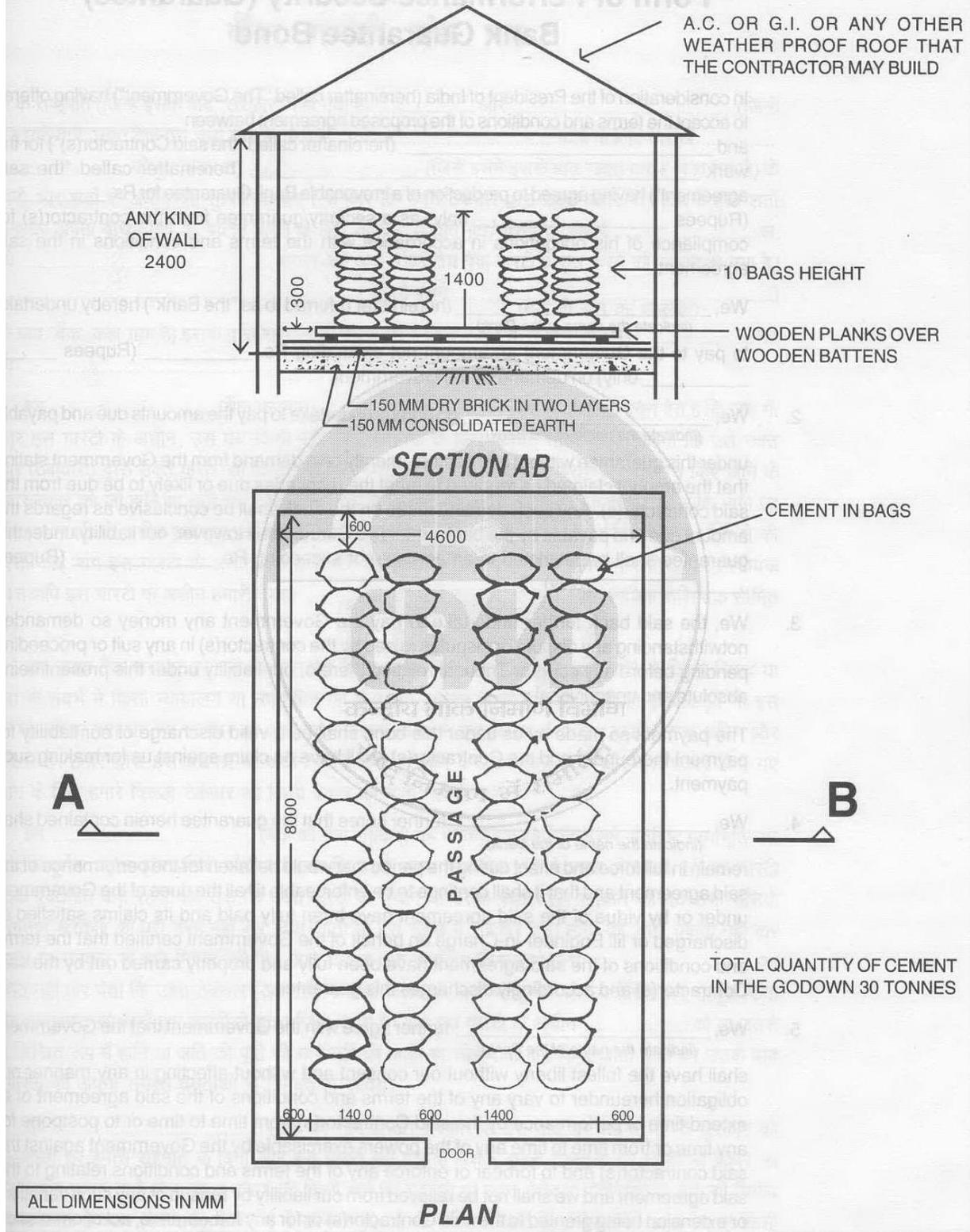
1. Statement of claims with amount of claims.
- 2.

Yours faithfully,

(Signatures)

Copy in duplicate to:The Chaiperson I-CDC of Institute,

सीमेन्ट गोदाम का रेखाचित्र / SKETCH OF CEMENT GODOWN



SECTION: 4

Format / Performa/ Guarantee Bonds

Form of Earnest Money Deposit

Bank Guarantee Bond

WHEREAS, contractor..... (Name of Contractor) (hereinafter called "the Contractor") has submitted his tender dated.....(date) for the construction of.....(Name of work) (hereinafter called "the tender")

KNOW ALL PEOPLE by these presents that we.....(name of Bank) having our registered office at.....(hereinafter called "the bank") are bound unto(Name and division of Executive Engineer) (**hereinafter called the Engineer-In-Charge**) in the sum of Rs.....(Rs. In words.....) for which payment well and truly to be made to the said Institute the bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this..... day of20.....

THE CONDITIONS of this obligation are:

- 1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the form of Tender;
- 2) If the contractor having been notification of the acceptance of his tender by the Institute ;
 - (a) Fails or refuses to execute the form of Agreement in accordance with the Instruction to contractor, if required;

OR

- (b) Fails or refuses to furnish the performance Guarantee, in accordance with the provisions of tender document and instructions to contractor,

We undertake to pay to the Institute for Plasma Research either up to the above amount or part thereof upon receipt of his first written demand, without the Institute having to substantiates his demand, provided that in his demand the Institute will note that the amount claimed by his is due to him owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date*..... After the deadline for submission of tender as such deadline is stated in the Instructions to contractor or as it may be extended by the Institute for Plasma Research, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE.....

SIGNATURE OF THE BANK

WITNESS.....
(SIGNATURE, NAME AND ADDRESS)

SEAL

*Date to be worked out on the basis of validity period of 6 months form last date of receipt of tender.

**Form of Performance Security (Guarantee)
Bank Guarantee Bond**

Inconsideration of the Director ,IPR (hereinafter called The Institute) having offered to accept the terms and conditions of the proposed agreement between **Institute For Plasma Research, Bhat, Gandhinagar** and _____ (hereinafter called "the said Contractor(s)") for the work _____ (hereinafter called "the said agreement") having agreed to production of a irrevocable Bank Guarantee for Rs. _____ (Rupees_____ only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We, _____ (hereinafter referred to as "the Bank") hereby undertake to pay to the Institute an amount not exceeding Rs. _____ (Rupees only) on demand by the Institute.
2. We, _____ (indicate the name of the Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demure, merely on a demand from the Institute /Government stating that the amount claimed as required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ (Rupees _____ only)
3. We, the said bank further undertake to pay the Institute / Government any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.
4. We, _____ (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the Institute / Government under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-Charge on behalf of the Institute / Government certified that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.
5. We, _____ (indicate the name of the Bank) further agree with the Institute / Government that the Institute / Government) shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Institute/Government against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of the Institute/Government or any indulgence by the Institute/Government to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We, _____(indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of the Institute / Government in writing.
8. This guarantee shall be valid upto _____ unless extended on demand by the Institute / Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs. _____ (Rupees _____ only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged.

Dated the ____ day of _____ for _____ (indicate the name of the Bank)

**Form of Mobilization advance (Guarantee)
Bank Guarantee Bond**

Inconsideration of the Director ,IPR (hereinafter called The Institute) having offered to accept the terms and conditions of the proposed agreement between **Institute For Plasma Research, Bhat, Gandhinagar** _____ (hereinafter called "the said Contractor(s)") for the work of _____ (hereinafter called „the said agreement“) having agreed to production of a irrevocable Bank Guarantee for Rs. _____ (Rupees _____ only) as a security/guarantee from the contractor(s) for Mobilization advance to compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We, _____ (hereinafter referred to as"the Bank") hereby undertake (indicate the name of the Bank) to pay to the Institute an amount not exceeding Rs. _____ (Rupees only) on demand by the Institute.
2. We, _____ (indicate the name of the Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demure, merely on a demand from the Institute /Government stating that the amount claimed as required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ (Rupees _____ only)
3. We, the said bank further undertake to pay the Institute / Government any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.
4. We, _____ (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the Institute / Government under or by virtue of the said agreement for Mobilization advance including interest have been fully paid and its claims satisfied or discharged or till Engineer-in-Charge on behalf of the Institute / Government certified that the terms and conditions of the said agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.
5. We, _____ (indicate the name of the Bank) further agree with the Institute / Government that the Institute / Government) shall have the fullest liberty without our consent and without affecting in any manner our obligation hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Institute/Government against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of theInstitute/Government or any indulgence by the Institute/Government to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We, _____(indicate the name of the Bank) agree that in case of encashment of this Bank Guarantee, the requisite amount shall be drawn in favour of " Institute for Plasma Research, Bhat, Gandhinagar" or any other authority as demanded by him and shall be payable by demand draft at location specified by him at such time.
8. We, _____(indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of the Institute / Government in writing.
9. This guarantee shall be valid upto _____ unless extended on demand by the Institute / Government. Notwithstanding anything mentioned above, our liability against this guarantee is restricted to As. _____ (Rupees only) and unless a claim in writing is lodged with us within six months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged.

Dated the ____ day of _____ for _____ (indicate the name of the Bank)

INDENTURE FOR SECURED ADVANCE

(For use in cases in which the contract is for finished work and the contractor has entered into an agreement for the execute of a certain specified quantity of work in a given time.)

Institute for Plasma Research

State : Gujarat Administration : Institute for plasma research

THIS INDENTURE made the _____ day of _____ 20 ____ BETWEEN (hereinafter called the Contractor which expression shall where the context so admits or implies be deemed to include his executors, administrators and assigns) of the one part and the Institute (hereinafter called the Institute which expression shall where the context so admits or implies be deemed to include his successors in office and assigns) of the other part.

WHEREAS by an agreement dated _____ (hereinafter called the said agreement) the contractor has agreed.

AND WHEREAS the contractor has applied to the Institute that he may be allowed advance on the security of materials absolutely belonging to him and brought by him to the site of the works, he subject of the said agreement for use in the construction of such of the works as he has undertaken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charges).

AND WHEREAS the Institute has agreed to advance to the contractor the sum of Rupees _____ on the security of materials, the quantities and other particulars of which are detailed in -Part-II of a Running Account Bill (B) for the said works signed by the contractor on and the Institute has reserved to himself the option of making any further advances on the security of other materials brought by the contractor to the site of the said works.

NOW THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the sum of Rupees _____ on or before the execution of these presents paid to the contractor by the Institute (the receipt where of the contractor both hereby acknowledge and of such further advance, if any, as may be made to him as aforesaid the contractor both hereby convenient and agree with the Institute and declare as follows:

1. That the said sum of Rupees _____ so advanced by the Institute to the contractor as aforesaid and all or any further sum or sums advanced as aforesaid shall be employed by the contractor in or towards expenditure the execution of the said works and for no other purpose whatsoever.
2. That the materials detailed in the said Running Account Bill (B) which have been offered to and accepted by the Institute as security are absolutely the contractor's own property and free from encumbrances of any kind and the contractor will not make any application for or receives a further advance on the security of materials which are not absolutely his own property and free from encumbrance of any kind and the contractor indemnifies and Institute against all claims to any materials in respect of which an advance has been made to him as aforesaid.
3. That the materials detailed in the said Running Account Bill (B) and all other materials on the security of which any further advance or advances may hereafter to be made as aforesaid (hereinafter called the said materials) shall be used by the contractor solely in the execution of the said works in accordance with the directions of the Engineer-in charge of the said works, Institute (hereinafter called "the Engineer-in charge) and in the terms of the said agreement.

4. That the contractor shall make at his own cost all necessary and adequate arrangements for the proper watch, safe- custody and protections against all risks of the said materials and that until used in construction as aforesaid said materials shall remain at the site of the said works in the contractor's custody and on his own responsibility and shall at all times be open to inspection by the Engineer-in charge or any officer authorised by him. In the event of the materials or any part thereof being stolen, destroyed or damaged or becoming deteriorated in a greater degree that is due to reasonable use and wear thereof the contractor will forthwith replace the same with other materials of like quality or repair and make good the same as required by the Engineer-in charge.
5. That the said materials shall not on any account be removed from the site of the works except with the written permission of the Engineer-in charge or an officer authorised by Institute.
6. That the advance shall be repayable in full when or before contractor receives payment from the Institute of the price payable to him for the said works under the terms and provisions of the said agreement. Provided that if any intermediate payments are made to the contractor on account of work done thereon the occasion of each such payment the Institute will be at liberty to make a recovery from the contractor's bill for such payment by deduction there from the value of the said materials than actually used in the construction and in respect of which recovery has not been made previously the value for this purpose being determined in respect of the each description of materials at the rates at which the amounts of the advances made under these presents were calculated.
7. That if the contractor shall at any time make any default in the performance or observance in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances what may still be owing to the Institute shall immediately on the happening of such default be repayable by the contractor to the Institute together with interest thereon at twelve percent per annum from the date of respective dates of such advance or advances to the date of repayment and with all costs, charges, damages and expenses incurred by the Institute in or for the recovery thereof or the enforcement of this security or otherwise by reasons of the default of the contractor and contractor hereby convenient and agrees with the Institute to repay and pay the same respectively, to him accordingly.
8. That the contractor hereby charges all the said materials with the repayment to the Institute of the said sum of Rs. _____, and any further sum or sums advanced as aforesaid and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS and it is-hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the powers contained therein if and whenever the convenient for Payment and repayment herein before contained shall become enforceable and the money owing shall not be paid in accordance there with the Institute may at any time thereafter adopt all or any of the following courses as he may deemed best.
 - a) Seize and utilise the said materials or any part thereof in the completion of the said works on behalf of the contractor in accordance with the provisions in that behalf contained in the said agreement debiting the contractor with the actual cost of effecting such completion and the amount due in respect of advances under these present and crediting the contractor with the value of work done as if he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the contractor he is to pay same to the Institute on demand.
 - b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sum, aforesaid repayable or payable to the Institute under these presents and pay over the surplus (if any) to the contractor.

c) Deduct all or any part of the money owing out of the security deposit or any sum due to the contractor under the said agreement.

9. That except in the event of such default on the part of the contractor as aforesaid interest on the said advances shall not be payable.

10. That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been herein before expressly provided for the same shall be referred to the Project Administrator / Associate Dean/ Dean / Director of the Institute, time being in force shall apply to any such reference.

IN WITNESS thereof the said _____ and _____ by the order under the direction of the Institute have hereinto set their respective hands the day and year first above written. Signed, sealed and delivered by the said contractor in the presence of :

Signature

Name

Address

Witness

Signed by

by the order and direction of the Institute in the presence of:

Signature

Name

Address

Witness

GUARANTEE BOND FOR ANTI-TERMITE TREATMENT

(For Guarantee to be executed by contractors for removal of defects after completion of anti-termite treatment works)

This agreement made this _____ day _____ of two thousand and _____ between M/s. _____ (hereinafter called "the Guarantor of the one part) and the Institute for Plasma Research (hereinafter called "the Institute" the other part.)

Whereas this agreement is supplementary to a contract (hereinafter called "the Contract) dated _____ and made between the Guarantor of the one part and the Institute of the other part whereby the Contractor interalia undertook to render the buildings and structure completely termite proof. AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said structure will remain termite proof for ten years from the date of handing over of the building and or completion date of contract whichever is later.

NOW THE GUARANTOR hereby guarantees that the anti-termite treatment provided by him will render the structure completely termite proof and the minimum life of such anti-termite treatment shall be ten years to be reckoned from the date of handing over of the building and/or completion of the building whichever is later.

Provided that the Guarantor will not responsible for damages caused due to structural defects or misuse of premises/area.

a) Misuse of premises shall mean any operation which will disturb the chemical barrier like excavation under floors breaking of walls at G.L. disturbing the treatment already carried out.

The decision of the Engineer-in-Charge with regard to cause of damage shall be final.

During this period of guarantee the guarantor shall make all the arrangements to do the post constructional anti-termite treatment in all the buildings in case of any termite nuisance being found in the building, to the satisfaction of the Engineer-in-Charge at the cost of guarantor and shall commence the work for such treatment within seven days from the date of calling upon him to rectify the defects, by the Engineer-in-Charge, failing which the work shall be got done by the Institute by some other contractor at the GUARANTOR'S COST and risk. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if the Guarantor fails to execute the anti-termite treatment or commits breach thereunder then the Guarantor will indemnify the principal and his successors against all loss, damage, cost, expense or otherwise which may be incurred by the Institute by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the Institute the decision of the Engineer-in-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligator _____ and by _____ and for and on behalf of the Institute for Plasma Research on the day, month and year first above written.

SIGNED, sealed and delivered by (OBLIGATOR) in the presence of :

1.

2.

SIGNED FOR AND ON BEHALF OF THE INSTITUTE FOR PLASMA RESEARCH BY

_____ in the
presence of: _____

1.

2.

GUARANTEE BOND FOR WATERPROOFING WORKS

(For Guarantee to be executed by contractors for removal of defects after completion of water-proofing works.)

This agreement made this _____ day of _____ two thousand and _____ between M/s. _____ (hereinafter called "the Guarantor of the one part) and the Institute for Plasma Research (hereinafter called "the Institute" of the other part.)

Whereas this agreement is supplementary to a contract (hereinafter called "the Contract) dated and made between the Guarantor of the one part and the Institute of the other part whereby the Contractor inter alia undertook to render the buildings and structure such as roof of buildings, over head water tanks, under ground tanks, lift pits, basement, toilets, etc. in the said contract recited completely water and leak proof.

AND WHEREAS THE GUARANTOR agree to give a guarantee to effect that at the said structure will remain water and leak proof for ten years from the date of handing over of the building and/or actual date of completion of work as recorded whichever is later.

NOW THE GUARANTOR hereby guarantee that waterproofing treatment provided by him will render the structures completely leak proof and the minimum life of such waterproofing treatment shall be ten years to be reckoned from the date of handing over of the building and/or actual date of completion of the work as recorded whichever is later.

Provided that the Guarantor will not be responsible for leakage caused by earthquake or structural defects or misuse of roof or other structures or alteration and for such purpose:

- a) Misuse of structure shall mean any operation which will damage water-proofing treatment, like chopping of fire wood and things of the same nature which might cause damage to the structure;
- b) Alteration shall mean construction of an additional story or a part of the roof or construction adjoining to existing roof whereby water-proofing treatment is removed in parts;
- c) Damaging or puncturing of the waterproofing treatment provided to over head tanks or basement or underground tank or lift pit, for providing any P .H./Electric connections or any other reasons whatsoever;
- d) The decision of the Engineer-in-Charge with regard to cause of leakage shall be final.

During this period of guarantee the guarantor shall make good all the defects and in case of any defect being found, render the building waterproof to the satisfaction of the Engineer-in-Charge at the cost of the guarantor and shall commence the work for such rectification within seven days from the date of issue of the notice, from the Engineer-in-Charge calling upon him to rectify the defects, failing which the work shall be got done by the Institute by some other contractor at the GUARANTOR'S COST and risk. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if the Guarantor fails to execute the waterproofing or commits breach there under then the Guarantor will indemnify the Principal and his successors against all loss, damage, cost expense or otherwise which may be incurred by the Institute by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the Institute the decision of the Engineer-in-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligator _____
and by _____ and for and on behalf of the Institute for Plasma
Research on the day, month and year first above written.

SIGNED, sealed and delivered by (OBLIGATOR) in the presence of : 1.2.

SIGNED FOR AND ON BEHALF OF THE INSTITUTE FOR PLASMA RESEARCH BY
_____, in the presence of:

- 1.
- 2.

SECTION: 5

List of Drawings

Section - 5: List of Drawings: (Drawings separately attached)

List of Drawings:

Sr No.	Drawing No.	Description of Drawing
1	IPR/TN/CIVIL-PR/01/2020/01	Layout Drawing Indicating the Compound wall for execution of Concertina Coil ,Chain link Fencing, Increasing in Height of compound wall.
2	IPR/TN/CIVIL-PR/01/2020/02	Layout Drawing indicating expansion joint in the compound wall.
3	IPR/TN/CIVIL-PR/01/2020/03	Drawing indicating the methodology to close the expansion joint in compound wall.
4	IPR/TN/CIVIL-PR/01/2020/04	Drawing indicating the design of Aluminium Cupboard.

SECTION: 6

Applicable Standards/ Approved Makes/ Detailed Specifications

SECTION - 6 - (i) - Applicable Standards - Civil & Plumbing Works

Applicable Standards for Civil & Plumbing Works

1	Conversion factors	IS:786
2	Method of measurement of building works	IS:1200
3	Code of practice for measurement of civil engineering works	IS:3385
4	Materials and workmanship for earthwork and excavation	IS:1200 (PART I)
5	Safety code for blasting and related drilling operations	IS:4081
6	Safety code for excavation work	IS:3764
7	Moisture content in sand for filling	IS:2720
8	Determination of moisture content	IS:2720 (PART II)
9	Determination of moisture content & dry density relation using light compaction	IS: 2720 (PART VIII)
10	Determination of dry density of soils in-place by the sand replacement method	IS:2720(PART XXVIII)
11	Determination of dry density of soils in-place by the core cutter method	IS:2720 (PART XXIX)
12	Anti termite treatment	IS:6313(PART I TO III)
13	Construction water	IS:456
14	Methods of sampling and test (physical and chemical water used in industry)	IS:3025
15	Ordinary (33 grade)/low heat Portland cement	IS:269
16	Ordinary Portland cement (43 grade)	IS:8112
17	Ordinary Portland cement (53 grade)	IS:12269
18	White Portland cement	IS:8042-E
19	Portland pozzolana cement	IS:1489
20	Rapid hardening Portland cement	IS:8041, IS:269
21	Portland(blast furnace) slag cement	IS:455
22	Hydrophobic cement	IS:8043
23	High alumina cement	IS:6452
24	Super sulphated cement	IS:6909
25	Oil well cement	IS:8229E
26	Standard for testing of cement	IS:650
27	Methods of physical tests for hydraulic cement	IS:4031
28	Specification for standard sand for testing of cement	IS:650
29	Coarse and fine aggregates for concrete	IS:383, IS:515
30	Gradation of coarse aggregates	IS:383(TABLEII)
31	Gradation of fine aggregates	IS:383 (TABLE III)
32	All-in-aggregates	IS:383 (TABLE IV)
33	Method of tests for aggregates for concrete	IS:2386 (PART I TO VIII)
34	Methods of determination the maximum qty. of deleterious materials in aggregate	IS:2386 (PART II)
35	Limiting values of the maximum quantities of deleterious materials in aggregate	IS:383 (TABLE I)
36	Flakiness index of aggregates	IS:2396 (PART I), IS:5640
37	Moisture content test for aggregates	IS:2386 (PART III)
38	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.	IS:432 (PART I & II)

39	Specification for plain hard drawn steel wire fabric for cement concrete	IS:1566
40	Specification for cold twisted steel bars for concrete reinforcement	IS:1786
41	Specifications for hot rolled mild steel and medium tensile steel deformed bars	IS:1139, IS:1739
42	Code of practice for bending and fixing of bars for concrete reinforcement	IS:2502
43	Mild steel binding wire	IS:280
44	Code of practice for welding of mild steel bars used for RCC	IS:2751
45	Code of practice for plain and reinforced concrete	IS:456
46	Code of practice for general construction of plain and RCC for dams	IS:457
47	Testing of reinforced cement concrete	IS:516
48	Method of tests for strength of concrete	IS:516
49	Methods of sampling & analysis of concrete	IS:1199
50	Code of practice for concrete structures for storage of liquids	IS:3370 (PART I TO IV)
51	Code of practice for composite construction	IS:3935
52	Code of practice for construction of reinforced concrete shell roof	IS:2204
53	Criteria for the design of RCC shell structures and folded plates	IS:2210
54	Specification for batch type concrete mixers	IS:1791
55	Specification for portable swing weigh batchers for concrete	IS:2722
56	Specification for roller pan mixer	IS:2438
57	Specification for concrete vibrators immersion type	IS:2505
58	Specification for screed board concrete vibrators	IS:2506
59	Specification for concrete vibrating tables	IS:2514
60	Specification for pan vibrators	IS:3366
61	Specification for form vibrators for concrete	IS:4656
62	Code of practice for use of immersion vibrators for consolidated concrete	IS:3558
63	Air entraining agent	ASTM:6260
64	Criteria for design and construction of precast concrete trusses	IS:3201
65	Prestressed concrete	IS:1343
66	Specification for high tensile steel bars used in code of practice for pre-stressed concrete	IS:2090
67	Specification for plain hard drawn steel wire for pre-stressed concrete	IS:1785 (PART I)
68	Specification for plywood for concrete	
69	Shuttering work	IS:4990
70	Code of practice for steel tubular scaffolding	IS:4014 (PART I & II)
71	Specification for steel scaffolding	IS:2750
72	Safety code for scaffolds and ladders	IS:3696
73	Common burnt clay building bricks	IS:1077
74	Classification of burnt clay bricks	IS:3102
75	Burnt clay building bricks, heavy duty	IS:2180
76	Burnt clay facing bricks	IS:2691,IS:1077
77	Method of sampling and testing clay building bricks	IS:3495 (PART I - IV)
78	Mortar for brick work	IS:2250
79	Code of practice for brick work	IS:2221
80	Masonry works	IS:3466
81	Structural safety etc. Of building masonry walls	IS:1905
82	Load bearing hollow concrete blocks	IS:2185
83	Lime - cement - cinder hollow concrete blocks	IS:5498
84	Lime - cement - cinder solid blocks	IS:3115
85	Code of practice for construction of stone masonry	IS:1597 (PART I)

86	Stone tests	IS:1124
87	Code of practice for design and installation of joints in buildings	IS:3414
88	Joint sealing compound	IS:834
89	Pre-molded bituminous joint filler	IS:1838
90	Timber door, window and ventilator frames	IS:4021
91	Material & workmanship for wood work	IS:883, IS:4021
92	Wooden flush door shutters (solid core type)	IS:2202 (PART I)
93	Timber paneled and glazed shutters	IS:1003 (PART I & II)
94	Method of tests for wooden flush doors, type tests	IS:4020
95	Plywood & tests	IS:303
96	General tests for wood work	IS:1659
97	Red lead for wood knot	IS:103
98	Oil type wood preservative	IS:218
99	Particle board	IS:3087
100	Transparent sheet glass for glazing & framing purposes	IS:1761
101	Resin bonded fiber glass	IS:3144
102	Putty for glazing	IS:420
103	Steel door frames	IS:4351
104	Steel window	IS:1361
105	Steel doors	IS:1038
106	Steel ventilators	IS:1081
107	Rolling shutters	IS:6248
108	Primer for steel doors, windows & ventilators	IS:102
109	Aluminum alloy for door/window frames	IS DSGN. HEA-WP OF IS:733
110	Sections	IS:1948
111	Anodizing	BS:1616
112	Hydraulic lime & storage	IS:712
113	General tests for lime	IS:6932 (PART I TO X)
114	Field tests for lime	IS:1624
115	Lime mortar preparation	IS:1625
116	Slacked lime	IS:1639
117	Surkhi	IS:1344
118	Code of practice for application of lime plaster finish	IS:2394
119	Rough cast plaster	IS:1661(CLAUSE-165)
120	Specification for integral cement water proofing compounds	IS:2645
121	Water proofing asphalt/maxphalt	IS:702
122	Bitumen saturated layer	IS:1322
123	Bitumen felt	IS:1322
124	Bitumen	IS:702
125	Code of practice for laying and finishing of cement concrete flooring tiles	IS:1443
126	Material & workmanship for flooring	IS:1197, IS:1344
127	Code of practice for laying in situ terrazzo floor finish	IS:2114
128	Code of practice for laying in-situ cement concrete flooring	IS:2571
129	Mosaic tiles	IS:1237
130	Glazed earthenware tiles	IS:777
131	Marble chips & marble mosaic terrazzo	IS:2114
132	Plain cement tiles & tests	IS:1237
133	Marble mosaic tiles	IS:1237
134	Marble slab	IS:1130
135	PVC flooring tiles & sheets	IS:3461,IS:3462

136	Broken marble mosaic tiles	IS:1257
137	Oxy-chloride	IS:658
138	Magnesium chloride	IS:657
139	C.I. grid tiles	IS:210
140	Pigment for terrazzo flooring	IS:459
141	Rivets	IS:1148
142	Electrodes for welding	IS:814
143	Code of practice for use of electric arc welding for general construction in steel	IS:813
144	Tests for welding works	IS:1181
145	Welding works	IS:816
146	Bolts and nuts	IS:1367
147	Tests for bolts and nuts	IS:1608
148	Structural steel sections & tests	IS:226
149	Structural steel plates	IS:2062
150	Defects in structural steel	IS:229
151	Dimension & properties of steel section	IS:808
152	Structural steel work	IS:226, IS:4948
154	Expanded metal steel sheet	IS:412
155	Mild steel wire gauze jali	IS:280
156	Welding procedure & edge preparation	IS:823
157	Washers	IS:2016
158	Storage of welding wire & electrodes	IS:816
159	Primer to structural surface for bolts	IS:2074
160	Checkered plates	IS:3502
161	Code of practice for painting of ferrous metal in building and allied finishes	IS:1477 (PART I & II)
162	Distemper and dry colour	IS:427
163	Code of practice for painting concrete, masonry and plaster surfaces	IS:2395
164	Distemper and oil emulsion	IS:428
165	Enamel paints	IS:2933
170	Coat of zinc chromate	IS:104
171	French spirit polish	IS:348
172	GI sheets	IS:227
173	Ac sheets	IS:459
174	Ac sheet fixing	IS:730
175	Mangalore pattern tiles	IS:654
176	Fiber glass reinforced polyester	IS:4154
177	Galvanized steel for barbed wire	IS:278
178	Insulation of hot water pipes, tanks & heat exchanger	BS:476
179	GI pipes & MS tubes	IS:1239 (PART I)
180	Screw down bib cocks & stop cocks	IS:781
181	Vitreous sanitary fixtures(general)	IS:2556 (PART I)
182	Gun metal wheel, globe, check, gate & non return valves	IS:778
183	Wash basin	IS:2556 (PART IV), IS:771
184	European W.C.	IS:2556, IS:771
185	Solid plastic seat & cover	IS:2548
186	Orissa pan W.C.	IS:2556 (PART III)
187	Squatting pans & traps	IS:2556 (PART III)
188	Indian W.C. (wash down W.C.)	IS:2556 (PART II), IS:771
189	Urinals	IS:2556 (PART VI)
190	Half round channels	IS:2556 (PART VII)

Tender for Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar. Part-II Technical Bid Page

191 Specific requirements of siphonic wash down W.C.	IS:2556 (PART VIII)
192 Ss sink/C.I./flushing tank brackets	IS:775
193 C.I. siphonic flushing cistern	IS:774
194 Lead pipes	IS:404 (PART I)
195 Sand cast pipes & fittings	IS:1729
196 C.I. spun soil pipes & fittings	IS:3939
197 Gully trap	IS:651
198 Glazed stone ware pipes & fittings	IS:651
199 Ac pipe	IS:1626,IS:1626 (PART I)
200 High pressure/crydon ball valve	IS:1703
201 C.I. sluice valve	IS:780
202 Capstan head	IS:1795
203 Malleable iron fittings	IS:1879 (PART I TO X)
204 C.I. pipes	IS:1536, IS:1537
205 Molten (pig)lead	IS:782
206 C.I. manhole frames & covers	IS:1726
207 Concrete pipes	IS:458
208 Threads for screwed pipes	IS:554
209 Lead jointing	IS:718
210 Carbon steel for pipes	IS:9161
211 Low level ceramic cistern	IS:774
212 Bowl pattern flat back urinals	IS:2556 (PART IV)
213 Showers	IS:2064
214 Heavy C.I. pipes	IS:1729
215 Concrete mix design	IS:10262
216 Code of practice for construction of floor and roof with joists and filler blocks	IS:6061 (PART I)
217 Code of practice for construction of light weight concrete block masonry	IS:6042
218 Specification for load bearing light weight concrete blocks	IS:3590
219 Code of practice for construction of hollow concrete block masonry	IS:2572
220 Specification for concrete masonry units (hollow and solid concrete blocks)	IS:2185 (PART I)
221 Chemical composition of ordinary Portland cement	IS:4032
222 Sulphate resistant cement	BS:4027 & ASTM C-150 TYPE II
223 Specifications for circular hollow sections	IS:1161
224 Properties of rectangular & square hollow sections	IS:4923
225 Cold formed welded & seamless carbon steel structural tubing	ASTMA 500
226 Cold but not formed welded & seamless carbon steel structural tubing	ASTMA 501
227 Hot formed welded & seamless high strength low alloy tubing	ASTMA 618
228 Hot rolled structural steel hollow section	BS:4848/

SECTION - 6 - (ii) - Cement Consumption

Item	Ratio / Grade	Consumption
A. CEMENT CONCRETE		
BBCC	01:06:12	2.3 Bags/m3.
	01:05:10	2.6 Bags/m3.
	01:04:08	3.4 Bags/m3.
PCC	01:06:12	2.3 Bags/m3.
	01:05:10	2.6 Bags/m3.
	01:04:08	3.4 Bags/m3.
RCC	01:03:06	4.3 Bags/m3.
	01:02:04	6.4 Bags/m3.
	01:1.5:03	8 Bags/m3.
	01:01:02	12.2 Bags/m3.
	01:02:05	5.4 Bags/m3.
	01:2.5:05	5.1 Bags/m3.
B. MORTARS		
Cement and Sand mortar		
	01:01	20.4 Bags/m3.
	01:02	13.6 Bags/m3.
	01:03	10.2 Bags/m3.
	01:04	7.6 Bags/m3.
	01:05	6.2 Bags/m3.
	01:06	5 Bags/m3.
	01:08	4 Bags/m3.
Gauged mortar (Cement Lime and Sand mortar)		
	01:01:06	4.9 Bags/m3.
	01:01:08	3.8 Bags/m3.
	01:02:09	3.3 Bags/m3.
	01:05:10	2.95 Bags/m3.
	01:06:12	2.4 Bags/m3.
C. MASONRY WORK		
Brickwork in Cement sand mortar		
	Modular (19 x 9 x 9)	
	01:03	2.55 Bags/m3.
	01:04	1.9 Bags/m3.
	01:05	1.56 Bags/m3.
	01:06	1.27 Bags/m3.
	01:08	0.95 Bags/m3.
Brickwork in Gauge Mortar		
	01:01:06	1.21 Bags/m3.
	01:01:08	0.96 Bags/m3.
	01:02:09	0.81 Bags/m3.
Stone masonry, Uncoursed		
Random Rubble walling		
	Conventional (23 x 11 x 7)	
	01:03	2.95 Bags/m3.
	01:04	2.29 Bags/m3.
	01:06	1.51 Bags/m3.

	01:08	1.18	Bags/m3.
Item	Ratio/Grade	Consumption	
Stone masonry in Gauged Mortar	01:01:06	1.48	Bags/m3.
	01:01:08	1.14	Bags/m3.
	01:02:09	0.99	Bags/m3.
D. PLASTERING			
12 mm. thick plaster in Cement mortar, on Brick masonry	01:02	0.24	Bags/m ² .
	01:03	0.17	Bags/m ² .
	01:04	0.14	Bags/m ² .
	01:05	0.1	Bags/m ² .
	01:06	0.09	Bags/m ² .
12 mm. thick plaster in Gauged mortar, on Brick masonry	01:01:08	0.07	Bags/m ² .
	01:02:09	0.06	Bags/m ² .
12 mm. thick plaster in Cement mortar, on Stone masonry	01:02	0.31	Bags/m ² .
	01:03	0.22	Bags/m ² .
	01:04	0.17	Bags/m ² .
	01:06	0.11	Bags/m ² .
12 mm. thick plaster in Gauged mortar, on Stone masonry	01:01:08	0.08	Bags/m ² .
	01:02:09	0.07	Bags/m ² .
20 mm. thick plaster in Cement mortar, on Brick masonry	01:02	0.34	Bags/m ² .
	01:03	0.24	Bags/m ² .
	01:04	0.19	Bags/m ² .
	01:05	0.13	Bags/m ² .
	01:06	0.12	Bags/m ² .
20 mm. thick plaster in Gauged mortar, on Brick masonry	01:01:08	0.1	Bags/m ² .
	01:02:09	0.08	Bags/m ² .
20 mm. thick plaster in Cement mortar, on Stone masonry	01:02	0.41	Bags/m ² .
	01:03	0.29	Bags/m ² .
	01:04	0.22	Bags/m ² .
	01:06	0.14	Bags/m ² .
20 mm. thick plaster in Gauged mortar, on Stone masonry	01:01:08	0.11	Bags/m ² .
	01:02:09	0.09	Bags/m ² .
20 mm. thick Sand Face plaster		0.2	Bags/m ² .
12 mm. thick Water Proof plaster in 1:4 Cement mortar		0.15	Bags/m ² .
Neat Cement finishing		0.044	Bags/m ² .
E. POINTING			
Flush, Grooved or Struck in Cement Brick masonry	01:01	0.06	Bags/m ² .
	01:02	0.05	Bags/m ² .
	01:03	0.03	Bags/m ² .
	01:04	0.028	Bags/m ² .
Flush, Grooved or Struck in Cement Random Stone masonry	01:02	0.01	Bags/m ² .
	01:03	0.08	Bags/m ² .

	01:04	0.06	Bags/m ² .
Item	Ratio/ Grade	Consumption	
F. FLOORING			
Precast Mosaic Tiles in cement mortar		0.2	Bags/m ² .
Precast Mosaic Tiles dado in cement mortar		0.23	Bags/m ² .
Green and Brown Kotah Stone in flooring, skirting & dado		0.3	Bags/m ² .
Green Kotah Stone in Risers and Treads		0.3	Bags/m ² .
Double Polished Kotah Stone		0.3	Bags/m ² .
Rough Kotah Stone		0.3	Bags/m ² .
Glazed Tiles		0.2	Bags/m ² .
Spartek Tiles		0.2	Bags/m ² .
China mosaic		0.22	Bags/m ² .
Marble Slab		0.25	Bags/m ² .
Granite Slab		0.25	Bags/m ² .
Jesalmer		0.25	Bags/m ² .
Red Mandana		0.35	Bags/m ² .
I.P.S,	40 mm. thick	0.35	Bags/m ² .
	50 mm. thick	0.4	Bags/m ² .
Pinkish White Dholpur		0.15	Bags/m ² .
Red Dholpur		0.15	Bags/m ² .
Brick-on-edge		0.31	Bags/m ² .
Terrazzo		0.17	Bags/m ² .
G. STEEL WORK			
Fixing Windows in C.C Blocks 15 x 10 x 10 cm. in C.C	01:03:06	0.03	Bags/m ² .
Fixing Holdfasts in C.C Blocks			
15 x 15 x 30 cm. in C.C	01:03:06	3.3	Bags/100 nos.
23 x 25 x 30 cm. in C.C	01:03:06	7.76	Bags/100 nos.
30 x 30 x 45 cm. in C.C	01:03:06	19.8	Bags/100 nos.
H. MISCELLANEOUS			
Filling Zaris with			
C.M.	01:03	5	Bags/100 nos.
C.C	01:02:04	3.2	Bags/100 nos.
BBCC 1:5:10 Blocks, 30 x 30 x 50 cm. for Wire fencing		5.1	Bags/100 nos.
C.C Blocks for Flooring, 30 x 30 x 30 cm.	01:04:08	5	Bags/100 m ² .
I. ROADWORK			
Precast Curbs of P.C.C	01:02:04	21.5	Bags/100 m.
J. SANITARY WORK			
R.C.C Hume pipes jointed with Cement mortar 1:1			
	600 mm. dia.	6.4	Bags/100 m.
	450 mm. dia.	4.8	Bags/100 m.
	300 mm. dia.	2.2	Bags/100 m.
	230 mm. dia.	1.8	Bags/100 m.
	150 mm. dia.	1.2	Bags/100 m.
	100 mm. dia.	1	Bags/100 m.
SW pipes jointed with Cement mortar 1:1			
	300 mm. dia.	12.94	Bags/100 m.
	230 mm. dia.	9.74	Bags/100 m.

Item	Ratio/ Grade	Consumption
	150 mm. dia.	6.56 Bags/100 m.
	100 mm. dia.	4.34 Bags/100 m.
C.I Waste water line, concealed including filling the zari with	75 mm. dia.	8.6 Bags/100 m.
Cement mortar 1:4 and joints in Cement mortar 1:1	100 mm. dia.	10.88 Bags/100 m.
C.I Soil pipe/Rain water pipe, concealed, including filling the	100 mm. dia.	10.88 Bags/100 m.
zari with C.M. 1:4 and joints in Cement mortar 1:1	150 mm. dia.	14.66 Bags/100 m.
Fixing European type WC		0.1 Bag/no.
Fixing Orissa pan		
Fixing Urinal/s.		0.2 Bag/no.
Fixing Wash Hand Basin		0.03 Bag/no.
Fixing S.S Sink		0.05 Bag/no.
Brick Masonry Chambern 300 x 300 x 610 mm.		1.7 Bag/no.
Half Round Channel 100 mm.		15.86 Bags/100 m.
Fixing 100 mm. dia. SW Gully Trap		0.5 Bag/no.
K. STORM WATER DRAINAGE & CULVERTS		
R.C.C. pipe NP - 2		
	230 mm. dia.	1.8 Bags/100 m.
	300 mm. dia.	2.4 Bags/100 m.
	450 mm. dia.	5.4 Bags/100 m.
	900 mm. dia.	9.8 Bags/100 m.
Storm water Gully Chamber		6 Bag/no.

SECTION – 6 - (iii) - List of Approved Makes

A - Civil works:

- | | | |
|-----|---|--|
| 1) | (a) Ordinary Portland cement
(b) Port land Pozzolana cement | Ultratech, Ambuja, Binani, Birla
Ultratech, Ambuja, Binani, Birla |
| 2) | White Cement | Birla, J.K. |
| 3) | TMT - Fe-415 / Fe-500 Ribbed bars | Tata, SAIL., RINL.Electro TMT, Friends |
| 4) | Structural Rolled Steel sections-beams, channels, tee, flats, angles, bars (round, square, hexagonal) | Tata, SAIL, RINL, Jindal |
| 5) | Structural Hollow steel sections (Square & Rectangular) | Tata, Asian , Jindal |
| 6) | Structural tubular sections | Tata, Asian, Jindal |
| 7) | Coarse Aggregates (machine cut) 6mm to 40mm sizes | Approved quarry from Sevalia, Vadagam (Hard black trap stone) |
| 8) | Stone Rubbles & Gravels | Approved quarry from Sevalia, Vadagam (Hard black trap stone) |
| 9) | Paver block | Vyara, Super, Alcock. |
| 10) | Shuttering plywood | Green, Archid, Duro, Century, KitPly Anchor, Pragati |
| 11) | BWP plywood as per - IS - 710 | Green, Archid, Duro, Century, KitPly Anchor, |
| 12) | Commercial Plywood - IS - 303 (BWR/MR) | Green, Archid, Duro, Century, KitPly Anchor |
| 13) | Decorative ply (Veneer) | Green ,Durian, Century, Archid. |
| 14) | MDF | Nuwood, Maftalal, Duratuff |
| 15) | Prelam particle board | Novapan, Bhutan.(exterior grade only) |
| 16) | Laminate sheet | Formica, Greenlam, Alfa-ica, Decolam, Neoluxe., Bloom |

17)	Cement bonded particle board	NCL (Bison board), Everest (Eternite), Shera
18)	Calcium silicate board	Gypsum India ,Hilux
19)	Flush door – decorative / non decorative	Green, Archid, Duro, Century, KitPly Anchor,
20)	Compact sheet	Sundek, bloom, Bakelite, century, Alfica, Vir.
21)	Locks	Godrej, Dorset, Yale, EPPW, Kitch, Hafle, Dorma, Ebco
22)	Float Glass / Mirror	Modi guard, Saint gobain, Ashahi
23)	MS Rolling shutter	Sarvottam, Suryoday, Gandhi, Sona, Avians,
24)	Precast terrazo tiles & skirting(Mosaic)	Royal ,Alcock, Vyara, Nitco,.
25)	Glazed tiles	Johnson,Kajaria, Somani, Asian, Restile, Nitco.
26)	Ceramic tiles	Johnson,Kajaria, Somani, Asian, Restile, Nitco.
27)	Vitrified clay tiles	Johnson,Kajaria, Somani, Asian, Restile, Nitco.
28)	Construction chemicals	M.C. Bauchemie,Fosroc, Sika ,Cico, Pidilite/Dr Fixit, Roffe, BAL/Ardev Endura,
29)	Joint Filler / silicon paint	Wacker, Dowcorning,Sika, Chokshi
30)	Pre-coated steel roofing/	Tata bluescope colour bond, Nippon walling sheets, Meta color.
31)	Paint, primer, putty	Asian, Berger, ICI, Nerolac, Dulux, Birla (putty), Roofit(Putty)
32)	Polish	MRF, Asian, ICI, Taralac, Berger
33)	Waterstop	Arti Polymer ,Fixopan
34)	Door Window & Furniture Hardware	Kitch, EPPW, Dunex, Dorma, Ebco, Palladium
35)	Adhesives	Fevicol, Kitcol, Araldite, BAL.
36)	Anchor fastenr / bolts	Hilti. Fischer

37)	Linseed oil	Saffola
38)	Floor spring	Everite, Hemco, Godrej, Hyper, Haffle
39)	Door closer	Godrej, Dorma, Yale, Everite, Haffle, Kitch
40)	Aluminum sections	Jindal, Hindalco, Indal.
41)	Aluminum finish	20 micron color anodized /50micron pure polyester powder coating - Contractor shall provide the micron thickness measuring equipment at site through out the work during progress for checking the anodizing/powder coating thickness. Visibly should looks uniform as per standards.
42)	Window locks cum handle	Kitch, EPPW, Dunex, Dorma, Ebco, Palladium
43)	Filler rubber of glass panel	EPDM quality only
44)	Wool felt/weather strip	Shall be imported of Italy make
45)	False ceiling	M/s. Hunter Douglas India Pvt. Ltd.
46)	Insulation	M/s Bakelite Hylum,

B - Plumbing works:

1)	Sanitary wares	CERA / HINDUSTAN
2)	CP Fixtures AND ACCESSORIES	JAQUAR - CONTINENTAL
3)	Half-turn flush-cock	PRINCE heavy quality CROWN Heavy quality
4)	Flush-Valve	Jaquar , CROWN
5)	GI Pipes	TATA, Asian, Jindal
6)	GI fittings & Specials	R BRAND, DRP
7)	Valve with gun metal construction	Zoloto, L & T audco, Leader
8)	Plastic control valve	DPP, PRINCE, Prayg

9)	CI Pipes & fittings	NECO, BIC
10)	uPVC Pipes & fittings	Supreme, FINOLEX, Prince, Astral Dutron, Ashirwad
11)	Stoneware Pipes & fittings	Girish or best quality as approved by the architect or EIC
12)	SS Sink	Nirali
13)	PVC Seats	COMMANDER, HINDWARE, CERA
14)	CI Manhole cover, frame and grating	NECO, BIC
15)	Float/Equilibrium Valves with Copper Floats	HAWA, Glenfield
16)	Polyethylene composite pressure pipe	KITEC
17)	Copper pipe	IBP-NECO, Rajco
18)	Pressure tank (Bladder type)	WELLMATE
19)	HDPE pipe and fittings	Hasti - PIL, DUTRON, WAVIN
20)	RCC Hume pipe and fittings	Patel Hume pipes , ALCOCK, INDIAN HUME PIPE or As approved by EIC
21)	PVC water tank	SINTEX

NOTE:

- (i) **All materials shall conform to the relevant standards or Code of Bureau of Indian standards and shall have ISI mark validated for the period of installation and take over. They shall also fulfil all hydraulic tests at site and shall be free from all noticeable deficiencies during the guarantee period as well.**
- (ii) **All the Materials/Makes listed above and other than as specified above shall be used after obtaining prior approval from the Architect / Engineer-in-charge.**

SECTION - 6 (iv) - Material Specifications

SECTION -A

Concertina Coil/ Chain Link Fencing

Item Sr. no. 01

Providing & fixing concertina coil fencing of required dia ~600 mm over existing compound wall upto 6m height, over the existing angle iron 'Y' shaped placed 1.5 - 2 m apart and with 9 horizontal R.B.T.stud tied with G.I.Staple / clips to retain horizontal, including necessary bolts /G.I.barbed wire / turn buckle (if required) etc tied to angle iron with making holes (if required) in Y angles etc all complete, as per direction of Engineer-in-charge with reinforced barbed tape (R.B.T) / Spring core (2.5mm thick) wire of tensile strength of 165 kg/sq.mm. with tape (0.52mm thick) and weight 43.478gm/ meter, of make approved by EIC.

Note:

1. The quoted rate should also be inclusive of cost of necessary scaffolding if required.
2. One sample of 6m length of Concertina coil as per specification should be carried out site and offered for inspection. Only after acceptance of the sample, the contractor shall proceed with the work.

A. Materials & Workmanship

Material:

1. The concertina coil should be of ~600mm diameter at any given point on the compound wall after execution.
2. The thickness of spring core of the concertina coil should be 2.5mm thick.
3. The tensile strength of the spring core wire should be of 165kg/sq.mm.
4. Each coil sample of the concertina coil should be stretch at most for 6meters only.
5. Each 6 meters length of concertina coil shall have ~50 nos of turns of the coil.
6. The tape thickness of the concertina coil should be 0.5mm thick.

Workmanship:

1. The Concertina oil material should be brought at site and stocked suitably.
2. The Required length of work should be identified first in phase manner.
3. The existing barbered wires should be dismantled for that particular length and stocked properly.
4. The existing Y angles over the compound wall should be cleaned for dirt and rust using suitable sand papers.
5. The Y angles should be painted as per the specification mentioned elsewhere in the technical bid.
6. The RBT studs wire should be laid as per the specification mentioned, if required additional holes should be done in the Y angles.
7. The concertina coil should be stretched to the permissible required length, and placed over the Y angles.
8. Suitable anchorages and tying of the concertina coil with the RBT studs and Y angles should be carried out using GI clips and turn buckles if required.

B. Mode of measurement and Payment.

The measurement shall be taken in RMT along the linear length of the compound wall over which the concertina coil has been executed. The rate shall be for a unit of one Running meter.

Note: Any wastage will not be measured & paid i.e. the quoted rate should be inclusive of all wastages.

Item Sr. no. 02

Providing and fixing G.I CHAIN LINK FENCING of size 50 mm x 50mm x 10 guage x 10 guage over the existing compound wall fixed with screws/bolts/welding using 25 mm x 5 mm flat to the existing angle iron Y shaped using GI binding wire including providing 10 Guage GI wire horizontally at top and bottom including cost of all materials required for the work etc. complete at all heights / levels all as directed by the Engineer-in-charge.

Note : Rate should be inclusive of follwing

1. GI Chain link fencing 50 mm x 50 mm x 10 guage x 10 guage
2. 10 guage GI wire at top and bottom
3. All bolts / screws / welding and other items etc.
4. Scaffolding for erection works
5. Providing and fixing labour

Rate should be exclusive cost of 25 mm x 5mm flat. The same shall be measured under respective item of this tender.

A. Materials & Workman Ship

Material:

1. The GI Chain link fencing should be of size 50 mm x 50 mm x 10 gauge x 10 gauge.
2. 10 gauge GI wire should be used at top and bottom to tie the chain-link fencing.
3. The chain link fencing should be tied with bolts / screws / welding and to the 25mm x 5mm M.S. flats etc.
4. The material should be brought as per above mentioned Item Sr. no. 2.

Workmanship:

1. The existing barbed wires on the compound wall between the Y angles should be properly removed, stacked and handed over to the IPR.
2. The chain-link fencing should be cut to the required dimension as per the desired length for the execution.
3. It should be properly screws/bolted/welded to the M.S. flats and fixed to the Y angles.
4. GI Wires should be used to tie the chain link fencing at top and bottom.
5. The Chain link fencing fixed over the compound wall should be cleaned and painted as per the specification mentioned.

B. Mode of measurement and Payment

The measurement shall be taken in square meter measured up to two decimals for the erected chain link fencing. The rate shall be for a unit of one square meter.

Note: Any wastage will not be measured & paid.

SECTION –B STEEL - REINFORCEMENT & STRUCTURAL

1.0 REINFORCEMENT

1.1 GENERAL REQUIREMENTS

Steel Conforming to pars 5.1.2 for reinforcement shall be clear and free from loose milscales, dust, loose rust, coats of paints, oil or other coatings which may destroy or reduce bond. It shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. Prior to assembly of reinforcement on no account any oily substance shall be used for removing the rust.

1.1.1 ASSEMBLY OF REINFORCEMENT

Bars shall be bent correctly and accurately to the size and shape as shown in the detailed drawing and directed by Engineer-in-Charge. Preferably bars of full length shall be used. Necessary cutting and straightening is also included. Over lapping of bars, where necessary shall be done as directed by the Engineer-in-Charge. The overlapping bars shall not touch each other and these shall be kept apart with concrete between them by 25 mm or 1 1/4 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be bound together at intervals not exceeding twice the dia of such bars with two strands annealed steel wire of 0.90mm to 1.6mm twisted tight. The overlaps/splices shall be staggered as per directions of the Engineer-in-Charge. But in no case the over lapping shall be provided in more than 50% of cross sectional area at one section. The bars of 36 dia and above shall not be lapped but welded. In case lapping is unavoidable this may be allowed with additional spirals over the lapped portion as per approved drawing.

1.1.2 BONDS AND HOOKS FORMING END ANCHORAGES

Reinforcement shall be bent and fixed in accordance with procedure specified in IS 2502, code of practice for bending and fixing of bars for concrete reinforcement.

(a) **U – Type Hook**

In case of mild steel plain bars standard U type hook shall be provided by bending ends of into semi-circular hooks having clear diameter equal to four times the diameter of the bar and straight ends of hook beyond semi-circular bend shall be minimum 4 times the diameter.

Note: In case of work in seismic zone, the size of hooks at the end of the rod shall be eight times the diameter of bar or as given in the structural drawing.

(b) **Bends**

Bend forming anchorage to a M.S. plain bar shall be bent with an internal radius equal to two times the diameter of the bar with a minimum length. beyond the bend equal to four times the diameter of the bar.

1.1.3 ANCHORING BARS IN TENSION

Deformed bars may be used without end anchorages provided development length requirement is satisfied. Hooks should normally be provided for plain bars in tension. Length of bars will be determined as per IS: 456.

1.1.4 ANCHORING BARS IN COMPRESSION

The anchorage length of straight bar in compression shall be equal to the Development length of bars in compression as specified in IS: 456. The projected length of hooks, bends and straight lengths beyond bend, if provided for a bar in compression, shall be considered for development length.

1.1.5 BINDERS, STIRRUPS, LINKS ETC.

In case of binders, stirrups, links etc. the straight portion beyond the curve at the end shall be not less than eight times the nominal dia. of bar.

1.1.6 WELDING BARS

Wherever facilities for electric arc welding is available, welding of bars shall be done in lieu of overlap. The location and type of welding shall be got approved by Engineer-in-Charge. Welding shall be as per IS: 2751 and IS: 9417.

1.1.7 The stipulations in ISA56-2000 shall be followed wherever applicable even though the same has not be specifically stated in this booklet.

1.2 PLACING IN POSITION

1.2.1 Fabricated reinforcement bars shall be placed in position as shown in the drawings and/or as directed by the Engineer In-Charge. The bars crossing one another has to be tied together at every intersection with two strands of annealed steel wire 0.9 to 1.6mm thickness twisted tight to make. The skeleton of steel work rigid so that the reinforcement does not get displaced during deposition of concrete. Tack welding in crossing bars shall also be permitted in lieu of binding with steel wire if approved by Engineer-in-Charge.

1.2.2 The bars shall be kept in correct position by the following methods

- a) In case of beam and slab construction precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 x 4 cm section and of thickness equal to the specified cover shall be placed between the bars and shuttering, so as to secure and maintain the requisite cover of concrete over reinforcement.
- b) In case of cantilevered and doubly reinforced beams or slabs, the vertical distance between the horizontal bars shall be maintained by introducing chairs, spacers or support bars of steel at 1 m or at shorter spacing to avoid sagging.
- c) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them : or with block of Cement mortar 1:2 (1 cement :2 coarse sand) of required size suitably tied to the reinforcement to ensure that they are in correct position during concreting.
- d) In case of other R.C.C. structure such as arches, domes, shells, storage tanks etc. a combination of cover blocks, spacers and templates shall be used as directed by Engineer-in-Charge.

Note: The cover block shall be approved by Engineer-in-Charge. In case of concrete cover blocks only are approved by Engineer-in-Charge the same shall be used and the cover block for normal concrete should be one grade more than grade of concrete. PVC cover blocks if approved by Engineer-in-Charge may be used.

1.3.3 TOLERANCE ON PLACING OF REINFORCEMENT

Unless otherwise specified by the Engineer-in-Charge reinforcement shall be placed within the following tolerances: Tolerance in spacing

- | | | |
|-----|---------------------------------------|---------|
| (a) | For effective depth, 200 mm or less | + 10 mm |
| (b) | For effective depth, more than 200 mm | + 15 mm |

Minimum cover in structural members shall be maintained for relevant exposure as per drawing. The minimum nominal cover to meet durability requirements shall be as under:

Exposure	Nominal Concrete cover in mm not less than
Mild	20
Moderate	30
Severe	45
Very Severe	50
Extreme	75

Notes:

1. For main reinforcement upto 12mm diameter bar for mild exposure the nominal cover may be reduced by 5 mm.
2. Unless specified otherwise, actual concrete cover should not deviate from the required nominal cover by +10mm.

3. For exposure condition 'severe' and 'very severe', reduction of 5 mm may be made where concrete grade is M35 and above.

1.4 BENDING AT CONSTRUCTION JOINTS

Where reinforcement bars are bent aside at construction joints and afterwards bent back into their original position care should be taken to ensure that at no time the radius of the bend is less than 4 bar diameters for plain mild steel or 6 bar diameters for deformed bars. Care shall also be taken when bending back bars to ensure that the concrete around the bar is not damaged.

1.4.1 MEASUREMENT

Reinforcement including authorised spacer bars and lappages shall be measured in length of different diameters, as actually (not more than as specified in the drgs.) used in the work nearest to a centimetre and their weight calculated on the basis of standard weight given in Table below. Wastage and unauthorised overlaps shall not be paid for. Annealed steel wire required for binding or tack welding shall not be measured, its cost being included in the rate of reinforcement. Wherever tack welding is used in lieu of binding, such welds shall not be measured. Chairs separators etc. shall be provided only approved numbers & length of chairs actually provided at site by as directed by the Engineer. In-charge and measured separately and paid for.

**Cross Sectional area and mass of steel bar
(As per Clause 5.2 of IS: 1786)**

Nominal size mm.	Cross Sectional area sq mm	Mass per meter Run kg
		Weight per kg per m
6	28.3	0.222
7	38.5	0.302
8	50.3	0.395
10	78.6	0.617
12	113.1	0.888
16	201.2	1.580
18	254.6	2.00
20	314.3	2.47
22.	380.3	2.98
25	491.1	3.85
28	616.0	4.83
32	804.6	6.31
36	1018.3	7.99
40	1257.2	9.85
45	1591.1	12.50
50	1964.3	15.42

Payment shall be made as per actual unit weight per meter of bar procured at site. The bar having weight on higher side than permissible tolerance given in IS, may be acceptable but

measurement & payment shall be restricted to standard weight as given in IS. Bar having weight variations lower side than permissible variation given in IS shall not be acceptable.

1.4.2 RATE

The rate for reinforcement shall include the cost of labour and materials required for all operations described above such as cleaning of reinforcement bars, straightening, cutting, hooking, bending, binding placing in position etc as required or directed including tack welding on crossing of bars in lieu of binding in wires etc.

1.4.3 THERMO MECHANICALLY TREATED BARS (TMT-BARS)

1.4.3.1 Introduction

Thermo Mechanically Treated (TMT) Bars is a recent technological advancement for production of strength deformed steel bars for concrete reinforcement. In this process higher strength is obtained in thermo mechanical treatment, wherein the steel bars get intensive cooling immediately after rolling. Sudden reduction in temperature creates a hardened surface layer with the internal core still being hot. While further cooling in atmosphere, tempering takes place by the heat from the core. This process is expected to improve the properties of strength and ductility of the bars.

1.4.3.2 ADVANTAGE

Generally, the higher strength in steel can be obtained by increasing Carbon content, Micro alloying, Thermo Mechanical Treatment or Cold Twisting. So far in India, cold twisting of bars was used extensively for production of high strength bars. These bars can easily be identified by the two main ribs being helical, where as in hot rolled bars these ribs are straight. In the case of TMT Bars the higher strength is obtained by thermos mechanical treatment and the Carbon content also has been brought down leading to improved Ductility.

1.4.3.3 PERMISSION TO USE

However, it may be noted that deliberations are going on at the Bureau of Indian Standard (BIS), for making appropriate provisions in relevant BIS codes and it is expected that his will be done shortly. Meanwhile, the properties of these bars have been examined and it has now been decided that these bars may be allowed to be used in CED works.

1.4.3.4 PROPERTIES

**TABLE-1
CHEMICAL PROPERTIES**

Constituent	Percent, Maximum								
	Fe 415	Fe 415D	Fe 415S	Fe 500	Fe 500D	Fe 500S	Fe 550	Fe 550D	Fe 600
Carbon	0.30	0.25	0.25	0.30	0.25	0.25	0.30	0.25	0.30
Sulphur	0.060	0.045	0.045	0.055	0.040	0.040	0.055	0.040	0.040
Phosphorus	0.060	0.045	0.045	0.055	0.040	0.040	0.050	0.040	0.040
Sulphur and phosphorus	0.110	0.085	0.085	0.105	0.075	0.075	0.100	0.075	0.075

TABLE-2
MECHANICAL PROPERTIES (AS PER IS 1786-2008 TABLE 3)

Sl.No.	Property	Fe 415	Fe 415D	Fe 415S	Fe 500	Fe 500D	Fe 500S	Fe 550	Fe 550D	Fe 600
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	0.2 percent proof stress/ yield stress, <i>Min.</i> N/mm ²	415.0	415.0	415.0	500.0	500.0	500.0	550.0	550.0	600.0
ii)	0.2 percent proof stress/ yield stress, <i>Max.</i> N/mm ²	—	—	540.0	—	—	625.0	—	—	—
iii)	TS/YS ratio ¹⁾ , N/mm ²	≥ 1.10, but TS not less than 485.0 N/mm ²	≥ 1.12, but TS not less than 500.0 N/mm ²	1.25	≥ 1.08, but TS not less than 545.0 N/mm ²	≥ 1.10, but TS not less than 565.0 N/mm ²	1.25	≥ 1.06, but TS not less than 585 N/mm ²	≥ 1.08, but TS not less than 600.0 N/mm ²	≥ 1.06, but TS not less than 660 N/mm ²
iv)	Elongation, percent, min. on gauge length $5.65\sqrt{A}$, where <i>A</i> is the cross-sectional area of the test piece	14.5	18.0	20.0	12.0	16.0	18.0	10.0	14.5	10.0
v)	Total elongation at maximum force, percent, <i>Min.</i> on gauge length $5.65\sqrt{A}$, where <i>A</i> is the cross-sectional area of the test piece (see 3.9) ²⁾	—	5	10	—	5	8	—	5	—

¹⁾ TS/YS ratio refers to ratio of tensile strength to the 0.2 percent proof stress or yield stress of the test piece
²⁾ Test, wherever specified by the purchaser.

1.4.5 LIMITATIONS

1.4.5.1 Standard Table of SP 16 (Design Aid to IS:456) can be used for utilising these design process. However, there are limitations when it comes to using the strengths 415 Mpa in Earthquake prone areas IS: 13920 forbids using strengths higher than 415 Mpa under following situations: The Structure is located in Seismic zone IV & V.

- (i) The Structure is located in Seismic Zone – III and has the importance factor (1) greater than
- (ii) The structure is located in Seismic Zone – III and is an Industrial Structure
- (iii) The Structure is located in Seismic Zone – III and is more than 5 storey high.

1.4.5.2 While every care shall be taken to avoid mixing different types and grades of bars in structure members as main reinforcement to satisfy Clause 25.1 of IS:456, if approved by competent authority / indicated in approved structural drawing, under exigencies where two grades/types of bars are to be used in the same building 'the same may be used.

1.4.6 IDENTIFICATION

Care shall also be taken to properly identify these bars at site. The staff shall be specially looking for identification marks on these bars. While TISCON Bars are available with embosses on their bars SAIL – TMT are yet to do so. Currently SAIL is providing Bundled bars colour coded yellow for TMT 500 and Green for TMT 550 (No colour code for TMT 415) at the ends along with a tally indicating the grade with each bundle Rashtriya Ispaat Nigams's rebar can be identified with In-Sigpia which is embossed on every rebar during the rolling process itself. However, the grade of rebar can be identified by means of colour coding. Grade Fe 415 is coded Blue colour and Fe 500 is coded with Blue-Green colour. Hence, it will be advisable to see that the type/grade of bars are brought to site and used in the project after conducting tests for each lot.

1.4.7 MATERIALS

1.4.7.1 STEEL

Finished steel shall be well and cleanly rolled to the dimensions and weight subject to permissible tolerances as per IS:1852. Finished material shall be free from cracks, surface flaws, laminations, imperfect and rough edges and any other defects. They shall be free from rust, scaling and putting and shall be well protected. For structural purpose following varieties of steel only should be used unless otherwise specified.

- (a) ST 42-S conforming to IS:226: For all types of structures (riveted or bolted) including those subjected to dynamic loading and where fatigue, wide fluctuation of stresses, reversal of stresses are involved like in crane gantry girders, road and rail bridges etc. It is suitable for welding only if the thickness of the materials does not exceed 20 mm.
- (b) S.T. 42-W conforming to IS 2062: This is fusion welding quality steel used for structures like crane gantry girders, road and rail bridges etc.
- (c) S.T. 42-0 conforming to IS 1977: This is ordinary quality .steel which shall be used only for structures not subjected to dynamic loading, where welding is not employed, structures not situated in earth quake zones and structures the design of which has not been based on plastic theory.
- (d) S.T. 32-0 conforming to IS 1977: This is ordinary quality steel which shall be used only for doors, window frames, window bars, grills, steel gates, hand railing, builders hardware, fencing posts, tie bars etc.
- (e) All structural steel work shall conform to code of practice for use of structural steel in general building construction IS: 800.
- (f) All structural steel and electrodes shall comply in all respects with Indian Standard Specification for structural steel.

1.4.8 PAINTING

Surfaces to be painted, oiled or otherwise treated shall be dry and thoroughly cleaned to remove all loose scales and loose rust.

Inaccessible surfaces after shop assembly shall receive full specified protective treatment before assembly except sealed hollow sections. The part of steel member to be encased in concrete shall not be painted or oiled. Prior to placing any steel member in position or taken out of workshop a priming coat of approved steel primer i.e., Yellow zinc chromate primer conforming to latest IS should be applied.

1.4.9 WORKMANSHIP

All workmanship shall be of acceptable standard in every respect, and accuracy should be ensured so that all parts will fit together properly on erection.

All ends shall be cut true to planes. They must fit the abutting surfaces closely.
All stiffeners shall bear tightly at both ends.

All butt ends of compression members "shall be in close contact throughout the area of the joint.

All holes in plates and sections between 12.7 mm and 19 mm thick shall be punched to such a diameter that 3.18 mm of metal is left all around the hole to be cleaned out to correct size by reamer.

The base connection shall be provided as shown in drawings and accurate workmanship shall be ensured to provide the connections.

Figured dimensions on the drawings shall be taken.

1.4.10 ERECTION

- a) All the plants and equipments used for erection should be of adequate capacity and contractor has to furnish details of same to Engineer In-Charge well before the programmed date for erection and get his clearance/approval.
- b) During erection, the work shall be securely braced and fastened temporarily to provide safety against all erection stresses etc. No permanent welding shall be done until proper alignment has been obtained.
- c) Any parts which do not fit accurately or which are not in accordance with the drawings and specifications shall be liable to rejection and if rejected shall at once be made good.
- d) Engineer-in-Charge shall have full liberty at all reasonable times to enter the contractor's premises for the purpose of inspecting the work and no work shall be taken down, painted or dispatched until it has been inspected and passed. The contractor shall supply free of charge all labour and tools required for testing of work.

NOTE: On any straight weld the first run shall not ordinarily be deposited with a larger diameter electrode than 4 mm. For subsequent run the electrodes shall not be increased by more than two electrodes between consecutive runs.

1.4.11 WELDING OPERATIONS

The contractor shall ensure that each welding operator employed on fabrication or erection is an efficient and dependable welder, who has passed qualifying tests on the types of welds which he will be called upon to make. Sample tests shall have to be given by the contractor to the entire satisfaction of the Engineer-in-Charge.

1.4.12 WELDING PROCESS

- a) The work shall be positioned for downward welding where ever possible.
- b) Arc length, voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work. The welding current and electrode sizes for different types of joints shall be as per IS: 9595.
- c) The sequence of welding shall be such as to avoid undue distortion and minimize residual shrinkage stresses. Recommendation of IS: 9595 shall be followed.
- d) The electrode manipulation during welding shall be such as to ensure that:

- 1) The parent metal is in a fused stage when the filler metal makes contact with it.
- 2) The weld metal does not overflow upon any unfused parent metal forming over lappings.
- 3) The parent metal is not under-cut along the weld toes.

The flowing metal floats, the slag, the oxides, and the gas bubbles to the surface behind the advancing pool. In case any of these requirements is unattainable by manipulation, the current shall be adjusted or the electrode size changed.

Each time the arc is started the electrode shall be moved in such a way that the fusion of base metal at the starting point is assured. At the completion of a run the movement of electrode shall be slowed down to fill the arc crater. After every interruption of the arc except at completion of a run, the arc shall be re-started ahead of the previous deposit and then moved back to fill the center or such alternative technique shall be used as will ensure complete filling of the crater, **or** complete fusion between the new and old deposit and the base metal at the point of junction, and result in continuity of weld. Before welding operation is completed, all traces of slag shall be removed from the deposit, by chipping if necessary, and the deposit and the adjoining base metal shall be wire brushed and cleaned at all points. The requirements shall apply not only to successive layers, but also to successive beads, and to the over lapping area wherever a junction is made on starting a new electrode.

- 4) The welds shall be free from cracks, discontinuity in welding and other defects such as (i) under size, (ii) over-size, (iii) under-cutting and (iv) over-cutting in the case of fillet welds and defects (ii), (iii) & (iv) in the case of butt welds.

All defective welds which shall be considered harmful to the structural strength shall be subjected to radiographic examination as described in IS: 1182.

In case of welded butt joints in steel of thickness up to 50 mm the weld joint shall be subjected to radiographic examination as described in IS:1182. All welds shall be cleaned of slag and other deposits after completion. Till the work is inspected and approved painting shall not be done. The surface to be painted shall be cleaned of spatter, rust, loose scale, oil and dirt.

Inspection and. testing of welding shall be as per IS: 822.

1.4.13. Welding shall generally be done by electric process or as **per IS: 816**, 7069 and 823-1964. Gas Welding shall only be resorted to using oxyacetylene flame with specific approval of the Engineer-in-Charge. Gas welding shall not be permitted to structural steel work.

1.4.14 WORKMANSHIP

1.4.14.1 PREPARATION OF FUSION FACES

- (a) Fusion faces shall be cut by shearing machine or gas cutting and later dressed by filing or grinding, so that they shall be free from irregularities such as would interfere with the deposition of the specified size of weld to be the cause of defects. Fusion faces and the surrounding surfaces shall **be** free from heavy slag and free from oil, paints or any other substance which might affect the quality of the weld or impede the progress of welding.
- (b) The parts to be welded shall be brought into as close contact as possible and the gap due to faulty workmanship or incorrect fit up shall not exceed 1.6 mm. If separation of 1.6 mm or more occurs locally the size of the fillet welds shall be increased at such positions by an amount equal to the width of the gap.

1.4.14.2 WELDING

SIZE OF ELECTRODES AND RUNS

The maximum dia of the electrodes for welding any work shall be as per IS: 814 and appendix 'B' of IS: 823 and in the following table whichever is least.

Average thickness of plate or section	Maximum cut diameter of electrodes to be used
Less than 5 mm	3.8 mm
5 mm up to but not including 8 mm	4 mm
8 mm up to but not including 10mm	5 mm
10 mm up to but not including 18 mm	6 mm
16 mm up to but not including 25 mm	9 mm
25 mm and over	9 mm

The parts to be welded shall be maintained to their correct position during welding. They shall be securely held in position by means of tack welds, service bolts, clamps or rings before commencing welding so as to prevent any relative movement due to distortion, wind or any other cause. Step back mentioned should be used to avoid distortion.

The minimum leg length of a filler weld as deposited should be not less than the specified size and the throat thickness as deposited should be not less than that tabulated below:

THROAT THICKNESS OF FILLET

Angle between fusion faces	60° – 90°	91°-100°	101° -106°	107° -113°
Throat thickness in cm	0.70	0.65	0.60	0.55

In no case should a concave weld be deposited without the specific approval of the Engineer-in Charge unless the leg length is increased above the specified, so that the resultant throat thickness is as great as would have been obtained by the deposition of fillet.

All welds shall be deposited in a pre-arranged order and sequence taking due account of the effects of distortion and shrinkage stresses.

After making each run of welding, all slag shall be removed and final run shall be protected by clean boiled linseed oil till approved. The weld metal, as deposited shall be free from crack, slag, excessive porosity, cavities and other faults.

The weld metal shall be properly fused with the parent metal without overlapping or series undercutting at the tees of the weld.

The surfaces of the weld shall have a uniform and consistent contour and regular appearance.

In welds containing cracks, porosity or cavities in which the old metal tends to overlap in the parent metal without proper fusion the defective portions of the welds shall be cut out and re welded. Where serious undercutting occurs additional weld metal shall be deposited to make good the reduction.

Peeling of welds shall be carried out only with the approval of the Engineer-in Charge.

Immediately after de-slagging, inspection and approval, all site welds and the surrounding surfaces shall be painted to protect the metal with clean boiled linseed oil.

1.4.15 BUTT WELDS

The ends of butt joints shall be welded so as to provide the full throat thickness. The weld face shall be at all places proud of the surface of the parent metal but shall not exceed 3.18 mm.

1.4.16 SHOP DRAWINGS

The shop drawings indicating all the requisite details of structural steel based on contract drawings shall be submitted to the Engineer-in-Charge along with the necessary information for fabrication, erection, painting of structures etc., immediately after acceptance of the tender.

1.4.17 FABRICATION OF BUILT UP SECTION BY WELDING

The fabrication shall generally be done as specified in IS: 800. Adequate care shall be taken while fabricating to ensure accuracy so that these can be assembled without being unduly packed, strained or unduly forced into position. The built up section shall be true and free from twist, kinks, buckles, or open joints. Suitable templates of wood or metal shall be made to facilitate accurate fabrication. Unless approved in fabrication drawing no two pieces shall be welded or joined to make up for the required length of the member.

1.4.18 ERECTION AND FIXING IN POSITION PREFABRICATED TRUSSES AND COLUMNS

The prefabricated steel laced columns are to be strictly according to the details furnished in the drawing. All scaffolding, temporary supports, tools, trusses required for erecting, hoisting and fixing in position the columns and trusses shall be provided by the contractor at his own cost. The trusses and columns shall be erected and fixed in the position true to plumb and levels and lines in a workman-like manner as directed by the Engineer-in-Charge. The various components being erected shall be supported and held in position suitably till completion of erection. Any damage to the materials caused by the contractor shall be made good and rectified at his own cost to the entire satisfaction of the Engineer In-Charge.

1.4.19 STEEL DOORS, WINDOWS AND VENTILATORS

The doors, windows and ventilators shall be manufactured from uniform IS standard sections and or M.S. angles to suit sizes as given in the schedule of quantities. The weight of different rolled steel section used for the manufacture of doors, windows and ventilators, shall not be less than those specified in IS: 103 or 1038 unless otherwise specified. The steel shall be of fusion welding quality St. 42 designation. The steel section shall conform in all respects to IS: 4062. In case where the standard door and windows are of insufficient strength for the particular door, window, ventilator etc. suitable other M.S rolled or built up sections of sufficient strength shall be used. Necessary Mild Steel stiffeners are to be provided in doors wherever required for structural stability. The contractor shall produce detailed shop drawings for the doors, windows and ventilators showing the sizes and arrangement of the sections and units and system of operation for the approval of the Engineer-in-Charge and fabrication shall be commenced only after approval to these shop drawings.

Corners of doors, and ventilators shall be accurately mitred, jointed and fitted to produce flush joints and folded along the concealed line of contact. The corners of fixed and opening frame

shall be electrically flash butt-welded to form a solid and true right angle and all frames shall be square and flat.

The weld shall thoroughly penetrate the metal resulting in complete fusion between frames. Mechanically jointed corners or those developed by the rods and/or superficial surface welding shall not be permitted.

All cut outs, recesses, mortising or milling operations required for hardware shall be accurately made and reinforced with backing plates as required to ensure adequate strength of the connections. No field fabrication of frames shall be permitted.

Intermediate glazing bars shall be tenoned and riveted into the frames and inter-sections, the horizontal glazing bars shall pass through the vertical bars and the joints closed by hydraulic pressure.

The steel doors and windows shall be according to the specifications and design. The sizes of doors and windows shall be calculated so as to allow 1.24 cm clearance on all the four sides of opening to allow for easy fitting of doors, windows and ventilators. The actual sizes of doors, windows and ventilators shall not vary by more than 1.5 mm from those given in the design.

The thickness and type of glazing shall be as specified in the schedule. The glass panes shall be free from flaws, specks or bubbles and shall have square corners and straight loose in the frames.

The beading shall be of standard aluminium channel as shown on drawing and approved. The manufacturers shall be intimated in advance to drill holes for head screws. Beads shall be fixed with screws spaced not more than 10 cm from each corner.

The screws, nuts, washers, bolts, rivets, weather bars and any other miscellaneous fastening services shall be of steel. Samples of doors/windows/ ventilators with all fittings, locking arrangement peg stays, handles etc. shall be submitted for approval to the Engineer-in-Charge and got approved before taking up the manufacture of full quantity. No extra payment will be made towards the supply of same for approval.

The component parts of doors, windows, ventilators shall all be as per approved working drawings.

Composite units consist of a combination of two or more units of doors, windows and ventilators etc. as the case may be. The different units shall be coupled by using coupling sections. The coupling sections shall be made from M.S sheet 3.15 mm in thickness and 56 mm wide as per IS:1038 para 5.2 and these shall be fixed with bolts and nuts.

Wherever the doors, windows and ventilators shall be coupled with a coupling section mastic cement shall be applied between the junctions to make the joint water tight.

All steel surfaces shall be thoroughly cleaned of rust, scale and dirt by pickling and marking. A shop priming coat of superior quality red oxide or equivalent shall then be given before despatch.

Unless otherwise specified the contractor's rate for doors, windows, ventilators shall be inclusive of supply of necessary fixtures, fittings, fastenings like lugs, beading, peg stays, handles, locking arrangement, screws, spring catch, applying a priming coat, glazing etc. complete.

1.4.20 REQUIREMENT OF WELDED JOINTS OF STEEL DOORS, WINDOWS, VENTILATORS AND COMPOSITE UNITS

I. VISUAL INSPECTION TEST

When two opposite corners of the frame are cut, paint removed and inspected the joint shall conform to:

- (a) Welds should have been made all along the place of meeting of the members and there is no tack welding.
- (b) Welds are properly grounded.
- (c) The joint is completely solid and no visible cavities.

II. MICRO AND MACRO EXAMINATION

From the two opposite corners obtained for visual test, the flanges of the sections shall be cut with the help of a saw. The cut surface of the remaining portions shall be polished, etched and examined. The polished and etched faces of the weld and base metal shall be free from cracks and reasonably free from under cutting, over laps, gross porosity and entrapped slag.

III. FILLET WELD TEST

The fillet weld in the remaining portion of the joint shall be fractured by hammering. The fractured surface shall be free from slag, inclusion porosity, crack penetration defects and fusion defects.

1.4.21 FIXING OF STEEL DOORS, WINDOWS & VENTILATORS

Steel doors and windows shall be stacked in upright position on level ground, preferably on wooden battens to keep them in true shape without damage.

Doors, windows and ventilators shall be fixed to masonry (inclusive of brick, RCC stone and marble) timber and steel work openings as shown in drawings in the following manner.

Openings may be flush or rebated as shown in the drawing. These openings may have rendered finish or a 'flair faced' finish (i.e., without rendering as in case of marble or stone facing). Where openings are flush and with a rendered finish a clearance of 1.25 cm shall be provided between the steel frame and opening. In case of external masonry finish "fair faced" and with rebated jambs, a minimum 1.25 cm clearance between frame and opening shall be provided.

Steel work opening shall be so designed that the outer flange of the door, windows or ventilator frame section overlaps the steel surface by 10 mm.

Outer frame shall be provided with fixing holes centrally in the web of the sections in the position given in IS: 1038. The materials for fixing frames to opening in different class of opening shall generally conform to IS: 1038-1957.

1.4.22. FIXING PROCEDURE MASONRY OPENINGS

(a) Fixing with lugs:

- I. Doors, windows and ventilators unit, shall not be 'built' in as the work proceeds but opening shall be left all-around. The size of the opening shall first be checked and cleared of obstruction, if any.
The position of the unit of fixing holes shall be marked on the jamb. Necessary holes shall be made in the masonry and lugs not less than 10cm long 15 x 3 mm size fixed in cement concrete blocks 15 x 10 x 10 cm size of 1:3:6 mix (1 cement :3 coarse sand :6 graded stone aggregate 20 mm nominal size).
- The frames of units shall be set in the openings by using wooden wedges at the jamb, head and sill, (wedges shall preferably -be placed near the points where a glazing bar meets the frames) and be plumbed in position.
- II. Then it lugs shall be fixed with the frame with 20 mm long and 7.3 mm dia G.I. Counter sunk machine screws and nuts. In case of flush opening which are rendered smooth wedges shall be removed and gap between unit and the jambs shall be filled with approved filling material.
- III. In case of flush jamb with external 'fair faced' finish the gap between the opening and frame shall be filled with mastic from inside till it oozes out on external face. The oozing mastic shall be cleaned and flush pointed. The internal gap shall be filled with mastic to about 1/ 3rd depth and the rest with cement mortar.
- IV. In case of rebated jambs and jambs finished 'fair faced ' externally the mastic shall be freely applied to the inside channel of frame, jamb and sill, so as to ensure a water tight joint. After the unit is firmly fixed in position surplus mastic shall be cleaned and flush pointed.

(b) Fixing with screws and plugs

In RCC work where lugs cannot be embedded due to reinforcement bars etc. wooden plugs shall be fixed in RCC at proper position while laying concrete. Alternatively ravel plugs may be fixed in proper position and frames fixed to them with 60 mm galvanized wood screws. Alternatively approved anchor fastener may be used.

Wood Work Openings:

Wooden openings are normally rebated and mastic shall be applied to jambs, sill of a channel before fixing in position. The frame shall be set in opening using wooden wedges and fixed to the opening with 60 mm galvanized wood screws.

Extra timber fillets of hard wood to match the adjoining work shall also be provided around the frame to close the extra gap between opening and frame.

STEEL WORK OPENINGS

Before placing the unit frame in position mastic shall be applied and a Mild Steel or hard wood fillet shall be provided around the frame to close the extra gap between opening and frame. The unit shall then be fixed to the opening with fixing clips or with nuts and bolts as shown in the drawings or as directed by the Engineer In-Charge.

1.4.23. FIXING OF COMPOSITE UNITS

The fixing procedure for composite units shall generally be as described above except that:

- (a) Where large units shall be formed by coupling individual units together (with coupling sections), the mullions and transoms shall be bedded in mastic to ensure water tightness. Mastic shall be applied liberally to the channels of the outside frame sections before assembly and after coupling. All oozing out mastic shall be cut out neatly.
- (b) Mullions normally project 2.5 cm at head and sill and are fixed in pockets made into the masonry, timber or steel work opening. But where it is at cross joint with a transom the shorter coupling unit shall run through unbroken and other coupling unit shall be cut square to form a butt with other members.

1.4.24 COLLAPSIBLE GATES

These shall be from the approved manufacturers and shall be fabricated from the mild steel sections. The details of vertical channels, flat iron diagonals, top and bottom rails, balls bearings etc. shall be as per approved manufacturer's specification. The bolts, nuts, locking arrangements, stoppers, handles, special fittings like springs, catch and locks shall all be as specified in the description of item. The gate shall open and close smoothly and easily.

The height of the gate shall be measured as length of the vertical double channels and breadth from outside to outside of the end fixed double channels in open position of the gate. The area shall be measured in sq. meters correct to two decimals.

1.4.25 M.S SHEET SLIDING SHUTTERS

These shall be manufactured as per approved shop drawings.

The shutters, MS angle iron frame work, diagonal braces, gusset plates, MS sheet coverings, top and bottom guide rails, pulleys, ball bearings., stoppers, hold fasts, other fittings and all shall be indicated in detail in shop drawings and got approved by Engineer-in-Charge prior to fabrication. The guide rails shall be sufficiently long and continued along the wall on both ends so that sliding shutter can rest in the wall portion giving full opening if required.

The details of guide rail fixing to floor by anchor bolts embedded in cement concrete, supporting of steel sections at top, damping arrangement to avoid shutters rolling back with the opening shall all be indicated in the shop drawing and got approved.

Two channel sections shall be suitably fixed vertically below the extreme clamps in the wall and floor to avoid the shutter from going out of the support at top and bottom.

Damages if any to the adjoining work while erecting/fixing the sliding door shall be made good to match the adjoining finishes at the cost of sliding door fixing agency.

The measurement for steel sliding door shall be correct to cm and area calculated in sq meters correct to two decimal places. The height of the shelter shall be measured from outside to outside the guide rail and width outside to outside of shutter including vertical position channels in sides when closed.

1.4.26 ROLLING GRILLS

Rolling grills are similar in design, construction, and operation of rolling shutter and all provisions of rolling shutter above shall be applicable to rolling grills except in respect of the shutter portion which shall conform to IS: 6248.

A rolling shutter may have a rolling grill portion at top or bottom or at both places. The total height of all segments of grill portions shall not exceed 1 m and individual segment height shall not be more than 0.5m. The measurement of rolling grills shall be similar to rolling shutter.

1.4.27 MODE OF MEASUREMENT FOR STEEL WORK

- (a) work in single sections/built up section

The work as fixed in place shall be measured in running metres correct to a millimeter. The unit weights of per meter section shall be measured to the nearest two decimals of kilogramme. The standard weight of steel sections shall conform to IS 808 with tolerance in sizes as per IS 1852. Tolerance in weight is given in below Table. Steel sections shall be acceptable within tolerance limits.

For Measurement & Payment for steel sections shall be made as per actual unit weight per meter of the section procured at the site. The actual unit weight per meter shall be considered for measurement & payment. Sections having weight on higher side than permissible tolerance, may be acceptable but payment shall be restricted to standard weight as per IS. Steel sections having weight variations lower side than permissible variation shall not be acceptable.

No deduction shall be made for rivet/ or bolt holes (excluding holes for anchor or holding down bolts).

Oiling, temporary cleats, marking, packing and delivering to site shall be included in the scope of work and will not be measured.

Item Sr. no. 3.

Supplying, fabricating and erecting in position MS flats of 25 x 5 mm steel works in single sections including cutting, hoisting, fixing in position, applying two coats priming coat of zinc chromate primer and painting with two coats of aluminium paint, using bolts, nuts as necessary all as per drawings and specifications at all heights..

In flats of all thicknesses.

1.0 Materials & Workmanship:

Materials & Workmanship is as described in above section – B.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section B. The rate shall be for a unit of one Metric Tonne.

Note: Any wastage will not be measured & paid.

Item Sr. no. 8.

Suppling, fabricating, assembling, hoisting/ erecting and fixing in position at all heights and with all leads, structural steel works of welded built-up sections, all as per structural drawings and as per detailed specifications (for materials and workmanship) in the situations described hereinafter including a)cutting of components to required lengths/ widths and shapes/profiles, b)smooth machining of edges/ faces , c) welding (electric arc welding) at joints of built-up sections/ single sections for required weld lengths and sizes and d) painting all over with two coats of Aluminium paint of approved quality , make and colour/shade over two coat of zinc chromate primer with surfaces duly prepared to receive painting etc., complete all as directed by the Engineer-in-charge .

NOTE: Fabrication shall be in a perfectly workmanship like manner and as provided in Section V and VI of IS 800 and IS 7215. Welding shall be carried out by qualified welders. Electrodes for welding, the procedure, selection, test and inspection shall conform to provisions in IS 816,

IS 818, IS 822, and IS 833. Erection/hoisting shall commence only after passing of fabricated parts by the Engineer -in- charge.

Structural steel works as in item above but with MS angles tees and other sections.

2.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – B.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section B. The rate shall be for a unit of one Kilogram.

Note: Any wastage will not be measured & paid.

Item Sr. no. 13.

Supplying & laying / tying in position steel reinforcement bars for all R.C.C items manufactured by SAIL, TISCO, RINL (VIZAG STEEL) , JSW Steel, Jindal Steel & Power limited (under brand name of “JINDAL PANTHER”) or equivalent PRIMARY make confirming to IS 1786 for all RCC items including de coiling, cutting, hooking, bending, cranking, fabricating to required shape, placing in position and tying the system at each junction with soft drawn annealed binding wire of diameter not less than 1.00mm with 2 strands etc; complete all as per specifications at all heights and in all floors (binding wire will not be measured for payment).With Thermo-Mechanically Treated (TMT) bars Fe 500D grade

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – B.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section B. The rate shall be for a unit of one Kilogram.

Note: Rolling margin & wastage will not be measured & paid.

Item Sr. no. 16.

Suppling, fabricating, assembling, hoisting/ erecting and fixing in position of 10mm dia M.S. Bar at all heights and with all leads including cutting, welding, Painting all over with two coats of Synthetic enamel paint of approved quality, make and colour/shade over two coat of Yellow zinc chromate primer with surfaces duly prepared to receive painting etc., complete all as directed by the Engineer-in-charge.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – B.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section B. The rate shall be for a unit of one Kilogram.

Note: Rolling margin & wastage will not be measured & paid.

SECTION - C PAITNINGS/ FINISHING

4.1 SCAFFOLDING

For all masonry work, finishing works etc., wherever necessary only, double scaffolding independent of work has to be adopted. In case of any special work / special type of scaffolding requirement etc. the scaffolding scheme shall be got approved from the Engineer-in-charge well in advance of actual erection of scaffolding.

4.2 PLASTERING

The term plastering shall cover all types of rough or fair finished plastering rendering, floating and setting coats screed etc. in lime, cement lime or cement mortar.

Dubbing out shall mean filling in hollows in the surface of wall and roughly leveling up irregular or out of plumb surfaces prior to rendering.

Rendering shall mean the plastic coat which is applied following the dubbing out where required or final coat in case of one coat work.

Floating coat shall mean the second coat used in a three coat work to bring the rendering coat to a true and even surface before the setting coat is applied.

Setting coat shall mean final coat in a two or three coat work.

Thickness of plaster shall mean minimum thickness at any point on a surface. This does not include thickness of dubbing out.

The term even and fair as referred to finishing of the final plastered surface shall mean a surface finished with a wooden float.

The terms even and smooth as referred to finishing of the final plastered surface shall mean a surface leveled with wooden float and subsequently finished with a steel trowel.

The type and mix of mortar for plastering, the number of coats, the surface finish, and the background which the plaster is to be applied shall be as indicated.

The mortar for dubbing out and rendering coat shall be of the same type and mix of proposed

plastering.

Ceiling plastering shall be completed before commencement of wall plastering in any area.

4.3 MIX OF MORTAR

The mix of mortar shall be as indicated.

a) PREPARATION OF SURFACES

The surfaces to be plastered shall be prepared in the following manner.

i) BRICK WORK AND MASONRY

The joints in row work shall be raked out to a depth of not less than 10mm as the work proceeds.

ii) CONCRETE SURFACES

For new work, surface shall be left sufficiently rough to provide adhesion. For old work surface shall be roughened by hacking or bush hammering. All dust, loose particles, laitance efflorescence, grease and oil and all such matters shall be removed where so directed. In all cases mentioned above the surface before plastering shall be thoroughly brushed down to remove dust, loose particles and efflorescence if any and kept well wetted. Plastering shall not be commenced unless preparatory work has been passed in writing by EIC.

b) APPLICATION OF PLASTER

Mortar shall be firmly applied in a little more than the required thickness and well pressed into joints. Correct thickness of plaster shall be obtained by using wood screed or laying plaster screeds at intervals of 1.5m. The dubbing out rendering and floating coats shall be left rough or scored to provide key for the subsequent coats of plaster and kept damp. In the case of one coat work or after the completion of setting coat the final surface shall be kept wet at least seven days. In hot weather surfaces exposed to sun shall be screened with wet matting or by other approved means. Unless otherwise indicated the final surfaces of external plaster work shall be finished rough and fair internal plaster shall, be finished with even smooth.

Plastering shall be done from top to bottom and care shall be taken to avoid joints in continuous surface. Partly set and dried mortar shall not be used.

CEMENT PLASTERING WITH NEERU FINISH FOR INTERNAL WALLS AND CEILING

Cement, sand and water required for the work shall conform to specifications laid down herein before under section 'Cement Concrete' (plain and reinforced) except that sand for finishing coat shall be fine sand. The surface to be plastered shall first be thoroughly cleaned down. All joints shall be raked out in case of brick work, stone masonry as the work proceeds. The surface to be plastered shall be well wetted for a minimum period of 24 hours before commencing the work. The mortar for all plaster shall be cement and sand of mix as specified in the schedule of quantities. Care should be taken to avoid damage to the floor due to scaffolding by adopting suitable measures. Damages if any shall be rectified by contractor at his own cost.

The surface to be plastered shall first be dubbed out with cement mortar to cover any irregularities and faces up to the proudest part. The dubbing coat shall then be done to provide key for the rendering coat. The rendering coat of cement and sand mortar shall then be applied over the dubbed surfaces.

The surfaces thus rendered shall then be finished smooth with good quality lime neeru. Neeru shall be prepared at site out of best quality fat lime, slaked at site with fresh water and slaked in accordance with the relevant IS code for slaking lime. The slaked and silted limes shall be reduced to a fine paste by grinding in a mortar mill (150 turns). Sufficient quantity which can be used within 10 days only shall

be prepared at a time.

All exposed angles and junctions of walls and doors etc. shall be carefully finished so as to furnish a neat and even surface. An entire unobstructed area shall be plastered in one operation. Before the base coat sets the neeru finish should be applied and finished smooth. The entire plastered surface shall be truly plain. Plaster work shall be cured for at least 7 days by approved methods taking precaution against damage to plaster during this operation.

The contractor shall take every precaution right from the commencement of the plaster work to prevent any craziness that may appear on the surface of plaster.

The contractor shall be responsible for making good any portion of plaster which in the opinion of the Engineer-in-Charge required removal and redoing.

The plastering shall be finished at skirting level.

4.4 SAND FACED CEMENT PLASTER

Sand faced plastering shall be executed as described below:

- a) The surfaces shall be cleaned and dubbed out as specified under cement plaster.
- b) A rendering coat of cement and sand mortar (1:4) shall be applied over the dubbing coat, the thickness excluding key not to be less than 38mm.
- c) While the rendering is still green, the surfaces shall be roughened lightly with wire brush. All loose particles shall be dusted and 6 mm thick cement mortar (1:4) shall be applied. The finished surface shall be slightly pressed with closed pricked wooden board or a wet sponge to bring the sand particles into prominence.
- d) General Workman ship, curing etc. shall be all as specified under cement plaster work.

4.5 CEMENT PLASTERING FINISHED ROUGH FOR EXTERNAL WALLS

Plastering shall be carried out generally as specified above for cement plastering with neeru finish. Neeru finish is not required for the surface plastering is to be finished rough. The sand to be used for the rough plastering shall be coarse sand.

4.6 ROUGH CAST PLASTER

4.6.1 Rough cast finish comprises of a mixture of sand and gravel in specified proportion dashed over freshly plastered surface. The scaffolding, preparation of surface, mortar etc. shall all be as specified and generally as per that for cement mortar plastering.

4.6.2 APPLICATION

The plaster base over which rough cast finish is to be applied shall consist of two coats comprising under layer 12mm thick and top layer 10mm thick. The under layer shall be applied in the same manner as for cement mortar plaster except that the surface shall be rough finished. The top layer shall be laid a day or two after the under layer has attained initial set. The under layer shall not be allowed to dry out before the top layer is laid on. The mortar used for applying top layer shall be sufficiently plastic and of rich mix 1:3 (1 cement: 3 fine sand) or otherwise specified, so that the mix of sand and gravel get well pitched with plaster surface. In order to make the base plastic about 10% of finely ground hydrated lime by volume of cement shall be added when preparing mortar for top layer unless specified otherwise.

4.6.3 FINISHING

The base surface which has to receive rough cast mixture shall be in plastic state when dashed over it. The rough cast mixture shall consist of sand or gravel or crushed stone as specified. The crushed stone shall be of uniform colour and size of 2.36mm to 12.55 mm as specified. The mixture shall be wetted and shall be dashed on the plaster base in plastic state by hand scoop so that the mix get well pitched into the plaster base and surface represent a homogeneous surface. A sample rough cast plaster shall be got approved by the Engineer-in-charge well in advance of actual work.

4.6.4 PEBBLE DASH FINISH (INSITU WORK)

The specification shall be similar to rough cast plaster except washed pebble or crushed stone of size 6.3mm to 12.5mm as specified shall be used in lieu of gravel or crushed stone in rough cast plaster work.

4.6.5 PLASTERING WITH TERRAZZO FINISH

4.6.5.1 The scaffolding, preparation of surface, etc. shall all be as specified under cement mortar plastering. The mortar shall be prepared as that under terrazzo dado work specified earlier. A 12mm thick under coat and 6 mm top coat shall be provided for 18mm thick plastering with terrazzo finish. The under coat shall consist of cm1:3 (1 cement: 3 coarse sand) unless otherwise specified. The specification for 6mm top coarse shall be as per cast in site. Tarrozzo dado work said above.

4.6.5.2 APPLICATION

The 12mm under coat shall be laid as in cement mortar plastering except that the surface shall be rough, and furrowed 2mm deep with scratching tool diagonally both ways to form key for the top coat. The scratching lines shall be at not more than 15cm apart. The surface shall be kept wet till finishing coat is applied. After under coat has sufficiently set but not dried at any case. Within 48 hours the top layer has to be laid in the same manner under 40mm marble chips flooring as far as applicable. The finished surface shall be smooth, highly polished and absolutely even so that when light from sideways is reflected on it, it does not show any kind of waviness curing shall be done as soon as the plaster has hardened and not to be damaged when watered and continued for 7 days. Any cracks which appear in the surface and all portions which sound hollow when tapped or are found to be soft or otherwise defective shall be cut out in rectangular shape and redone as directed by the EIC. The finish of rectification work shall be indistinguishable from the rest of the portion and does not show as a patch.

4.7 POINTING ON STONE WORK / BRICK WORK / TILE WORK

The following general specifications shall apply to all types of pointing:

4.7.1 SCAFFOLDING

Independent double scaffolding shall be done wherever required.

4.7.2 PREPARATION OF SURFACE

This shall be done as specified for plastering item except that the joints shall be raked to such a depth that the minimum depth of the new mortar measured from either the sunk surface of the finished pointing or from edge of the stone shall not be less than 12mm.

4.7.3 The mortar shall be pressed into the raked out joints, with a pointing trowel, either flush, sunk or raised. According to the type of pointing required. The mortar shall not be spread over the corner, edges or surfaces of the masonry. The pointing shall then be finished with the proper tool. The excess mortar shall then be cut off from the edges of the lines and surface of masonry shall also be cleaned off all mortar. The pointing has to be to the exact size and shape stipulated. The pointing shall be cured for 7 days and it should be protected from damages during this period.

4.7.4 The pointing shall be truly horizontal and vertical except where the joints are slanting as in random rubble masonry. Lines of joints from different directions should meet neatly at the junctions instead of crossing beyond.

4.7.5 CEMENT WATER PROOFING COMPOUND

Wherever admixture of water proofing compound is specified for cement plastering work or concrete work integral water proofing compound conforming to IS 2645 and of approved brand and manufacturer only shall be used. The contractor shall bring the material to the site in their original packing. The containers shall be opened in the presence of EIC or his representative. The material shall be mixed with dry cement in the proportion by weight recommended by the manufacturers or as described in the item as directed by the EIC. The water proofing mixer shall get well and integrally mixed with the cement and does not run out separately when water is added. It shall be measured by

weight unless otherwise stated. The rate shall include all labour and materials involved in mixing.

4.7.6 PAINTING / POLISHING GENERAL

The material required for painting, varnishing etc for the work shall be brought from approved manufacturers. Prior to bulk procurement the sample to be got approved from EIC. Adequate quantity required for the work should be brought at a time and kept in joint custody of contractor and EIC. The empty tins should not be removed from site till the relevant item of work has been completed, cleaned off dust prior to next coat. No left over paint shall be put back into stock tin. When not in use the container shall be kept properly closed. Top of the surfaces and surfaces in similar hidden locations shall not be left out.

Plastic emulsion, Acrylic emulsion, flat oil paint, synthetic enamel paint etc., shall be of special quality from approved manufacturers. Inferior quality (Bazaar quality paints even though manufactured by the approved manufacturers) shall not be used on the work.

Sample tins of paints for all coats to be submitted to the EIC for his approval prior to bulk procurement. The priming under coating and finishing coats shall be from different tins. The finishing coat shall be semi-gloss or matt finish as directed by the Engineer-in-Charge.

All the materials shall be kept properly protected when not in use. Lids of containers shall be kept closed and the surface of paint in open or partially open containers shall be covered with a thin layer of turpentine to prevent the formation of skin. Materials which in the opinion of the Engineer-in-Charge have become stale shall not be used on the works and shall be removed from the site of the work.

The paints shall generally conform to the chemical composition and other characteristics in the relevant IS Specification.

The paint shall be put on with approved brushes, kept well bound and well worked during its application. For iron work, fairly stiff brushes shall be used. The painting to be carried out in such order as directed by Engineer-in-Charge. The brushes shall be thoroughly cleaned before being used for a different types of class of materials.

4.7.8 POLILSHING WAX POLISH

A mixture of Bee's wax and turpentine in proportion 2:1 weight shall be used. The wax is melted and added to the turpentine, mixed well and allowed to cool.

The surface of the wood work shall be prepared as for oil painting before waxing. The wood work shall be smeared and rubbed with the mixture and allowed to remain overnight so that the mixture may soak into the pores of the wood. After drying, the surface shall be lightly rubbed with a fine sand paper prior to second and third coats. After the final coat, the surface shall be rubbed up with a soft flannel to a fine polish.

The wood work shall show an even polished surface and to be approved by Engineer-in-charge.

ITEM Sr. No. 10

Plastering 20mm thick with cement mortar 1:4 finished rough including scaffolding, curing, etc.; complete for EXTERNAL SURFACES of stone masonry/ brick masonry walls, sills, jambs, soffits, etc.; complete all as per specifications for heights up to 10 mtr above GL. Mix specified is for cement : coarse Sand.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – C.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section C. The rate shall be for a unit of one Square meter.

The measurement should in Square meters. Area of plastering will be measured net and shall be paid for. The measurement of length of wall plastering shall be taken between walls or partitions (dimensions before plastering shall be taken) for the length and from top of the floor or skirting or dado as the case may be to the underside of ceiling for the height. All openings more than 0.1 sq.m. shall be deducted and all jambs, soffits, sills of these openings if done, will be measured to arrive to the net area for payment. No opening less than 0.1 sqm. shall be deducted and no jambs etc. for such openings shall be measured for payment.

Architectural bands and narrow widths of plaster over structural as well as non-structural and the line when prepared in the same thickness of plaster shall not be measured separately and shall be covered by respective plaster items.

3.0 Rate

The rate shall be for a unit of one sq. meters The rate shall include the cost of finishing all the edges, corners, cost of all materials, labours, scaffolding, transport, curing etc. The rates shall also include for hacking and/or bush hammering to form key for plaster and for spatter dash treatment, as specified, as and where necessary. The rates shall also include for all work in narrow width, arises, rounded angles, chamfered external angles, drip moulds, grooves and for making good after all trades. The rate shall also include for groove with cement finish upto 12 mm. x 6 mm. to be formed in plaster at junctions of RCC and brick surface without any extra charge. The rate shall also include for similar grooves in plaster at the junction of masonry and wood or metal door /window /ventilator frame or at bottom of beam /lintels as drip moulds without extra charge. The rate should also inclusive of roughning of plaster with wire marks (If required) to receive tiles/other coats.

The rate shall include the cost of finishing all the edges, corners, cost of all materials, labour, transport, scaffolding, curing etc. and grooves if so specified in the item of schedule of quantities.

The rate for plastering should include the cost of work towards the following items for co-ordination with electrical item:

1. Neatly plastering around DBs, junction boxes, M.S. boxes etc. should be done and made matching with the wall finish after installation of electrical equipments.
2. All DBs, service boxes, covers etc. should be covered by a plastic cloth or other suitable covering materials such that water or materials should not splash the same during brick work and plastering work. This is to be done in such a way that electrical equipments as well as painted surfaces are not spoiled.
3. for fixing M.S. boxes, DBs etc. Thiyya should be given such that the required face of the M.S. box, DB covers etc. in line with final finished plastered surface.
4. The rate for the item shall also include rounding up of corner and angles making sharp corners and angles finishing around ceiling rose and electrical fittings etc. fixed by other agencies, finishing of top of dado and skirting (zad finishing), junctions of roof and wall or beam with the finish as specified in the item. Plastering of brick and concrete cornice and copings and plastering in restricted areas if any shall not be measured separately.

4.8 PAINTING

- 4.8.1 a)** All paints to be of best manufacture and to be delivered on the site in the marker's original packages and tins and the maker's guarantee to be produced if called for by the Engineer-in-Charge. The paints shall be of the qualities suitable for use in the local climatic conditions. Thinners must be those recommended by the manufacturers and used as directed by them.
- b)** The paints to be used for the various categories of painting work shall be of those manufactured by one of the standard manufacturer's e.g. M/s Nerolac, Shalimar or any other manufacturers,

as may be approved by the Engineer-in-Charge. Only the best quality paint of various categories shall be used. Paints for the application by brush shall be strained through paint strainer. The paint shall be kept stirred and used within the specified time. Hardened or damaged paint shall not be use.

c) APPLICATION

The paint shall be applied by means of brushes and in the manner specified by the manufacturer. The number of coats shall be as mentioned in the item. When more than one coat is ordered subsequent, coats shall be applied after the preceding coat is properly finished / cured and thoroughly hardened, inspected and approved, and as per manufacturers specifications.

Absorbant surfaces shall be evenly damped so as to give an even suction, In dry weather, freshly cement painted surfaces shall be kept damp for at least 2 days and protected from direct sun.

4.8.2 WATER PROOF CEMENT PAINT

a) The water proof cement paint shall be of approved manufacturer and it shall be of approved colour and shade. The contractor shall bring them to the site in original air tight containers with seals intact.

b) The brushes to be used shall be as specified by the manufacturers and they shall be got approved by Engineer-in-Charge. The surface to be painted shall be prepared as specified by the manufacturers of the paint. Surfaces shall be thoroughly cleaned free from dirt, dust etc. by brushing and washing down with clean water. Any grease, oil paint or any other foreign materials shall be removed by approved methods.

Rough cast surface shall be thoroughly brushed and washed to remove dirt and dust.

c) MIXING THE PAINT

The dry cement paint shall be thoroughly mixed with clean fresh water so as to produce paint of required consistency which for normal work shall be that of ordinary paints. In mixing and application, the contractor shall follow the manufacturer's instructions.

4.8.3 STEEL WORK

All iron and steel work delivered to the site already primed, to be examined so as to ascertain the quality and condition of the existing primer to satisfy that it is hard, firmly adhering, and not chalking, blistered or cracked. If the quality or condition of the existing primer is not satisfactory, it shall be completely removed and the surface thoroughly cleaned and wire brushed and primed immediately with the appropriate primer. All iron and steel works delivered to the site un-primed shall be scrapped and wire brushed to remove any rust and loose scale and cleaned to remove all dirt and grease and then primed immediately with the appropriate primer.

The primer coat shall be of red lead paint conforming to IS-102. Primer coat shall be applied only after completely drying the surface to be painted but immediately after cleaning. The contractor shall adhere to the time schedule given by the paint manufacturer regarding application of primer coat.

Under coating puttying shall be done if necessary and directed by the Engineer-in-Charge.

4.8.4 PAINTING WOOD WORK

a) EMBEDDED TIMBER

Timber embedded in masonry shall be given two coats of hot coal tar or solignum before erection.

PRIMING COAT

This shall consist of equal parts of white and red lead mixed to boiled linseed oil to the required consistency applied uniformly over the surface. When this coat is dry, all cracks, holes and

other such defects shall be filled with a mixture of one part white lead and three parts ordinary putty. The surface shall then be rubbed down with sand paper and dusted clean.

FINISHING COATS

The first coat shall be thin so that plaster may be thoroughly saturated. The second coat oil plus 1 1/2 oz of litharge or patent driers and shall be applied before the wood work is fixed in position.

b) **ON OUT SIDE WOOD WORK**

Priming shall consist of 10 lbs. of white lead plus 2.28 Itr.of raw linseed oil plus 2 ox of red lead plus 2 ox of litharge or patent driers and shall be applied before the wood work is fixed in position.

c) **STOPPING**

After priming, all small holes, cracks, open joints and similar minor defects of every kind shall be stopped with putty made from pure whiting mixed to the proper consistency with raw linseed oil, a little white lead being, worked in after mixing to help the hardening of the putty. On no account putty is to be used before the priming coat is put on.

d) **ADDITIONAL COATS**

After applying primer coats, the work shall be lightly rubbed down smooth with sand paper and the subsequent coats of paint of the specified shade approved by the Engineer-in-charge shall be applied. The paint shall be applied with brushes. It shall be spread as smoothly as possible with the brush by means of crossing (right angles to the grain) and then laying off crossing with the brush marks are not visible. Each coat of paint shall be allowed to dry thoroughly and shall be lightly rubbed down before the next is laid. Every coat of paint shall be passed by the Engineer-in-Charge before the next is laid on it. The finished surface shall not show any rain marks, ridges, or dry patches of paints and no puddles shall be left in the comers of panels and angle of moulding.

e) **USE OF SAND PAPER**

The surface shall be rubbed smooth with sand paper, first with coarse grade and then finished with a medium grade paper. Sand papering must be finished with the grain. When finished no scratches from the coarse paper should show.

f) **Before priming coat is applied, the knotting shall be done by one of the following methods as directed by .the Engineer-in-Charge.**

a) **Ordinary or size knotting** – This shall be applied in two coats. The first to be made by grinding red lead in water and mixing it with strong glue size, used hot. The second coat shall be of red lead ground in linseed oil and thinned with boiled linseed oil and turpentine.

b) **Lime knotting** – Cover the knot with hot lime and leave for 24 hours then scrap off and coat the surface with size knotting as above.

c) **Patent knotting** – This consists of 2 coats of a varnish made by dissolving shellac in methylated spirits of wine.

4.8.4.1 PAINTING WITH ENAMAL PAINT

Enamel paint shall conform to IS 2933. Paint of approved brand, manufacturer and colour only shall be used. The preparation of surface for painting etc all shall be as in the case of other painting works above.

4.8.4.2 PAINTING WITH SYNTHETIC ENAMEL PAINT

Synthetic enamel paint shall conform to IS 2932 paint of approved brand, manufacturer and colour only shall be used. Preparation of surface shall be similar to that for enamel painting. One coat of the

specified ordinary paint of shade suited to the shade of top coat shall be applied and allowed to dry overnight. It shall be rubbed- next day with the finest grade of wet abrasive paper to ensure a smooth and even surface, free from brush marks and all loose particles dusted off. The top coat of synthetic enamel paint of desired shade shall be applied after the under coat is thoroughly dry. Additional finishing coat shall be applied if found necessary to ensure properly uniform surface. All other details shall be generally as per that for enamel painting.

4.8.4.3 PAINTING WITH ALUMINUM PAINT

The aluminum painting shall conform to IS 2339. Paint of approved brand and manufacturer only shall be used. The paint comes in compact dual container 'with the paste and medium separately which shall be mixed together to proper consistency for use.

When applied for steel work, all rust and scale shall be removed by scrapping, brushing with steel wire etc. and smoothed with sand paper and thoroughly cleaned of dust. Each coat of painting shall be allowed to dry for at least 24 hours and lightly rubbed down with fine grade sand paper and dusted off prior to next coat. The paint container should be frequently stirred to avoid settling of aluminum paste. The paint shall be applied quickly otherwise it is difficult to finish the surface.

4.8.4.3 PAINTING WITH ANTICORROSIVE BITUMASTIC PAINT

Ready mixed paint conforming to IS 158 of approved brand and manufacturer shall be used. It shall be black, lead free; acid; alkali; heat water resistant. The drying time between alternate courses shall not be less than 3 hours. All other specifications shall be generally as per other painting works.

4.9 WASHABLE DISTEMPER

- a) Washable distemper of approved make, colour and shade shall be used, It shall conform to IS-427.

The surface to be distempered shall be cleaned and all cracks, holes and surface defects shall be repaired with gypsum and allowed to set hard. All irregularities shall be sand papered smooth and wiped clean. The surface so prepared must be completely dry and free from dust before distempering is commenced. The priming coat shall be applied over the completely dry surface in the manner recommended by the makers in the case of patent distempers.

- b) WASHABLE OIL BOUND DISTEMPER

The specifications for this item shall be same as for washable distemper except that washable oil bound distemper of the approved shade of colour conforming to IS 428. This shall be used after applying priming coat of petrifying liquid or other primer as may be recommended by the manufacturer of the distemper. Cement primer or distemper primer as described, of the same manufacture as distemper, as described in the items may also be adopted.

Only quantity of distemper required for days work shall be prepared. The distemper and primer shall be brought by the contractor in sealed tins in sufficient quantities at a time for the work and the same shall be kept in the joint custody of the contractor and Engineer-in-Charge. The empty tins shall not be removed from the site of work till the painting work is completed, consumption of painting material assessed, painting work passed by the EIC and removal of empty tins permitted by Engineer-in-charge.

Pitting in plaster shall be made good with plaster of pairs mixed with colour to be used. The surface to be rubbed down with fine grade sand paper and made smooth of coat of distemper shall be applied over the patches. The patched surface shall be allowed to dry thoroughly before regular coat of distemper is applied.

If the wall surface plaster has not dried, completely, cement primer shall be applied before

distempering the wall. But if distempering is done after the wall surface has dried completely, distemper primer shall be applied. Oil bound distemper is not recommended to be applied within six months of the completion of the wall plaster. However newly plastered surface is required to be distempered before a period of six months, it shall be given a coat of alkali resistant priming paint conforming to IS 109 and allowed to dry for at least 48 hours before distempering is commenced.

Unless otherwise stated for old works no primer coat is necessary

4.10 WHITE WASH / COLOUR WASH

The surface shall be prepared by removing all mortar droppings and foreign matter and thoroughly cleaned with wire of fiber brush and other means as may be ordered by the Engineer-in-charge to reproduce an approved clean and even surface. All loose pieces and scales shall be scrapped off and holes stopped with mortar which shall be cured afterwards.

On the surface so prepared, the white wash shall be laid, each coat shall be laid on with a brush. The first stroke of the brush shall be from the top downwards, another from bottom upwards over the first stroke, and similarly, one stroke from the right and another from the left over the first brush before it dries. This will form one coat. In all, three such coats of white wash shall be applied. Each coat must be allowed to dry and shall be subject to inspection before the next coat is applied. When dry the surface shall show no signs of crackings. It shall present a smooth and uniform finish free from brush marks and it should not come off easily when rubbed with a finger.

Doors, windows, floors etc. shall be protected from being splashed upon. Splashing and droppings if any, shall be removed and the surface cleaned.

4.10.1 COLOUR WASH

The base coat shall be a white wash as described above. The colour wash shall be prepared by adding necessary colouring matter of approved make to the white wash which has been strained. The colour shall be as approved by Engineer-in-Charge.

The contents of the drum or tin shall be stirred well before use. Thinning of paint shall not be permitted without the specific permission of the Engineer-in Charge.

4.10.2 WHITE WASH

White wash shall be prepared from fresh burnt white lime stone or shell lime. The lime shall be of C type as mentioned in IS-712. The lime shall be dissolved in a tub with sufficient quantity of water (about 4.5 litres / 1 kg of lime) and the whole thoroughly mixed and stirred until it attains the consistency of thin cream. The wash shall be taken out in small quantities and strained through a clean course cloth. Alternatively readymade whiting complying with IS 63 may also be used. Clean gum dissolved in hot water shall then be added in suitable proportion of 2 gm of gum to 1 eft of lime to prevent the white wash coming off easily when rubbed.

4.10.3 WALL PAINTING WITH PLASTIC EMULSION PAINT Wall painting with plastic Emulsion paint on new work.

GENERAL

Plastic emulsion paints are not suitable for application on external wood and iron surfaces and surfaces which are liable to heavy condensation and are to be used generally on masonry or plastered surfaces. Suitable primer as per manufacturer shall be provided.

PAINT

Plastic emulsion paint of approved brand and manufacture and of the required shade shall be used.

PREPARATION OF SURFACE

The surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of paris mixed with water on the entire surface including filing up the undulation and then sand papering the same after it is dry.

APPLICATION

The number of coats shall be as stipulated in the item.

The paint will be applied in the usual manner with brush or roller.

The paint dries by evaporation of the water content and as soon as the water has evaporated the film gets hard and the next coat can be applied. The time of drying varies from one hour on absorbent surfaces to 20 to 3 hours on nonabsorbent surfaces.

The thinning of emulsion is to be done with water and not with turpentine.

Thinning with water will be particularly required for the undercoat which is applied on the absorbent surface. The quantity of thinner to be added shall be as per manufacturer's instructions.

The surface on finishing shall present a flat velvety smooth finish. If necessary more coats will be applied till the surface presents a uniform appearance.

PRECAUTIONS

- a) Old brushes if there are to be used with emulsion paints, should be completely dried of turpentine or oil paints by washing in warm soap water.
Brushes should be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.
- b) In the preparation of walls for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.
- c) Splashes on floors etc. shall be cleaned out without delays as they will be difficult to remove after hardening.
- d) Washing of surfaces treated with emulsion paints shall not be done within 3 to 4 weeks of application.

OTHER DETAILS

These shall be as per specification for "painting" as far as they are applicable.

NOTE ON FINISHING WORKS: Unless and otherwise specified:

- 1) Plaster mix specified is for cement: fine sand.
- 2) The working "more coats" indicate the additional coats to be painted, wherever the desired finish has not been achieved after the application of the specified number of coats given. No extra payment will be made for the additional coats required to be rendered on account of the above.
- 3) For plastering items, the rate to include cost of providing 6mm grooves around doors, windows, ventilators and at junction of dissimilar materials. No extra is permissible.
- 4) Rates for all finishing items and lift charges from FFL/GL for all heights, depths and levels.
- 5) All the RCC faces like beam, slab, lintels, columns, flush with internal or external wall faces are plastered with CM 1:5 and measured under wall plastering and not under item of CM 1:4 for RCC surfaces.

Item Sr. no. 04

Providing and Painting with TWO or more coats with ALUMINIUM PAINT of approved make including cleaning the surfaces, necessary scaffolding, etc., including providing and applying

two coats of zinc croamte primer etc. complete all as per specifications over the chain link fencing and the Flats fixed over the existing compound wall for all height at all levels complete and as per paint manufacturers specifications and as directed by engineer-In Charge.

Note: The coefficient of painting one side is 0.5 i.e. for both the sides painting multiplication factor shall be one only.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – C.

2.0 Mode of measurement:

The measurement should in Square meters.

Note: The coefficient of painting one side is 0.5, i.e. for both the sides painting multiplication factor shall be one only.

Item Sr. no. 05

Providing and Painting with TWO or more coats with ALUMINIUM PAINT of approved make including cleaning the surfaces, necessary scaffolding, etc., including providing and applying two coats of zinc croamte primer etc. complete all as per specifications over the existing MS angle post fixed over the existing compound wall for all height at all levels complete and as per paint manufacturers specifications and as directed by engineer-In Charge.

Note: The perimeter of the angles/ sections and length shall be measured for calculating the area of application of the paint and coefficient of paint shall be considered as one only.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – C.

2.0 Mode of measurement:

The measurement should in Square meters.

Note: The perimeter of the angles/ sections and length shall be measured for calculating the area of application of the paint and coefficient of paint shall be considered as one only.

4.11 ALUMINIUM WORK

4.11 TERMINOLOGY

Bar

Any solid section, other than round, with at least one dimension of 10 mm or more.

Rod

Any round solid section with a diameter of 10 mm or greater.

Extruded Round Tube

A circular hollow extrusion of uniform wall thickness not subjected to cold drawing.

Hollow Section

An extruded shape other than round tube, the cross section of which completely encloses a void or voids and which is not subject to cold drawing.

Anodized Aluminum

Aluminum with an anodic coating, produced by an electrolytic oxidation process, in which the surface of the aluminum is covered with a coating, generally an oxide, to give protective and decorative properties.

Pre-laminated Particle Board

A particle board laminated on both surface by synthetic impregnated base papers under the influence of heat and pressure with finished foil under the pressure or pressure and heat depending on type of binder used.

Floor Spring (Hydraulically Regulated)

A device used to close the door so as to slow down its speed before it reaches its closed position.

Single Action Floor Spring (Hydraulically Regulated)

A device used to close the door in one direction only so as to slow down its speed before it reaches to its closed position.

Double Action Floor Spring (Hydraulically Regulated)

A device used to close the door in both directions so as to slow down its speed before it reaches its closed position.

Shoe

The device fixed to the bottom of the door leaf in order to hoist it to the floor spring.

Top Centre Pivot

The device to secure the upper portion of the door leaf and the door frame above.

Right Hand Floor Spring

A floor spring suitable for use on an anticlockwise door; an anticlockwise door is one which when viewed from above, rotates in anticlockwise direction about its hinge while opening.

Left Hand Floor Spring

The floor spring suitable for use on clockwise door a clockwise door is one which, when viewed from above, rotates in clockwise direction about its hinge while opening.

Sash

It is a complete window unit whether fixed or open type.

Composite Window

Window unit having two or more sashes joined together with one or more coupling members.

Centre – Hung Ventilator

A ventilator horizontally pivoted at the center on both sides. Top half opens inwards and bottom half opens outwards.

4.11 ALUMINIUM

4.11.1 Aluminum Sections

Aluminum sections used for fixed/openable windows, ventilators, partitions, frame work & doors etc. shall be suitable for use to meet architectural designs to relevant works and shall be subject to approval of the Engineer-in-Charge for technical, structural, functional and visual considerations. The aluminium extruded sections shall conform to IS 733 and IS 1285 for chemical composition and mechanical properties. The stainless steel screws shall be of grade AISI 304.

The permissible dimensional tolerances of the extruded sections shall be as per IS 6477 and shall be such as not to impair the proper and smooth functioning/operation and appearance of door and windows.

Aluminum glazed doors, windows etc. shall be of sizes, sections and details as shown in the drawings. The details shown in the drawings may be varied slightly to suit the standards adopted by the manufacturers of the aluminum work, with the approval of Engineer-in-Charge. Before proceeding with any fabrication work, the contractor shall prepare and submit, complete fabrication and installation drawings for each type of glazing doors, windows, ventilators and partition etc. for the approval of the Engineer-in-Charge. If the sections are varied, the contractor shall obtain prior approval of Engineer-in-Charge and nothing extra shall be paid on this account.

4.11.2 Anodizing

Standard aluminum extrusion sections are manufactured in various sizes and shapes in wide range of solid and hollow profiles with different functional shapes for architectural, structural glazing, curtain walls, doors, window & ventilators and various other purposes. The anodizing of these products is required to be done before the fabrication work by anodizing/electro coating plants which ensures uniform coating in uniform colour and shades. The extrusions are anodized up to 25 micron in different colours. The anodized extrusions are tested regularly under strict quality control adhering to Indian Standard.

4.11.3 Powder Coating

4.11.3.1 Material: The powder used for powder coating shall be Epoxy/polyester powder of make approved by the Engineer-in-Charge. The contractor shall give detailed programme for powder coating in advance, to facilitate the inspection by Engineer-in-Charge or his authorized representative.

4.11.3.2 Pre-treatment: Each aluminum alloy extrusion or performed section shall be thoroughly cleaned by alkaline or acidic solutions under the conditions specified by chemical conversion coating supplier and then rinsed. A chemical conversion coating shall be applied by treatment with a solution containing essentially chromate ions or chromate and phosphate ions as the active components as applicable. The amount of the conversion coating deposited depends on the type used by the conversion coating chemical supplier. The conversion coating shall be thoroughly rinsed either with the solution specified by the conversion coating chemical supplier or with de-mineralized water and then dried at the temperature for the time specified by the conversion coating chemical supplier. The contractor shall submit the detail specifications and application procedure for application of conversion coating for approval of Engineer-in-Charge. The metal surface after the conversion coating pretreatment and prior to the application of the coating shall be free from dust or powdery deposits.

4.11.3.3 Process: The polyester powder shall be applied by electrostatic powder spray method. Before start of powder coating the contractor shall submit detail specification for application of polyester powder from manufacturer of the polyester powder for approval of Engineer-in-Charge. The powder coating shall be applied as per the specification approved by Engineer-in-Charge.

4.11.3.4 Thickness: The thickness of the finished polyester powder coating measured by micron meter shall not be less than 50 micron nor more than 120 micron at any point.

4.11.3.5 Performance Requirements for the Finish

(i) Surface appearance: The finish on significant surfaces shall show no scratches when illuminated and is examined at an oblique angle, no blisters, craters; pinholes or scratches shall be visible from a distance of about 1 m. There shall not be any visible variation in the colour of finished surfaces of different sections and between the colours of different surfaces of same section.

(ii) Adhesion: When a coated test piece is tested using a spacing of 2 mm between each of the six parallel cuts (the cut is made through the full depth of powder coating so that metal surface is visible) and a piece of adhesive tape, approximately 25 mm x 150 mm approved by the Engineer-in-Charge is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test area, no pieces of the finish other than debris from the cutting operation shall be removed from the surface of the finish.

4.11.3.6 Protection of Powder Coated / Anodizing Finish: It is mandatory that all aluminum members shall be wrapped with self-adhesive non-staining PVC tape, approved by Engineer-in-Charge.

4.11.3.7 Measurement: All the aluminum sections including snap beading fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment. (Weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts.

4.11.3.8 Rate: The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.

4.12. REFLECTIVE GLASS

4.12.1 Definitions

(i) **Shading Coefficient:** The shading coefficient is the ratio of total solar transmittance to the transmittance through 3.2 mm (1/8”) clear glass. Windows with low shading coefficient values improve comfort for building, lower the total cooling load of the building and help smooth out of the difference in cooling loads between perimeter & core zones.

(ii) **Luminous Efficacy Constant (Ke)** indicates a windows relative performance in rejecting solar heat-while transmitting day light. It is the ratio of the visible transmittance to the shading coefficient; clear glass which lets in roughly equal amounts of visible light and solar near-infrared energy has a Ke close to 1.0. The solar radiation contains about 50% invisible near-infrared & ultra violet light.

Therefore, a perfectly selective glazing, which would all allow visible light pass through while blocking all of the invisible near-infrared & ultraviolet light, would have Ke of about 2.0.

(iii) **Resistance to Heat Conduction (R-value):** It is a measure of resistance to heat flow that occurs because of temperature difference between the two sides of the windows. The inverse of R-value is termed as U-value.

4.12.2 Reflective Glass

This is an ordinary float glass with a metallic coat to reduce solar heat. Clear glass transmits most of the sunlight that shines upon it, and most of the solar heat as well; the metallic coated glass i.e. reflective glass has better shading coefficients because they reflect rather than absorb infrared energy. However, most of reflective glazing blocks day light more than solar heat.

4.12.2.1 Types of Coatings: There are two types of reflective glass, Pyrolytic (Hard) coated and vacuum (soft) coated.

(i) **Pyrolytic:** It is a coating applied during glass manufacture. The coating is fused into the glass at 1200°C.

(ii) **Vacuum Coated Glass:** It involves the deposition of metal particles on the glass surface by a chain reaction in a vacuum vessel. It is often called a soft coat; because the coating is more susceptible to damage than hard coat glass. Where toughening of product is required, the product must be toughened first & then vacuum coated. Vacuum coated products have better shading coefficient values than pyrolytic products.

4.12.2.2 Performance of Reflective Glass: The performance of reflective glass 6 mm of nominal thickness is given below:

Sr. No.	Parameter	Threshold Ratio In % age
1	Visible Light Transmittance %	15-46
	Reflectance %	12-24
2	Total Solar Energy Transmittance %	16-24
	Reflectance %	8-12
3	Ultra violet rays Transmittance %	2-10
4	U-value Summer	0.58
	Winter	0.45
5	Shading Co-efficient	0.25-0.35

4.12.2.2 Testing: The reflective glass shall be tested for the followings:

(i) **Physical/Field Test:** In a true reflective glass, when a pointed pencil is placed, then tip of pencil (physical) & image should coincide.

(ii) **Lab. Test:** In the lab, the reflective glass shall be tested for the parameter specified in 21.5.2.2 above.

4.12.2.3 Fixing of glass shall be done as specified.

Item Sr. no. 18

Providing and fixing at all heights / in all floors with all leads Anodised Aluminium sections for the Shutters and shutter frame of the cupboard and the fixed covering of the electrical cutout / partitions, manufactured from aluminum sections of Jindal/ Indal/ Hindalco make having minimum 60 micron powder coating of approved shade & colour(including special colors) on sections for all floors/ all levels/ all heights/ all shapes/ all sizes as per the drawing, specifications. The quoted rate shall be inclusive of providing aluminium sections, powder coating, bending, cutting, fabrication, erection and fixing to the best workmanship manner with all type of wastage, also providing sliding lock with autolocking of ebbco make for the shutter and including of

1) Sheet metal screws, wool pile and aluminium angle corner cleat of required thickness and of full width, etc. for assembling the frame and shutter; 2) Best quality wool pile where ever shutter touches the frame; 4) Anchor fasteners of Hilty/ Mungo/ Fischer for fixing the frame assembly to the RCC or masonry surfaces. Minimum 1 anchor fastener shall be used for every 750mm length of section for stability of frame.3. Providing sealant all around the aluminium frame and sections as approved by the EIC.

But excluding 1) Rough ground to fix a frame with wall or any surface. Standard Section weight of installed aluminium sections shall only be measured and considered for the payment.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – C.

2.0 Mode of measurement:

The measurement should in KG,

Rate:

The quoted rate shall be inclusive of providing aluminium sections, powder coating, bending, cutting, fabrication, erection and fixing to the best workmanship manner with all type of wastage, also providing sliding lock with autolocking of ebbco make for the shutter and including of

1) Sheet metal screws, wool pile and aluminium angle corner cleat of required thickness and of full width, etc. for assembling the frame and shutter; 2) Best quality wool pile where ever shutter touches the frame; 4) Anchor fasteners of Hilty/ Mungo/ Fischer for fixing the frame assembly to the RCC or masonry surfaces. Minimum 1 anchor fastener shall be used for every 750mm length of section for stability of frame.3. Providing sealant all around the aluminium frame and sections as approved by the EIC.

Item Sr. no. 19

Providing and fixing rough ground (packing) in the gap between wall and door-window frame/ cupboard frame, to fix Partition(if required). The rate shall be inclusive of :

1) providing and fixing average 6-8mm thick compact sheet of width as per aluminium section / frame / shutter member.

2) filling the gap between wall and frame on both sides (outside and inside) with polyethylene backer rod of average 10 mm thickness of make Supreme and color and then sealing the remaining gap with neutral grade G/M (Glazed & Metal) weather silicon sealant / structural sealant of make Wacker/ Dowcorning/ GE/ Soudal/ Bostik of approved color. Work shall be carried out as per approved shop drawings and approved sample at all floors/ all levels/ all heights/ all shapes. Installed measurements shall be considered for payment.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – C.

- 2.0 **Mode of measurement:**
The measurement should in Sq.M.

Item Sr. no. 20

Providing and fixing Wired Glass of ~ 6 mm thick including 1 mm thick ss wire @ every 1 cm horizontal & vertical of make Modi guard / Saint Gobain / Asahi / Gopal glass make of any size, any shape and specified thickness in frame and shutter work with necessary cutting of glass as per drawing & specifications including providing and fixing with EPDM quality rubber/ silicon sealant/ structural sealant /3M tape on the periphery of the glass as per the required thickness etc. complete at all floors/ all levels/ all heights as per specifications. Actual visible glass installed quantity shall be measured and paid. Rate shall be inclusive of all type of wastage.

- 1.0 **Materials & Workmanship:**

Materials & Workmanship is as per described in above Item Sr. no. as above.

- 2.0 **Mode of measurement:**
The measurement should in Sq.M, The measurement shall be taken for the clear visible dimension.
No wastage shall be measured and paid.

Item Sr. no. 21

Providing and fixing GI Mosquito Mesh of ~24 guage over the cabinet of required dimension as per drawing .

- 1.0 **Materials & Workmanship:**

Materials & Workmanship is as per described as above.

- 2.0 **Mode of measurement:**
The measurement should in Sq.M.

**SECTION – D
BRICK / BLOCK / STONE MASONRY**

6.0 TERMINOLOGY

Bond: The arrangement of the bricks in successive courses to tie the brick work together both longitudinally and transversely. The arrangement is usually designed to ensure that no vertical joint of one course is exactly over the one in the next course above or below it, and there is greatest possible amount of lap.

BED JOINT: **Horizontal joint in brick work or masonry.**
Closer : Any portion of a brick used in constructing a wall, to close up the bond next to the end brick of a course.

Coping or Weathering: The cover applied over or the geometrical form given to a part of the structure to enable it to shed rain water.

Corbel : A cantilever projecting from the face of wall to form a bearing.

Cornice : Horizontal or ornamental feature projecting from the face of a wall.

Course : A layer of brick including bed mortar.

Cross Joint : A joint other than a bed joint -normal to the wall face.

Efflorescence : A powdery incrustment of salts left by evaporation. This may be visible on the

surface or may be below surface. In the latter case this is termed as crypto efflorescence.

Header	: A brick laid with its length across the wall.
Indenting	: The leaving recesses into which future work can be bonded.
Jamb	: The part of the wall at the side of an opening
Joint	: A junction of bricks.
Jointing	: The operation of finishing joints as the masonry work proceeds.
Pier	: A thickened section forming integral part of the wall placed at intervals along the wall primarily to increase the stiffness of the wall or to carry a vertical concentrated load. The thickness of a pier is the overall thickness including the thickness of the wall, or when bonded into one leaf of a cavity wall the thickness obtained by treating this leaf as an independent wall.
Pillar	: Pillar means a detached masonry support. This can be rectangular, circular, elliptical etc. in case of rectangular pillar, the breadth shall not exceed three times the thickness and thickness itself shall not exceed more than thrice the length of brick.
Quoin	: An external corner in brick work, the term may also denote the brick used to form the quoin.
Scaffolding	: A temporary erecting of timber or steel work used in the construction, alteration demolition or repairs of a building to support or to attend of the hoisting or lowering of workmen their tools and materials.
Sill	: A brick work forming the lower boundary of door or window opening.
Spandrel	: The space between the haunches and the road decking of an arch.
Stretcher	: A brick laid with its length in the direction of the wall.
String Course	: A horizontal course projecting from a wall usually introduced at every floor level or windows or below parapet for imparting architectural appearance to the structure and also keeping off the rain water.
Templet	: A pattern of sheet metal used as a guide for setting out specific section and shape.
Toothing	: Bricks left projecting in alternate courses to bond with future work.
Wall joint	: A joint parallel to the wall face.
Arises	: The edges of the brick formed by intersection of the plain surface of brick.
QUEEN CLOSER	: Queen closer is made by cutting brick longitudinally in two equal parts or by cutting bricks breadth wise in quarter lengths.
KING CLOSER	: King closer is made by cutting the brick half portion of header face and half portion of stretcher face in a triangular portion.
BEVELLED CLOSER	: Bevelled closer is made by cutting a triangular portion of the brick from half the width of brick to end of length side.
MITRED CLOSER	: Mitred closer is made by cutting a triangular portion of the brick through its width at an angle of 45° to 60° with the adjacent length of the brick.
FROG	: The depression of brick on its flat face for the purpose of forming key for holding the mortar with the brick is known as frog.

Bricks may be sand or shop moulded or machine pressed and wire cut and may be kiln or clamp burnt shall have a minimum compressive strengths of 35 kg/sqm unless otherwise specified. All bricks shall conform to the following requirements:

- The shall be sound, hard and well burnt with sharp edges of uniform size an regular shape, free from cracks,stones, or nodules of lime and other defects.
- They shall give a clear metallic ring when struck together
- They shall be uniform in colour and of the size indicated.
- They shall not be broken, cracked, stratified, under burnt, overburnt or soft.
- Bricks broken to examine the texture shall show that they are of clean homogenous nature, free from stones and lumps of lime.

6.1.0 BRICKS TILES / BRICK BATS

Bricks used in the masonry may be of the following type:

- a) **Common burnt clay bricks:** Shall be hand moulded. They shall be free from nodules of free lime, visible cracks, flaws warpage and organic matter, have a frog 100 mm in length 40mm in width and 10mm to 20mm deep on one of its flat sides. Bricks made by extrusion process and brick tiles may not be provided with frogs. Each brick shall be marked (in the frog where provided) with the manufacturers identification mark or initials.
- b) **FLY ASH LIME BRICKS (FALG BRICKS):** The fly Ash lime bricks (FALG bricks shall conform to IS: 12894. Visually the bricks shall be sound, compact and uniform in shape free from visible cracks, warpage flaws and organic matter. The bricks shall be solid and with or without frog on one of its flat side.

FLY ASH: Fly ash shall conform to grade 1 or grade 2 of IS: 3812.

NOTE: [This item will be operated only for load bearing structure up to 2 stories and for non-load bearing walls 23 ems thick for multi storied buildings].

Bottom ash: used as replacement of sand shall not have more than 12% loss on ignition when tested .

Sand: Deleterious materials, such as clay and silt in the sand shall preferably be less than 5%.

Lime: Lime shall conform to class 'C' hydrated lime of IS: 712.

Additives: Any suitable additive considered not detrimental to the durability of bricks may be used.

- c) **Clay Fly Ash Bricks:** The clay fly ash bricks shall conform to IS: 13757. The bricks shall be sound, compact and uniform in shape and colour. Bricks shall have smooth rectangular faces with sharp and square corners. The bricks shall be free from visible cracks, flaws, warpage, nodules of free lime and organic matter, the brick shall be hand or machine moulded. The bricks shall have frog of 100 mm in length 40mm width and 10 to 20 mm deep on one of its flat sides. If made by extrusion process may not be provided with frogs.

Fly Ash conform to grade 1 or grade 2 of IS: 3812.

Fly ash conform to grade 1 or grade 11 of IS: 3812.

(Calcium Silicate Bricks: The bricks shall conform to ISA139. The Calcium Silicate bricks shall be sound, compact and uniform in shape. Bricks shall be free from visible cracks, warpage organic matter, large pebbles and modules of free lime. Bricks shall be solid and with or without frog. The bricks shall be made of finely grounded sand siliceous rock and lime. In addition limited quantity of fly ash conforming to IS: 3812 may be used in the mix. These bricks are also known as Fly Ash Sand Lime bricks in the construction industry).

Tile Brick: The bricks of 4 cm height shall be moulded without frogs. Where modular tiles are not freely available in the market, the tile bricks of FRS thickness 44mm (1-3/4") may be used unless otherwise specified.

Brick Bats: Bricks bats shall be obtained from well burnt bricks.

6.1.1 DIMENSIONS

The bricks may be modular or non-modular. Sizes for both types of bricks / tiles shall be as per table –1. While use of modular bricks /tiles is recommended, non-modular (FPS) bricks / tiles can also be used where so specified. Non-modular bricks/tiles of sizes other than the sizes mentioned in table 1 may also be used where specified.

TABLE 1

TYPES OF BRICKS/TILES	NOMINAL SIZE/MM	ACTUALS SIZE/MM
Modular bricks	200 x 100 x 100 mm	190 x 90 x 90mm
Modular tile bricks	200 x 100 x 40mm	190 x 90 x 40 mm
Non-modular tile bricks	229 x 114 x 44 mm	225 x 111 x 44mm
Non-modular bricks	229 x 114 x 70mm	225 x 111 x 70mm

6.1.2 Classification

Bricks / Brick tiles shall be classified on the basis of their minimum compressive strength as given below:

TABLE 2

CLASS / DESIGNATION	AVERAGE COMPRESSIVE STRENGTH			
	NOT LESS THAN		LESS THAN	
	N/MM2	Kgf/cm2	N/mm2	Kgf/cm2
10 (100)	10	(100)	12.5	125
7.5 (75)	7.5	(75)	10	100
5 (50)	5	(50)	7.5	75
3.5 (35)	3.5	(35)	5.0	50

The bricks shall have smooth rectangular faces with sharp corner and shall be uniform in colour and emit clear ringing sound when struck.

Note: Upper limits specified in Table 2 are for calculating the average compressive strength.

6.1.3 SAMPLING AND TESTS

- Samples of bricks shall be subjected to the following tests:
- Dimensional tolerance
- Water absorption
- Efflorescence
- Compressive Strength

6.1.3.1 SAMPLING: For carrying out compressive strength, water absorption, efflorescence and dimensional tests, the samples of bricks shall be taken at random, according to the size of lot as given in Table 3 below. The sample thus taken shall be stored in a dry place until tests are made. For the purpose of sampling, the following definition shall apply:

a) Lot: A collection of bricks of same class and size, manufactured under relatively similar conditions of production. For the purpose of sampling a lot shall contain a maximum of 50000 bricks in case a consignment has bricks more than 50,000 of the same classification and size and manufactured under relatively similar conditions of production, it shall be divided into lots of 50,000 bricks or part thereof.

b) Sample: A collection of bricks selected for inspection and / or testing from a lot to reach

decision regarding the acceptance or rejection of the lot.

c) **Defective:** a brick failing to meet one or more of the specified requirements.

6.1.3.2 The samples shall be taken as below:

Sampling from a Stack: When it is necessary to take a sample from a stack, the stack shall be divided into a number of real or imaginary sections and the required number of bricks drawn from each section. For this purpose bricks in the upper layers of the stock shall be removed to enable units to be sampled from places within the stack.

Note: For other methods of sampling i.e. sampling in motion and sampling from lorries or trucks IS: 5454 may be referred.

Scale of sampling and criteria for conformity for visual and dimensional characteristics:

Visual Characteristics: The bricks shall be selected and inspected for ascertaining their conformity to the requirements of the relevant specifications.

The number of bricks to be selected from a lot shall depend on the size of lot and shall be in accordance of Col. 1 and 2 of Table 3 for visual characteristics in all cases and dimensional characteristics if specified for individual bricks.

All the bricks selected above in accordance with Col. 1 and 2 of Table 3 shall be examined for visual characteristics. If the number of defective bricks found in the sample is less than or equal to the corresponding numbers as specified in Col 3 of Table 3 the lot shall be considered as satisfying the requirements of visual characteristics, otherwise the lot shall be deemed as not having met the visual requirements.

Dimensional Characteristics: The number of bricks to be selected for inspecting the dimensions and tolerance shall be in accordance with Col. 1 and 4 of Table 3. These bricks will be divided into groups of 20 bricks at random and each of the group of 20 bricks thus formed will be tested for all the dimensions and tolerances. A lot shall be considered having found meeting the requirements of dimensions and tolerance if none of the groups of bricks inspected fails to meet the specified requirements.

**TABLE 3
SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES FOR
VISUAL AND DIMENSIONAL CHARACTERISTICS**

NO. OF BRICKS IN THE LOT SELECTED	FOR CHARACTERISTICS SPECIFIED FOR INDIVIDUAL BRICKS		FOR DIMENSIONAL CHARACTERISTICS FOR GROUP OF 20 BRICKS
	NO. OF BRICKS TO BE DEFECTIVE IN THE SAMPLE	PERMISSIBLE NO. OF	NO. OF BRICKS TO BE SELECTED
1	2	3	4
2001-10000	20	1	40
10001-35000	32	2	60
35001-50000	50	3	80

Note: In case the lot contains 2000 or less bricks the sampling shall be as per decision of the Engineer-in-

charge.

SCALE OF SAMPLING AND CRITERIA FOR PHYSICAL CHARACTERISTICS

The lot which has been found satisfactory in respect of visual and dimensional requirements shall be next tested for physical characteristics like compressive strength, water absorption, efflorescence as specified in relevant material specification. The bricks for this purpose shall be taken at random from those already selected above. The number of bricks to be selected for each of these characteristics shall be in accordance with relevant columns of Table 4.

TABLE 4
SCALE OF SAMPLING FOR PHYSICAL CHARACTERISTICS

LOT SIZE	SAMPLE SIZE FOR COMPRESSIVE STRENGTH, WATER ABSORPTION AND EFFLORESCENCE	PERMISSIBLE NO. OF DEFECTIVES FOR EFFLORESCENCE
(1)	(2)	(3)
2001-10000	5	0
10001-35000	10	0
35001-50000	15	1

Note: In case the lot contains 2000 or less bricks, the sampling shall be as per decision of Engineer-in-charge.

v) A lot shall be considered having satisfied the requirements of physical characteristics if the condition stipulated here in are all satisfied.

a) From the test results of compressive strength, the average shall be calculated and shall satisfy the requirements specified in relevant material specification.

Note: In case any of the test results for compressive strength exceeds the upper limit for the class of bricks, the same shall be limited to the upper limit of the class for the purpose of averaging.

b) Wherever specified in the material specification, the compressive strength of any individual bricks tested in the sample shall not fall below the minimum average compressive strength specified for the corresponding class of brick by more than 20 percent.

c) From the test results for water absorption, the average for the bricks in the sample shall be calculated and shall satisfy the relevant requirements specification in material specification.

d) The number of bricks failing to satisfy the requirements of the efflorescence specified in the relevant specification should not be more than the permissible no. of defectives given etc. Col. 3 of Table 4.

6.1.3.3 DIMENSIONAL TOLERANCES

The dimensions of non-modular bricks when tested as described above as per procedure described shall be within the following limits per 20 bricks.

For non-modular bricks

Length 4520 to 4680 mm (4600 ± 80 mm)

Width 2240 to 2160 mm (2200 ± 40 mm)

Height 1440 to 1360 mm (1400 ± 40 mm) for 70 mm high bricks

640 to 560 mm (600 ± 40 mm) for 30 mm high bricks

Brick tiles

76 to 84 cm (80 ± 4) for 40 mm high brick tiles.

In case of non-modular bricks, % age of tolerance will be ± 2% for group of 20 numbers of class 10 bricks, and ± 4% for other class of bricks.

6.1.3.4 Compressive Strength: The bricks, when tested in accordance with the procedure laid down shall have a minimum average compressive strength for various classes as given in Table 2. The compressive Strength of any individual brick tested shall not fall below the minimum inimum average compressive strength specified for corresponding class of brick by more than 20%. Compressive strength of any individual brick tested exceeds the upper limit specified in Table 2 for the corresponding class of bricks; the same shall be limited to upper limit of class as specified in Table 2 for the purpose of calculating the average compressive strength.

6.1.3.5 Water absorption: The average water absorption of bricks when tested in accordance with the procedure laid down shall be not more than 20% by weight.

6.1.3.6 Efflorescence: The rating of efflorescence of bricks when tested shall be not more than moderate.

6.1.4 STORAGE AND HANDLING OF BRICKS

Bricks shall not be dumped at site. They shall be stocked in regular tiers as they are unloaded to minimize breakages and defacements. Brick selected for particular purpose / situation shall **be** stocked separately.

6.1.5 Higher strength bricks when indicated must satisfy the strength requirements and also conform to other standards specified.

6.1.6 Fire Bricks

Fire bricks may be white or slightly yellowish in colour and shall not absorb water more than **10%** by weight when immersed in cold water for 14 hours.

6.2 BRICK WORK

6.2.1 CLASSIFICATION

The brick work shall be classified to the class designation of bricks used.

6.2.2 MORTAR

The mortar for the brick work shall be as specified, and conform to accepted standards. Lime shall not be used where reinforcement is provided in brick work.

6.2.3 SOAKING OF BRICKS

Bricks shall be soaked in water before use for a period for the water to just penetrate the whole depth of brick. Alternatively bricks may be adequately soaked instacks by spraying with clean water for a period not less than six hours. The bricks required for masonry work using mud mortar shall not be soaked. When the bricks are soaked they shall be removed from the tank sufficiently early so that at the time of laying they are skin dry. Such soaked bricks shall be stacked on a clean place where they are not again spoiled by dirt earth etc.

Note 1: The period of soaking may be easily found at site by a field test in which the bricks are soaked in water for different periods and then broken to find the extent of water penetration. The least period corresponds to complete soaking will be the one to be allowed for in construction work.

Note 2: If the bricks are soaked for the required time in water that is frequently changed the soluble salt in the bricks will be leached out, and subsequently efflorescence will be reduced.

6.2.4 LAYING

6.2.4.1 Bricks shall be laid in English Bond unless otherwise specified. For brick work in half brick wall, brick shall be laid in stretcher bond. Half or cut bricks shall not be used except as closer where necessary to complete the bond. Closers in such cases, shall be cut to the required size and used near the ends of the wall. Header bond shall be used preferably in all courses in curved plan for ensuring better alignment.

Note: Header bond shall also be used in foundation footings unless thickness of walls (width of footing) makes the use of headers impracticable. Where thickness of footing is uniform for a number of courses, the top course of footing shall be headers.

6.2.4.2 All loose materials, dirt and set lumps of mortar which may be lying over the surface on which the brick work is to be freshly started, shall be removed with a wire brush and surface wetted. Bricks shall be laid on a full bed of mortar, when laying, each brick shall be properly bedded and set in position by gently pressing with the handle of a trowel. Its inside face shall be buttered with mortar before the next brick is laid and pressed against it. Joints shall be fully filled and packed with mortar such that no hollow space are left inside the joints.

6.2.4.3 The walls shall be taken up truly in plumb or true to the required batter where specified. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Vertical joints in the alternate course shall come directly one over the other. Quoin, jambs and other angles shall be properly plumbed as the work proceeds. Care shall be taken to keep the preponds properly aligned within following maximum permissible tolerances.

- a) Deviation from vertical within a storey shall not exceed 6 mm per 3 m height.
- b) Deviation in vertically in total height of any wall of building more than one storey in height shall not exceed 12.5mm.
- c) Deviation from position shown on plan of any brick work shall not exceed 12.5mm.
- d) Relative displacement between load bearing wall in adjacent stories intended to be vertical alignments shall not exceed 6mm.
- e) A set of tools comprising of wooden straight edge, Mason's spirit levels, square, 1 meter rule line and plumb shall be kept on the site of work for every 3 masons for proper check during the progress of work.

6.2.4.4 All quoins shall be accurately constructed and the height of brick courses shall be kept uniform. This will be checked using graduated wooden straight edge or storey rod indicating height of each course including thickness of joints. The position of damp proof course, windows, sills, bottom of lintels top of the wall, etc. along the height of the wall shall be marked on the graduate straight edge or storey rods. Acute and obtuse quoins shall be bonded, where practicable in the same way as square quoins. Obtuse quoins shall be formed with squint showing three quarters brick on one face and quarter brick on the other.

6.2.4.5 The brick work shall be built in uniform layers.

No part of the wall during its construction shall rise more than one meter above the general construction level. Parts of wall left at different levels shall be raked back at an angle of 45 degree or less with the horizontal. Tothing shall not be permitted as an alternative to raking back. For half brick partition to be keyed into main walls, indents shall be left in the main walls.

6.2.4.6 All pipe fittings and specials, spouts, hold fasts and other fixtures which are required to be built into the walls shall be embedded, as specified, in their correct position as the work proceeds unless otherwise directed by the Engineer-in-charge.

6.2.4.7 Top courses of all plinths, parapets, steps and top of walls below floor and roof slabs shall be laid with brick on edge, unless specified otherwise. Brick on edge laid in the top courses at corner of the wall shall be properly radiated and keyed into position to form cut (maru) corners where bricks cannot be cut to the required shape to form cut (maru) corners, cement concrete 1:2:4 (1 cement, 2 coarse and

sand: 4 graded stone aggregate 20mm nominal size) equal to thickness of course shall be provided in lieu of cut bricks.

6.2.4.8 Frog if provided shall be of suitable size and shape formed centrally on one of the larger sides of the brick and shall not occupy more than 6% volume of brick. No frog shall be provided for wire cut bricks. Bricks shall be laid with frog up.

However, when top course is exposed bricks shall be laid with frog down. For the bricks to be laid with frog down, the frog shall be filled with mortar before placing the bricks in position.

6.2.4.9 In case of walls one brick thick and under, one face shall be kept even and in proper plan, while the other face may be slightly rough. In case of wall more than one brick thick, both the faces shall be kept even and in proper plane.

6.2.4.10 To facilitate taking service lines later without excessive cutting of completed work sleeve shall be provided, where specified, while raising the brick work. Such sleeves in external walls shall be sloped down outward so as to avoid passage of water inside.

6.2.4.11 Top of the brick work in coping and sills in external walls shall be slightly titled. Where brick coping and sills are projecting beyond the face of the wall, drip course / throating shall be provided where indicated.

6.2.4.12 Care shall be taken during construction that edges of jambs, sills and projections are not damaged in case of rain. New built work shall be covered with gunny bags or tarpaulin so as to prevent the mortar from being washed away. Damage, if any, shall be made good to the satisfaction of the Engineer-in-charge.

6.2.4.13 Vertical reinforcement in the form of bars (MS or high strength deformed bars), considered necessary at the corners and junction of walls and jamb opening doors, windows etc. shall be encased with cement mortar not leaner than 1:4 (1 cement : 4 coarse sand) or cement concrete mix as specified. The reinforcement shall be suitably tied, properly embedded in the foundation and at roof level. The dia of bars shall not be less than 8 mm and concrete grade shall be minimum 1:3:6 (1 cement :3 coarse sand :6 graded stone aggregate 20mm nominal size)

6.2.4.14 In retaining walls and the like, where water is likely to accumulate, weep holes, 50 to 75mm square shall be provided at 2 m vertically and horizontally unless otherwise specified. The lowest weep holes shall be at about 30cm above the ground level. All weep holes shall be surrounded by loose stones and shall have sufficient fall to drain out the water quickly.

6.2.4.15 Green work shall be protected from rain by suitable covering. Masonry work in cement, mortar shall be kept constantly, moist on all the faces for a minimum period of seven days. The top of masonry work shall be left flooded at the close of the day.

6.2.4.16 Work of cutting chases, wherever required to be made in the walls for housing GI pipes, CI pipe or any other fixtures shall be carried out in various locations as per guidelines given below:

- a) Cutting of chases in one brick thick and above load bearing walls.
 - i) As far as possible services should be planned with the help of vertical chases. Horizontal chases should be avoided.
 - ii) The depth of vertical chases and horizontal chases shall not exceed one-third and one-sixth of the thickness of the masonry respectively.
 - iii) When narrow stretches of masonry (or short length of walls) such as between doors and windows, cannot be avoided they should not be pierced with openings for soil pipes or waste pipes or timber joints, etc. where there is a possibility of load concentration such narrow lengths of walls shall be checked for stresses and high strength bricks in mortar or concrete walls provided, if required.

- iv) Horizontal chases when unavoidable should be located in the upper or lower one-third of height of storey and not more than three chases should be permitted in any stretch of a wall. No continuous horizontal chases shall exceed one meter in length. Where unavoidable, stresses in the affected area should be checked and kept within the permissible limits.
 - v) Vertical chases should not be closer than 2m in any stretch of a wall. These shall be kept away from bearings of beams and lintels. If unavoidable, stresses in the affected area should be checked and kept within permissible limits.
 - vi) Masonry directly above a recess, if wider than 30 cm horizontal dimension should be supported on lintel. Holes in masonry may be provided up to 30 cm width and 30 cm height without any lintel. In case of circular holes in the masonry, no lintel need be provided for holes up to 40 cm in diameter.
- b) Cutting of chases in half brick load bearing walls:
 - i) No chases shall be permitted in half brick load bearing walls and as such no recessed conduits and concealed pipes shall be provided with half load bearing walls.
 - c) Cutting of chases in half brick non-load bearing wall:
 - i) Services should be planed with the help of vertical chases. Horizontal chases should be provided only when unavoidable.

6.2.5 JOINTS

The thickness of all types of joints in brick work shall be such that four courses and three joints taken consecutively shall measure as follows:

- i) In case of modular brick conforming to IS: 1077 specification for common burnt clay building bricks equal to 39 cm.
- ii) In case of non-modular brick it shall be equal to 31 cms.

Note: Specified thickness of joints shall be of 1 cm, Deviation from the specified thickness of all joints shall not exceed one fifth of specified thickness.

6.2.5.1 Finishing of Joints: The face of brick work may be finished flush or by pointing. In flush finishing either the face joints of the mortar shall be worked out while still green to give a finished surface flush with the face of the brick work or the joints shall be squarely raked out to a depth of 1 cm while the mortar is still green for subsequent plastering. The faces of brick work shall be cleaned with wire brush so as to remove any splashes of mortar during the course of raising the brick work. In pointing, the joints shall be squarely raked out to a depth of 1.5cm while the mortar is still green and raked joint shall be brushed to remove dust and loose particles and well wetted and shall be later refilled with mortar to give ruled finish. Some such finishes are "flush", "weathered", ruled etc.

6.2.6 CURING

The brick work shall be constantly kept moist on all faces for a minimum period of seven days. Brick work done during the day shall be suitably marked indicating the date on which the work is done so as to keep a watch on curing period.

6.2.7 SCAFFOLDING

Scaffolding shall be strong to withstand all dead, live and impact loads which are likely to come on them. Scaffolding shall be provided to allow easy approach to every part of the work.

6.2.8 MEASUREMENTS

6.2.8.1 Brick work shall be measured in cubic metres unless otherwise specified. Any extra work over the specified dimensions shall be ignored. Dimensions shall be measured correct to the nearest 0.01 m i.e 1 cm. Area shall be calculated to the nearest 0.01 sq mtrs and the cubic contents shall be worked out to the nearest 0.01 cubic meters.

6.2.8.2 Brick work shall be measured at all levels / at all floors / at all height up to 30 m.

Note: Brick work in parapet walls, mumty, lift machine room and water tanks constructed on the roof to 1.2m height above roof shall be measured together with the corresponding work of the floor next below.

6.2.8.3 No deductions or additions shall be done and no extra payment made for the following:

Note: Where minimum area is defined for deduction of an opening, void or both, such area shall refer only to opening or void within the space measured.

- a) Ends of dissimilar materials (that is, joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps, etc) up to 0.1 m² in section;
- b) Opening up to 0.1 M² in area (see Note);
- c) Wall plates, bed plates, and bearing of slabs, chhajjas and the like, where thickness does not exceed 10 cm and bearing does not extend over the full thickness of wall;
- d) Cement concrete blocks as for hold fasts and holding down bolts;
- e) Iron fixtures, such as wall ties, pipes up to 300 mm diameter and hold fasts for doors and windows;
- f) Chases of section not exceeding 50 cm in girth; and
- g) Bearing portion of drip course, bearing of moulding and cornice.

Note: In calculating area of an opening, any separate lintel or sills shall be included with the size of the opening but end portions of lintel shall be excluded. Extra width of rebated reveals, if any shall also be excluded.

6.2.8.4 Walls half brick thick and less shall each -be measured separately in square metres stating thickness.

6.2.8.5 Walls beyond half brick thickness shall be measured in multiples of half brick which shall be deemed to be inclusive of mortar joints. For the sizes of bricks specified in 6.1.1, half brick thickness shall mean 100 mm for modular and 115 mm for non-modular bricks.

Where fractions of half brick occur due to architectural or other reasons, measurement shall be as follows:

- a) Up to 1/4th brick – actual measurements and
- b) Exceeding ¹/₄ th brick – full half bricks.

6.2.8.6 String courses, projecting pilasters, aprons, sills and other projections shall be fully described and measured separately in running meters stating dimensions of each projection.

6.2.8.7 Square or rectangular pillars shall be measured like the brick work in straight walls and shall include all cutting and wastage of bricks, tapered vertical joints and use of extra mortar, if any. Brick work curved on plan to a mean radius not exceeding six meters shall be measured separately and extra shall be payable over the rates for brick work in straight walls. Unless otherwise stated nothing extra shall be payable if the mean radius of the brick work curved in plan exceeds six meters.

6.2.8.8 All the Openings such as doors, windows, Rolling shutters, louvers, cut-outs etc. should be deducted fully from the brickworks measurements and net measurements after full deduction of these openings should be considered for payments.

6.2.9 RATE

The rate shall include the cost of materials and labour required for all the operations described above except the vertical reinforcement and its encasement in cement mortar or cement concrete. The rates shall also include the following:

- a) Raking out joints or finishing joints flush as the work proceeds;
- b) Preparing tops of existing walls and the like for raising further new brick work.
- c) Rough cutting and waste for forming gables, splays at eaves and the like; leaving holes for pipes up to 150mm dia, and encasing hold fasts, etc.
- d) Rough cutting and waste for brick work curved in plan and for backing to stone or other types of facing.
- e) Embedding in ends of beams, joists, slabs, lintels, sills, trusses, etc.

- f) Bedding wall plates, lintels, sills, roof tiles, corrugated sheets, etc. in or on walls if not covered on plan to a mean radius exceeding six meters.

6.3 BRICK WORK IN ARCH

The detailed specifications for brick work mentioned in 6.2 shall apply, in so far as they are applicable. Arch work shall include masonry for both gauged as well as plain arches. In gauged arches cut or moulded bricks shall be used. In plain arches, uncut bricks shall be used.

6.3.1 CIRCULAR ARCH

These shall be either (a) plain arches, and shall be built in half brick concentric rings with break joints or (b) gauged arches built with bricks cut or moulded to proper shape. The arch work shall be carried up from both ends simultaneously and keyed in the center. The brick shall be flush with mortar and well pressed into their positions so as to squeeze out a part of their mortar and leave the joints thin and compact. All joints shall be full of mortar and thickness of joints shall not be less than 5 mm nor more than 15mm.

After the arch is completed, the haunches shall be loaded by filling up the spandrels up to the crown level of the arch. Care shall be taken to load the haunches on two sides of the spandrels. When the arch face is to be pointed (and not plastered) the face brick shall be cut to proper shape or moulded so as to have the joints not more than 5 mm thick. These shall be laid with radial joints to the full depth of the arch. The voussoirs shall break joints to the full depth of the arch.

6.3.2 FLAT ARCHES

These shall be gauged arches of brick cut or moulded to proper shape. The extrados shall be kept horizontal and the intrados shall be given slight camber of 1 in 100 of the span. The center of the arch from which joints shall radiate, shall be determined by the point of the inter-section of the two lines drawing from ends of the arch at the springing level and at 60° to horizontal.

In flat arches, bricks shall be laid with radial joints to the full depth of arch and voussoirs breaking joints with each other. The arch work shall be carried up from both ends simultaneously and keyed in the center. The thickness of the joints shall not exceed 5 mm. Flat arches may be used for the sake of appearance but for the purpose of carrying loads of the wall above, these shall be used in conjunction with relieving arches, lintel placed below.

6.3.3 CENTRING AND SHUTTERING

The centering and shuttering for the arch shall be got approved by the Engineer-in-charge before the arch work is started. It shall be strong enough to bear the dead load of the arch and the live loads that are likely to come upon it during construction, without any appreciable deflections.

The shuttering shall be tightened with hard' wood wedged or sand boxes, so that the same could be used without jerks being transmitted to the arch. The sequence of easing the shuttering shall be got approved from the Engineer-in-charge. The shuttering shall be struck within 48 hours of the completion of the arch but not before 24 hours. This shall be done after the spandrel has been filled in and the arch loaded.

6.3.4 MEASUREMENTS

The length of the arch shall be measured as the mean of the extrados and intrados of the arch correct to a cm. The thickness of the arch shall be measured in multiples of the half brick.

The breadth in the direction of the thickness of wall shall be measured as specified. The cubical contents shall be calculated in cubic meter, correct to two places of decimal.

For aches exceeding 6m in spans extra payment shall be made on the actual area of the soffit for additional cost of centering including all strutting, bolting, wedging, easing, striking and its removal.

6.3.5 RATE

The rate inclusive of the cost of the materials and labour required for all the operations described.

6.4 HALF BRICK WORK

Brick work in half brick walls shall be done in the same manner as described above in 6.2.4 except that brick shall be laid in stretcher bond. When the half brick work is to be reinforced providing stiffeners at every 0.9m height with RCC 1:2:4; 115mm (wall thickness) 75mm confirming to relevant specification under concrete /RCC or providing 2 Nos. TMT bars of 8 mm dia shall be embedded in every third course as given in the item (the dia of bars shall not exceed 8 mm). These shall be securely anchored at their end where the partitions end. The free ends of the reinforcement shall be keyed into the mortar of the main brick work to which the half brick work is joined. The mortar used for reinforcement brick work shall be rich dense cement mortar of [mix 1:4 (1 Cement: 4 Coarse Sand) lime mortar shall not be used. Over laps in reinforcement, if any shall not be less than 30 cm. The mortar interposed between the reinforcement bars and the brick shall not be less than 5 mm. The mortar covering in the direction of joints shall not be less than 15mm.

6.4.1 Rate

The rate includes the cost of all materials and labour involved in all the operations described above except the reinforcement which is to be paid for separately unless specified otherwise.

16.4.1 Brick Tile work

The work shall be done in the same manner as described in 6.2.4 except that brick tile shall be used instead of bricks. The measurement and rate shall be same as specified under 6.2.

16.4.2 HONEY COMB BRICK WORK

The brick honey comb work shall be done with specified class of brick, laid in specified mortar. All joints and edges shall be struck flush to given an even surface.

The thickness of the brick honey comb work shall be half-brick only, unless otherwise specified. Opening shall be equal and alternate with half brick laid with a bearing of 2 cm on either side.

16.4.3 MEASUREMENTS

The length and the height shall be measured correct to a cm. Area shall be calculated in square meters correct to two place of decimal. Honey comb openings shall not be deducted.

6.4.5 Rate

The rate includes the cost of materials and labour involved in all the operations described above.

6.5 JOINING OLD BRICK WORK WITH NEW BRICK WORK

6.5.1 In case the height of the bricks of old as well as new work is same, the old work shall be toothed to the full width of the new wall and to the depth of a quarter of bricks in alternate courses. In case the height of the bricks is unequal, then the height of each course of new work shall be made equal to the height of the old work by adjusting thickness of horizontal mortar joints in the new wall. Where necessary adjustment shall be made equal to thickness of old wall by adjusting the thickness of vertical joints.

6.5.2 For joining new cross wall to old main walls, a number of rectangular recesses of width equal to the thickness of cross wall, three courses in height and half a brick in depth shall be cut in the main walls. A space of the three courses shall be left between two consecutive recesses. The new cross wall shall be bonded into the recesses to avoid any settlement.

6.5.3 Joining of old brick work with the new brick work shall be done in such a way that there shall not

be any hump or projection at the joint.

6.5.4 MEASUREMENT

The height and thickness of vertical face in contact with new work shall be measured to the nearest 0.01 m and shall be calculated to the nearest 0.01 sqm.

6.5.5 RATE

The rate includes the cost of labour and materials involved in all the operations described above.

6.6 MOULDING AND CORNICES

6.6.0 The specifications described under 6.2 shall apply in so far these are applicable. Moulding and cornices shall be made with bricks as specified for brick work. The bricks shall be cut and dressed to the required shape as shown in the architectural drawings.

6.6.1 Cornices shall not ordinarily project by more than 15 cm to 20 cm and this projection shall be obtained by projecting each brick length. For cornices projecting more than 20 cm and. requiring more than quarter bricks projection, metal clamps shall be used and paid for separately.

6.6.2 Corbelling shall be brought roughly to shape by plastering with the specified mortar. When the mortar is still green, the mouldings shall be finished straight and true with the help of metal templates.

6.6.3 CORNICE AND PROJECTION

The mouldings and cornices shall be cured for at least seven days. These shall be projected from the effects of sun and rain by suitable covering and also from damage during the execution of the work.

6.6.4 MEASUREMENTS

For the purpose of measurements, the sectional periphery of mouldings and cornices (excluding the portion in contact with wall) shall be measured in centimeters and length in metres (The girth and length shall be measured correct to a cm. No deduction shall be made from the masonry of wall for the bearing of the moulding and cornices.

6.6.5 RATE

The rate includes the cost of materials and labour involved in all the operations described above.

6.7 BRICK WORK UNDER WATER OR FOUL POSITIONS Brick work under following conditions:

- i) Work in or under water / or liquid mud;
- ii) Work in or under foul positions shall be measured separately for payment of extra rate over and above the quantity measured and paid under para 6.2.8.

6.8 EXPOSED BRICK WORK

6.8.1 Facing Bricks

The facing bricks made from suitable soils shall be free from cracks, flaws, nodules of free lime warpages and organic matter. These shall be thoroughly burnt and shall have plane rectangular faces with parallel sides and sharp straight right angled edges. Facing bricks shall have uniform colour and even texture. Unless otherwise specified, facing bricks shall be machine moulded. Selected hand moulded bricks may also be used as facing bricks where specified. As far as possible, total requirement of facing bricks for a work shall be arranged from the same kiln. Bricks with chipped edges and broken corners shall not be used.

6.8.2 DIMENSIONS AND TOLERANCES

The standard sizes of machine moulded facing bricks shall be as specified in 6.1.1.

6.8.2.1 The permissible tolerances shall be as under:

	DIMENSION	TOLERANCE (for Machine moulded bricks) in mm
Length	190 or 225	±3
Width	90 or 111	±1-5
Thickness	40 to 44	±1.5

Note: Tolerance and Dimensions for selected hand moulded bricks ±4 mm in length and ±3mm in width and thickness.

6.8.3 SAMPLING

As per para 6.1.3 and 6.1.3.2.

6.8.4 PHYSICAL REQUIREMENTS

Facing bricks shall be of class designation 75 unless otherwise specified. Average compressive strength shall not be less than 7.5 N/mm², water absorption shall not exceed 20 percent by weight and efflorescence rating shall be nil when tested in accordance with the procedure laid down and tolerance in dimensions shall be checked as per the procedure laid down
Mortar, soaking of bricks and laying shall be as specified in paras 6.2.2, 6.2.3 and 6.2.4.

6.8.5 Joints in the exposed brick work shall be truly horizontal and vertical and kept uniform with the help of wooden or steel strips. The thickness of joints shall be as per 6.2.5.0.

6.8.6 Curing and scaffolding shall be as specified in 6.2.6 and 6.2.7 respectively.

6.8.7 MEASUREMENTS

Exposed brick work in face using machine moulded bricks and selected hand moulded bricks shall be measured separately and the measurement shall be as specified in 6.2.8.

6.8.8 RATE

The rates shall be as specified in 6.2.9 and shall also include the following:

- Labour for selecting bricks and wastage of bricks where use of selected hand moulded brick is specified.
- Leaving uniform horizontal and vertical grooves of specified depth and providing joints of required thickness using wooden or steel strips as the work proceeds.

6.9.1 CAVITY WALL

It is a wall comprising of two leaves, each leaf being built of masonry units and separated by a cavity so as to provide an air space within the wall and tied together with metal ties or bonding units to ensure that two leaves as one structural unit. The width of the cavity shall not be less than 50 mm and not more than 115mm. Each leaf of the cavity wall shall not be less than 75mm. The space between the leaves being either left as cavity or filled with non-load bearing insulating and water proofing material.

6.9.2 METAL TIES

These may be of galvanized iron, wrought iron, gun metal, brass, copper, stainless steel or any such corrosion resistant metal, made of flats 20 x 5 mm cranked or twisted at their mid-point with ends split and fish tailed. The ties shall be built into horizontal bed joints during erection, placed sloping towards the exterior side to prevent water from flowing along it from outer to inner leaf side.

6.9.3 BONDING UNITS

These shall be preferably precast RCC units having cross section of thickness equal to course height of cavity wall with suitable width and length equal to thickness of walls plus cavity width all as in drawing.

Precast RCC units shall be provided with 2 No. 6 mm mild steel reinforcement bars tied with 2 No. 3mm dia [MS wire /hard drawn wire] cross bars placed in the center of units.

Cement concrete used in the bonding units shall not be leaner than 1:3:6 (1 cement: 3 coarse sand: 6 stone aggregate 20 mm nominal size) Metal tie bonds as specified may also be provided.

6.9.4 SPACING

Metal tile/bonding units shall be spaced not more than 90 cm apart horizontally and 45 cm vertically and staggered in each course. Additional ties shall be used near openings.

6.9.5 RESTRICTIONS

Cavity walls shall not normally be built more than 7.5 metres in height and 9 metres in length. Where large lengths and heights are desired, the wall shall be divided into panels with strengthening measures such as pillars etc. Cavity shall be covered at the top with at least two courses of masonry unit and / or a coping over it.

Adoption of cavity walls is not recommended when heavy concentrated load from beam etc. are to be supported.

7.1 RANDOM RUBBLE MASONRY

7.1.1 STONE

The stone shall be of the type specified such as black trap and shall be obtained from the quarries, approved by the Engineer-in-Charge. Stone shall be hard, sound and durable and free from weathering decay and defects like cavities, cracks, flaws, sand holes, injurious veins, patches of loose or soft materials and other similar defects that may adversely affect its strength and appearance. As far as possible stones shall be uniform colour, quality and texture. Generally stone shall not contain crypt crystalline silica or chart, mica and other deleterious materials like iron-oxide organic impurities etc.

Stones with round surface shall not be used.

The compressive strength of common types of stones shall be as per Table 1 and the percentage of water absorption shall generally not exceed 5% for stones other than specified in Table 1. For laterite this percentage is 12%.

TABLE 1

Type of Stone	Maximum Water Absorption percentage by weight	Minimum compressive strength kg/sq cm
Granite	0.5	1000
Basalt	0.5	400
Lime Stone (Slab & Tiles)	0.15	200
Sand Stone (Slab & Tiles)	2.5	300
Marble	0.40	500
Quartzite	0.40	800
Laterite (Block)	12	35

Note 1 : Test for compressive strength shall be carried out as laid down in IS:1121

(Part 1).

Note 2 : Test for water absorption shall be carried out as laid down in IS : 1124.

7.1.2 SIZE OF STONES

Normally stones used should be small enough to be lifted and placed by hand. Unless otherwise indicated, the length of stones for stone masonry shall not exceed three times the height and breadth or base shall not be greater than three-fourth the thickness of wall, or not less than 15 cm. The height of stone may be upto 30cm.

7.1.3 Random Rubble Masonry shall be uncoursed or brought to courses as specified. Uncoursed random rubble masonry shall be constructed with stones of sizes as referred to in para 7.1.2 and shapes picked up random from the stones brought from the approved quarry. Stones having sharp corners or round surfaces shall, however, not be used.

7.1.4 Random rubble masonry brought to the course is similar to uncoursed random rubble masonry except that the courses are roughly levelled at intervals varying from 30cm to 90cm in height according to size of stones used.

7.1.5 DRESSING

Each stone shall be hammer dressed on the face, the sides and the bed. Hammer dressing shall enable the stones to be laid close to neighboring stones such that the bushing in the face shall not project more than 40mm on the exposed face and 10mm on the face to be plastered.

7.1.6 MORTAR

The mortar used for joining shall be as specified.

7.1.7 LAYING

All stones shall be wetted before use. Each stone shall be placed close to the stones already laid so that the thickness of the mortar joints at the face is not more than 20mm. Face stones shall be arranged suitably to stagger the vertical joints and long vertical joints shall be avoided. Stones for hearting interior filling shall be hammered down with wooden mallet into the position 'firmly bedded in mortar. Chips or sprawls of stones may be used for filling of interstices between the adjacent stones in hearting and these shall not exceed 20% of the quantity of stone masonry. To form a bond between successive courses plum stones projecting vertically by about 15 to 20 cm shall be firmly embedded in the hearting at the interval of about one metre in every course. No hollow space shall be left anywhere in the masonry. The masonry work in wall shall be carried up true to plumb or to specified batter.

Random rubble masonry shall be brought to the level courses at plinth, window sills lintel and roof levels. Levelling shall be done with concrete comprising of one part of the mortar as used for masonry and two parts of graded stone aggregate of 20mm nominal size.

The masonry in structure shall be carried uniformly. Where the masonry of one part is to be delayed the work shall be raked back at an angle not steeper than 45°.

7.1.8 BOND STONES

Bond or through stones running through the thickness of walls, shall be provided in walls up to 60cm thickness and in case of walls above 60 cm thickness, a set of two or more bond stones overlapping each other by at least 15cm shall be provided in a line from face of the wall to the back.

In case of highly absorbent types of stones (porous lime stone and sand stone etc.) single piece bond stone may give rise to dampness. For all thicknesses of such walls, a set of two or more bond stones stepping each other by at least 15cm shall be provided. Length of each such bond stone shall not be less than two-third of the thickness of the wall.

Where bond stones of suitable lengths are not available precast cement concrete block of 1:3:6 mix (1 cement :3 coarse sand : 6 graded stone aggregate 20mm nominal size) of cross section not less than 225 sq. cm and length equal to the thickness of wall shall be used in lieu of bond stones. (This shall be applicable only in masonry below ground level and where masonry above ground level is finally required to be plastered).

At least one bond stone or a set of bond stones shall be provided for every 0.5 sqm of the area of wall surface. All bond stones shall be marked suitably with paint as directed by the Engineer In-Charge.

7.1.9 QUOIN AND JAMB STONES

The quoin and jamb stones shall be selected stones neatly dressed with hammer or chisel to form the required angle. Quoin stones shall not be less than 0.01 cum in volume. Height of quoins and jamb shall not be less than 15 cm. Quoins shall be laid in header and stretcher alternatively.

7.1.10 JOINTS

Stones shall be so laid that all joints are fully packed with mortar and chips. Face joints shall not be more than 20mm thick.

The joints shall be struck flush and finished at the time of laying when plastering or pointing is not be done. For the surface to be plastered or pointed, the joints shall be raked to a minimum depth of 20mm when the mortar is still green.

7.1.11 SCAFFOLDING

Single scaffolding shall not be adopted. Double scaffolding only shall be permitted for all stone wall work where scaffolding is required.

7.1.12 CURING

Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. In case of masonry with fat lime mortar curing shall commence two days after laying masonry and shall continue for at least seven days thereafter.

7.1.13 PROTECTION

Green work shall be protected from rain by suitable covering. The work shall also be suitably protected from damage, mortar dropping and rain during construction.

7.1.14 MEASUREMENTS

7.1.14.1 Unless otherwise stated measurements shall be as below. The length, height and thickness shall be measured correct to a cm. The thickness of wall shall be measured at joints excluding the bushing. Only specified dimension shall be allowed; anything extra shall be ignored. The quantity shall be calculated in cubic meter nearest to two places of decimal. R.C.C. Concrete course or band used as Bond Stone shall be paid under respective item of this tender followed by respective item specifications.

7.1.14.2 The work under the following categories shall be measured separately.

- i) From foundation to Plinth Level
- ii) From Plinth level to top of the building up to 30.0 m height

7.1.14.3 No deduction shall be made for extra payment made for the following:

- i) Ends of dissimilar materials (that is joints, beams, lintels, posts, girders, rafters purlins, trusses, corbels, steps etc.) up to 0.1 sq. m in section.
- ii) Openings each up to 0.1 sq. m in area. In calculating the area of openings, any separate Intel or sills shall be included along with the size of opening but the end portions of the lintels shall be excluded and the extra width of rebated reveals, if any, shall also be excluded.

iii) Wall plates and bed plates, and bearing of chhajjas and the like, where the thickness does not exceed 10cm and the bearing does not extend over the full thickness of the wall.

Note: The bearing of floor and roof shall be deducted from wall masonry.

iv) Drain holes and recesses for cement concrete blocks to embed hold fasts for doors, windows etc,

v) Building in masonry, iron fixture, pipes up to 300mm dia, hold fasts of doors and windows etc.

vi) Forming chases in masonry each up to section of 350 sq. cm.

7.1.14.4 Masonry (excluding fixing brick work) in chimney breasts with smoke or air flues not exceeding 20 sq. m (0.20 sq. m) in sectional area shall be measured as solid and no extra payment shall be made for pargetting and coring such flues. Where flues exceed 20 sq dm (0.20 sq m) sectional area deduction shall be made for the same and pargetting and coring flues shall be measured in running meters stating size of flues and paid for separately. Aperture for fire place shall be deducted and no extra payment made for splaying of jambs and throating.

7.1.14.5 Apertures for fire places shall not be deducted and extra labour shall not be, measured for splaying of jambs, throating and making arch to support the opening.

7.1.14.6 SQUARE OR RECTANGULAR PILLARS:

These shall be measured as walls, but payment shall be allowed for stone work in square or rectangular pillars over the rate for stone work in walls. Rectangular pillar shall mean a detached masonry support rectangular in section, such that its breadth does not exceed two and a half times the thickness.

7.1.14.7 CIRCULAR PILLARS (COLUMNS):

These shall be measured as per actual dimensions but extra payment shall be allowed for stone work in circular pillars over the rate for stone work in walls. The diameter as well as length shall be measured correct to a cm.

7.1.14.8 Tapered walls shall be measured net, as per actual dimensions and paid for as other walls.

7.1.14.9 CURVED MASONRY:

Stone masonry curved on plan to a mean radius exceeding 6 m shall be measured and included with general stone work. Stone work circular on plan to a mean radius not exceeding 6 m shall be measured separately and shall include all cuttings and waste and templates. It shall be measured as the mean length of the wall.

7.1.15 RATE

The rate shall include the cost of materials and labour required for all the operations described above and shall include the following:

- a) Raking out joints for plastering or pointing in pattern of grooved, raised or flush type pointing as directed shall be finished using prescribed Cement mortar with good workmanship with stipulated curing, etc. complete
- b) Preparing tops and sides of existing walls for raising and extending.
- c) Rough cutting and waste for forming gables cores, skew backs or spandrels of arches, splays at eaves and all rough cutting in the body of walling unless otherwise specified.
- d) Leading and making holes for pipes etc.
- e) Bedding and pointing wall plates, lintels, sills etc. in or on walls, bedding roof tiles and corrugated sheets in or on walls.
- f) Building in ends of joists, beams, lintels etc.
- g) Cement concrete course or band determined as Bond stone within masonry work shall be measured and paid with respective item of this tender separately followed with respective item specifications.

7.2 COURSED RUBBLE MASONRY-FIRST SORT

7.2.1 Stone

Shall be as specified in 7.1.1. 7.2.2 Size of Stone

Shall be as specified in 7.1.2.

7.2.3 DRESSING

Face stone shall be hammer dressed on all beds, and joints so as to give them approximately rectangular block shape. These shall be squared on all joints and beds. The bed joint shall be rough chiselled dressed for at least 8 cm back from the face, and side joints for at least 4 cm such that no portion of the dressed surface is more than 6 mm from straight edge placed on it. The bushing **on** the face shall not project more than 4 cm as an exposed face and one cm on a face to be plastered. The hammer dressed stone shall also have a rough tooling for minimum width of 2.5 cm along the four edges of the face of the stone, when stone work is exposed.

7.2.4 MORTAR

The mortar for jointing shall be specified.

7.2.5 LAYING

All stones shall be wetted before use. The walls shall be carried up truly plumb or to specified batter. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The height of each course shall not be less than 15cm nor more than 30cm.

Face stones shall be laid alternate headers and stretchers. No pinning shall be allowed on the face. No face stone shall be less in breadth than its height and at least one-third of the stones shall tail into the work for length not less than twice their height.

The hearting or the interior filling of the wall shall consist of stones carefully laid on their proper beds. In mortar chips and spalls of stone being used where necessary to avoid thick beds of joints of mortar and at the-same time ensuring that no hollow spaces are left anywhere in the masonry. The chips shall not be used below the hearting stone to bring these upto the level of face stones. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 10% of the quantity of stone masonry.

The masonry in a structure shall be carried up uniformly but where breaks are unavoidable, the joints shall be replaced back at angle not steeper than 45°.

Toothing shall not be allowed.

7.2.6 BOND STONES

Shall be as specified in 7.1.8 except that a bond stone or a set of bond stones shall be inserted 1.5 to 1.8m apart, in every course.

7.2.7 QUOINS

Quoins shall be of the same height as the course in which these occur. These shall be at least 45cm long and shall be laid stretchers and headers alternatively. These shall be laid square on the beds, which shall be rough-chisel dressed to a depth of at least 10cm. In case of exposed work, these stones shall have a minimum of 2.5cm wide chisel drafts at four edges, all the edges being in the same plane.

7.2.8 JOINTS

Joints shall be horizontal and all side joints vertical. All joints shall be fully packed with mortar, face joints shall not be more than one cm thick.

When plastering or pointing is not required to be done the joints shall be struck flush and finished at the time of laying. Otherwise, joints shall be raked to a minimum depth of 20mm by raking tool during the progress of work, when the mortar, is still green.

7.2.9 Curing, Scaffolding, measurements and rates shall be as specified under 7.1.

7.3 COURSED RUBBLE MASONRY-SECOND SORT

7.3.1 Stone: Shall be as specified in 7.1.1.

7.3.2 Size of Stone: Shall be as specified in 7.1.12.

7.3.3 Dressing: Shall be as specified in 7.2.3 except that no portion of dressed surface shall exceed 10mm from a straight edge placed on it.

7.3.4 Mortar: The mortar for jointing shall be as specified.

7.3.4.1 Laying: Shall be as specified in 7.2.5 except that the use of chips shall not exceed 15% of the quantity of stone masonry and stone, in each course need not be of the same height but not more than two stones shall be used in the height of a course.

7.3.5 BOND, STONE, QUOINS

Shall be as specified in 7.2.6 and 7.2.7 respectively.

7.3.6 JOINTS

All bed joints shall be horizontal and all side vertical. All joints shall be fully packed with mortar, face joints shall not be more than 2 cm thick.

When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise the joints shall be raked to a minimum depth of 20mm by raking tool during the progress of work, when the mortar is still green.

7.3.8 Curing Scaffolding, measurement and rates: Shall be as specified under 7.1.

7.4 PLAIN ASHLAR MASONRY

7.4.1 Stone shall be of the type specified. It shall be hard, sound, durable and tough, free from cracks, delayed with weathering and defects like cavities, cracks, flaws, sand holes, veins, patches of soft or loose materials etc.

Before starting the work, the contractor shall get the stones approved by Engineer-in-Charge.

7.4.2 SIZE OF STONE

Normally stones used should be small enough to be lifted and placed by hand. The length of the stone shall not exceed three times the height and the breadth on base shall not be greater than three-fourth of the thickness of wall nor less than 15cm. The height of stone may be up to 30cm.

7.4.3 DRESSING

Every stone shall be cut to the required size and shape, so as to be free from waviness and to give truly vertical and horizontal joints. In exposed masonry, the faces that are to remain exposed in the final position and the adjoining faces to a depth of 6 mm shall be fine chisel dressed so that when checked with 60cm straight edge, no point varies from it by more than 1mm. The top and bottom faces that are to form the bed joints shall be chisel dressed so that variation from 60cm straight edge at no point exceed 3mm. Faces which are to form the vertical joints should be chisel dressed so that variation at any point with 60cm straight edge does not exceed 6mm. Any vertical face that is to come against backing of masonry shall be dressed such that variation from straight edge does not exceed 10mm. All angles and edges that are to remain exposed in the final position shall be True Square and free from chippings.

A sample of dressed stone shall be prepared for approval of Engineer-in-Charge. It shall be kept at the work site as a sample after being approved.

7.4.4 The mortar for joining shall be as specified.

7.4.5 LAYING

All stone shall be wetted before placing. These shall be floated on mortar and bedded properly in positing with wooden mallets without the use of chips or under pinning of any sort.

The walls pillars shall be carried up truly plumb or battered as shown in drawings. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical.

In case of ashlar work without backing of brick work or coursed rubble masonry, face stone shall be laid headers and stretchers alternately unless otherwise directed. The headers shall be arranged to come as nearly as possible in the middle of stretchers above and below. Stone shall be laid in regular courses of not less than 15cm in height and all the courses shall be of same height, unless otherwise specified. For ashlar facing with backing of brick work or coursed rubble masonry face stone shall be laid in alternate courses of headers and stretchers unless otherwise directed. Face stone and bond stone course shall be maintained throughout. All connected masonry in a structure shall be carried up nearly at one uniform level throughout, but where breaks are unavoidable, the joints shall be made in good long steps so as to prevent cracks developing between new and old work. Bond stone provided in masonry shall be payable in the item of Ashlar masonry. Neither any deduction will be made from the brick masonry for embedding the bond stone in the backing nor any extra payment shall be made for any extra labour involved in making holes in brick masonry backing.

When necessary jib crane or other mechanical appliances shall be used to hoist the heavy pieces of stones and place these into correct positions, care being taken that the corners of the stone are not damaged. Stone shall be covered with gunny bags, before tying chain or rope is passed over it, and it shall be handled carefully. No piece which has been damaged shall be used in work.

7.4.6 BOND STONES: Shall be as specified in 7.1.8.

7.4.7 JOINTS

All joints shall be full of mortar. These shall be not more than 6mm thick. Face joints shall be uniform throughout and a uniform recess of 20mm depth from face shall be left with the help of the steel plate during the progress or work.

7.4.8 POINTING

All exposed joints shall be pointed with mortar as specified. The pointing when finished shall be sunk from stone face by 5mm or as specified. The depth of mortar in pointing work shall not be less than 15mm.

7.4.9 CURING

Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. In case of masonry with fat lime mortar, curing shall commence two days after laying of masonry and shall continue for at least seven days thereafter.

7.4.10 PROTECTIONS

Green work shall be protected from rain by suitable covering. The work shall also be suitably protected from damage, mortar dropping and rain during construction.

7.4.11 SCAFFOLDING

Double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.

7.4.12 MEASUREMENTS

Unless otherwise stated measurements shall be as below:

The finished work shall be measured correct to a centimeter in respect of length, breadth and height. The cubical contents shall be calculated in cubic meter nearest to two places of decimal.

7.4.12.1 No deduction nor any extra payment shall be made for the following:

Ends of dissimilar materials (that is joists, beams, lintels, posts, girders, rafters, purlins trusses, corbels, steps etc.) up to 0.1 sq.m. in section.

Openings up to 0.1 sq.m. in area. In calculating the area of opening, any separate lintels or sills shall be included along with the size of the opening but the end portion of the lintels shall be excluded and extra

width of rebated reveals, if any, shall also be excluded.

Wall plates and bed plates and bearing of chhajja and the like, where the thickness does not exceed 10cm and the bearing does extend over the full thickness of the wall.

Note: The bearing of floor and roof slabs shall be deducted from wall masonry.

Drainage holes and recesses left for cement concrete blocks to embed hold-fasts for door and windows, building in the masonry iron fixture and pipes up to 300mm diameter.

Stone walling in chimney breasts, chimney stacks, smoke or air flues not exceeding 0.2 sqm in sectional area shall be measured as solid and no extra measurement shall be made for pargetting and coring such flues. Where flues exceed 0.20 sq.m. In sectional area, deduction shall be made for the same and pargetting and coring flues paid for separately.

7.4.12.2 SQUARE, RECTANGULAR OR CIRCULAR PILLARS: Shall be measured and paid for as walls, but extra payment shall be allowed for such pillars and columns over the rate for stone work in walls.

Rectangular pillars shall mean a detached masonry support, rectangular in section, such that its breadth shall not exceed two and half time the thickness.

7.4.12.3 CURVED STONE WORK: Stone work curved on a plan to a mean radius exceeding six meters shall be measured net and included with general stone work. Stone work circular on a plan to a mean radius not exceeding six metres shall be measured separately and extra payment shall be allowed and shall include all cutting and waste and templates. It shall be measured as the mean length of wall.

7.4.13 RATE

The rate shall include the cost of materials and labour required for all the operations described above. Unless otherwise specified stone facing or wall lining up to and not exceeding 8cm thickness shall be paid for under "Stone work for wall lining etc. (Veneer work)". The stone work of thickness exceeding 8 cm shall be paid under relevant items of work.

7.5 STONE VENEERING WORK

Stone lining up to 8cm shall generally be treated as veneering work and lining of greater thickness as plain Ashlar masonry.

7.5.1 STONE

Shall be as specified in 7.4.1. The stone shall be cut into slabs of required thickness along the planes parallel to the natural bed of stone.

7.5.2 DRESSING

Shall be as specified in 7.4.3 except that dressing at the back shall not be done, so as to ensure better grip with hearting or backing. The dressed slabs shall be of the thickness as specified, with permissible tolerance of + 2 mm.

7.5.3 MORTAR: Mortar for fixing shall be as specified.

7.5.4 LAYING

The stone shall be wetted before laying. They shall then be fixed with mortar in position to line and level without the use of chips or under pinning of any sort.

7.5.4.1 Where so desired, the adjoining stones shall be secured to each other by means of copper pins 75mm long, 6mm diameter or as specified.

7.5.4.2 Further the stones shall be secured to the backing by means of clamps. The material for clamps shall have high resistance to corrosion under conditions of dampness and against the chemical action of mortar or concrete in which clamps are usually embedded.

Clamps shall be 25mm x 6mm and 30cms long in case of backing of stone masonry walls and bricks masonry walls thicker than 230mm. In case of backing with brick masonry walls 230mm

or less thick or RCC members clamps shall be of 25 x 6mm and length as per requirement, made out of gun metal or any other metal specified in para 7.5.4.6. Generally the outer length of clamps in half brick work backing shall be 115mm and in one brick work backing shall be 150mm. The typical shape and details of clamps for such backing shall be as per drawing for the work. Clamps shall be spaced not more than 60cm apart horizontally.

Alternatively the stone may be secured to the backing by means of stone dowels 10 x 5 x 2.5 cm as per shape indicated in drawing and the adjoining stone secured to each other by means of gun metal clamps or copper pins of the specified size. Minimum one clamp/stone dowel shall be used to secure one slab to the backing.

7.5.4.3 Clamps may be attached to its sides or top and bottom or sides, top and bottom. The minimum number of clamps required for fixing unit to the wall are as in drawing. The actual number of clamps and their sections, however, shall be as per requirements of design to carry the loads.

7.5.4.4 Where clamps are used to hold the unit in position only, the facings shall be provided with a continuous support on which the stones rest at the ground level and other storey levels, the support being in the form of projection from or recess into the concrete floor slab, or a beam between the columns or a metal angle attached to the floor slab or beams. These supports shall preferably be at vertical intervals not more than 3.5 m apart and also over the heads of all openings. Such supports shall also be provided where there is transition from thin facings below to thick facings above.

7.5.4.5 Alternatively clamps may be used to hold the units in position and in addition to support the units thus transferring the weight of the units to the backing. Such clamp should be properly designed as IS: 4101 (Part 1)

7.5.4.6 The clamps may be of gun metal or copper alloyed with zinc, tin, nickel, lead and/or stainless steel.

7.5.4.7 The pins, clamps and dowels shall be laid in cement mortar 1:2 (1 cement: 2 fine sand) and their samples got approved by the Engineer In-Charge and kept at site.

7.5.4.8 The walls shall be carried up truly plumb. All courses shall be laid truly horizontal and all vertical joints truly vertical. The stone shall break joints on the face for at least half the height of the course, unless otherwise shown in the drawings. The stone shall be laid in regular courses not less than 20cm height and all the stones shall be of the same height unless otherwise specified. No stone shall be less in length than one and half times its height unless otherwise specified.

7.5.4.9 As far as possible the backing shall be carried up simultaneously with the face work. In case of reinforced cement concrete backing, the lining shall be secured to the backing after it has set and got cured. The clamps shall be fixed in concrete at the required positions, while laying.

7.5.5 JOINTS

The joints shall be done with composite cement lime mortar 1:1:6 (1 cement: 1 lime putty: 6 fine sand) or as specified. All joints shall be full of mortar. Special care shall be taken to see that the groundings for veneer work are full of mortar. If any hollow groundings are detected by tapping the face stones, these shall be taken out and relaid. The thickness of joints shall be as small as possible, not exceeding 5mm. For a close but jointed facing the thickness shall not exceed 1.5 mm. The face joints shall be uniform throughout.

7.5.5.1 Where joint filler or compound is to be used, the joints shall be raked out to a depth of at least 25 mm after the mortar in the joints has set sufficiently and the filler or compound applied. The joints may be subsequently finished with a mortar suited to the appearance of the work. It is preferable to use joint sealing compound where the facing are exposed to heavy rainfall and winds and their selections would depend upon local experience and availability of joint sealing compounds. In their absence only masonry mortar 1:1:6 (1 cement 1 lime putty: 6 sand) which are proved to be successful from local exposure conditions shall be used.

7.5.6 OTHER DETAILS

Specifications for pointing, curing, protections and scaffolding shall be as specified under 7.4.

7.6 SHELVES, COPING, PLAIN, CORNICES, STRING COURSES ETC.

7.6.1 STONE: Stone shall be of uniform colour and texture and of the kind as stipulated.

7.6.2.1 DRESSING

The exposed faces and sides of shelves shall be chisel dressed such that the dressed surface shall not have more than 3mm from a straight edge placed on it. All visible angles and edges shall be free from chippings. The surfaces to be buried in the masonry shall be rough dressed.

7.6.2.2 LAYING

These shall be laid in mortar of specified mix and fixed as shown in drawing or as directed by the Engineer-in-Charge.

7.6.2.3 Other Details

Specifications for pointing, curing, protections and scaffolding shall be as specified under 7.4.

7.6.3 LATERITE STONE MASONRY

7.6.3.1 DRESSING

Laterite stones shall be hammer dressed into rectangular blocks so that all faces are free from waviness and unevenness, and the edges are true and square. The least thickness/breadth shall be not less than height. The length shall generally be equal to twice the breadth, unless otherwise specified.

7.6.3.2 LAYING

The dressed stones shall be laid in regular courses of not less than 15cm height. All courses in the masonry shall be of the same height unless otherwise directed. The stones shall be laid in alternate header stretcher fashion, alternative courses of header and stretchers or in any other suitable fashion as directed. The vertical joints shall break by at least 65mm. No specific corner stones are necessary. Quoin may be provided, where so indicated.

7.6.3.3 JOINTS

All bed joints shall be truly level and side joints truly vertical the thickness of joints shall not exceed 15mm. Each stone shall be carefully laid in place with joints completely filled with mortar. On faces, where no plastering or pointing is required to be done, the joints shall be struck flush as the work proceeds. In other cases, joints shall be raked square to a minimum depth of 15mm by a racking tool during the progress of work while the mortar is still green.

7.6.3.4 SCAFFOLDING, CURING AND PROTECTION

Same as in para 7.4.

7.7 PRECAST CONCRETE STONE BLOCKS MASONRY

7.7.0 TERMINOLOGY

For the purpose of this standard, the following definition shall apply:

Block Density – The density calculated by dividing the mass of a block by- the overall volume including holes or cavities.

Stone Spalls – Broken stone pieces of varying sizes obtained by breaking the natural river boulders or quarry stones.

Concrete Stone Masonry Block – A precast cement solid block having stone splaes in it (25 to 30 percent of block volume) and cement concrete with dense stone aggregate and sand. It is 100% solid.

Stone Face Exposed Block – A concrete stone masonry block where the stone spalls are exposed at one of its face. The face, when forms the exposed wall face, the wall gets the texture of stone surface exposed.

7.7.1 DIMENSIONS AND TOLERANCES

Concrete stone masonry block is a solid block and shall be referred to by its nominal dimensions the term 'normal' means that the dimensions includes the thickness of the mortar joint. Actual dimensions shall be 10mm short of the nominal dimensions.

The nominal dimensions of concrete stone masonry block shall be as follows:

Length 300 mm

Height 150 mm and
Width 100, 150 and 200 mm

In addition, block shall be manufactured in -one-third, half, two-third and three quarters of its full length. The nominal dimensions of the units are so designed that taking account of the thickness of mortar joints, they will produce wall lengths and heights which will conform to the principles of modular coordination.

Blocks or other nominal dimensions may also be made if so directed by the Engineer In-Charge

7.7.2 For accommodation vertical, reinforcement required in earthquake resistant construction, special block of half width and with semi-circular recess in it shall be used. These dimensions are suitable for 200 mm thick wall. Similar blocks shall be made for walls of thickness greater than 200 mm.

7.7.3 The maximum variation in the length of the units shall not be more than + 5mm and maximum variation in height and width of units more than + 3 mm.

7.7.4 Subject to the tolerance specified in 7.7.3 the faces of blocks shall be flat and rectangular, opposite faces shall be parallel, and all arises shall be square. The bedding surfaces shall be at right angles to the faces of the blocks.

7.7.5 Blocks with special faces Blocks with special faces shall be manufactured and supplied as specified in the item of agreement.

7.7.6 CLASSIFICATION

Concrete stone masonry blocks shall be classified according to their average compressive strength as given in Table 2.

7.7.7 MATERIALS

7.7.7.1 Cement: Cement complying with any of the following Indian Standards may be used at the discretion of the Engineer-in-Charge IS: 269, 455, 1489, 6909, 8041, and 8043.

7.7.7.2 When cement conforming to IS: 269 is used, replacement of cement by fly ash conforming to IS: 3812 may be permitted up to a limit of 20%. However, it shall be ensured that blending of fly ash with cement is as intimate as possible, at achieve maximum uniformity.

7.7.7.3 STONE SPACES: The stone spalls shall be of size ranging from 50 to 250mm in dimension. The stone spalls shall be hard, sound, round in shape, durable, free from decay and weathering. These shall not be flaky. The Spalls shall have rough surface for better bond with cement concrete. Good quality stone such as granite, sand stone and basalt shall be used. Slate shale or any other soft and flaky stone shall not be used. The spalls shall be obtained from approved quarry or by breaking river boulder. Larger size shall be broken into the required sizes and, shall be stacked into two categories:

100mm and above and Below 100 mm.

7.7.7.4 AGGREGATES: The aggregates used in the manufacture of block shall be clean and free from all deleterious matter, and shall conform to the requirements of IS: 383.

Maximum size of the coarse aggregate shall be 10 mm. Sand used in the manufacture of blocks shall be well graded, clean and free from deleterious mater, and shall conform to the requirements of IS:383. Besides it shall have fine particles 15 to 20% passing 300 micron I.S. Sieve and 5 to 15% passing 150 micron I.S Sieve.

It is recommended that the fineness modules of the combined aggregate shall be between 3.6 to 4.

7.7.7.5 Fly ash conforming to IS: 3812 may be used for part replacement of fine aggregate upto a limit of 20%.

7.7.8 MANUFACTURE

Blocks may be manufactured either at construction site or in factory on a central casting plate form using steel moulds with or without surface vibration of compaction of cement concrete.

7.7.8.1 Mould: Moulds shall be fabricated using mild steel plates and mild steel angles for stiffening the plates. The mould shall be either fixed type (bolt with four side walls fixed at corners, and top and bottom open) or split type.

Split type may be either individual or gang mould. Where the compaction of the concrete is done manually, the mould may be either fixed type or split type. When the compaction of the blocks is done with surface vibrator, the mould shall be only split type (individual or gang mould).

7.7.9 MIX

7.7.9.1 The cement concrete mix- for concrete stone masonry blocks shall not be richer than one part by volume of cement to 9 parts by volume of combined fine and coarse aggregates, and shall not be leaner than one part by volume of cement to 13 parts by volume of combined fine and coarse aggregates.

7.7.9.2 In case of blocks where compaction is done manually, concrete mix of medium consistency (10 – 12 mm slump) shall be used in order to enable proper compaction and demoulding. The consistency of the mix should be such that it may cohere when compressed in the hand without free water being visible.

7.7.9.3 In case of blocks where compaction is done by external vibrator, concrete mix of very low consistency (zero slump) shall be used in order to vibrate and compact the concrete under pressure.

7.7.9.4 MIXING: Concrete shall normally be mixed in a mechanical mixer unless otherwise permitted by Engineer-in-Charge. In case of hand mixing 10% extra cement shall be used without any extra payment.

Mixing shall be continued until there is a uniform distribution of the materials, and the mass is uniform in colour and consistency.

7.7.10 PLACING AND COMPACTION

Depending upon the size of the stone spalls, these shall be used either in one layer or in two layers- When used in two layers, large size spalls of 100 mm and above shall be placed in the bottom and concrete poured all around and at top, and shall be tamped manually, Second layer of stone spalls of size 50mm and above shall be placed over the first layer, and again concrete is poured all around upto 20 to 30mm above the top level of mould.

7.7.10.1 Depending upon the size of block the average volume of stone spalls used should generally between 25 to 30%. However, in no block, it shall be less than 20% of the volume of block.

7.7.10.2 Each stone spall shall have a minimum space of about 15 to 20mm around it. For blocks with exposed stone texture, the stone spalls shall touch the surface of the mould.

7.7.10.3 Blocks may be compacted manually as well as mechanically. In case of manual compaction the concrete laid after the first layer of stone spalls shall be tamped with mason's toll and again it shall be tamped with suitable tampers and compacted from top and finally struck off level with trowel.

In case of mechanical compaction, the mould shall be filled up to overflow, vibrated and mechanically tamped using external vibrator and struck off level.

7.7.10.4 Demoulding shall be done 5 to 10 minutes after compaction. In case of fixed type mould it shall be pulled up with side handles while pressing down the block with the plate at top with thumb. In case split type mould, the sides shall be removed first and the partition plates (gang mould) shall be pulled up subsequently.

7.7.10.5 After demoulding, the blocks shall be protected until they are sufficiently hardened to permit handling without damage.

7.7.11 'CURING

The blocks hardened shall than be cured in a curing water tank or in a curing yard and shall be kept continuously moist for at least 14 days.

7.7.11.1 DRYING: After curing, the blocks shall be dried for a period of two to four weeks depending upon weather before being used on the work. The blocks shall be allowed to complete their initial shrinkage before they; are laid in a wall.

7.7.12 PHYSICAL REQUIREMENT

7.7.12.1 General: All blocks shall be sound and free from cracks or other defects which may interfere with proper placing of the unit or impair the strength or performance of the construction. Expect that not more than 5% of a consignment contains slight cracks or small chipping.

7.7.12.3 DIMENSIONS: The overall dimensions of the blocks when measured as given in Appendix A of IS: 12440 shall be in accordance with 7.7.1 subject to the tolerance mentioned therein.

7.7.12.4 COMPRESSIVE STRENGTH: The minimum compressive strength at 28 days, being the average of eight blocks and the minimum compressive strength at 28 days of individual blocks, when tested in the manner described in Appendix B, of IS:12440, shall be as prescribed in Table 2

**TABLE 2
COMPRESSIVE STRENGTH OF CONCRETE STONE MASONRY BLOCKS**

Designation	Minimum average compressive strength on blocks N/mm'	Minimum strength of individual blocks N/mm'
5	5.0	3.5
6	6.0	4.2
7	7.0	5.0
9	9.0	6.3
10	10.0	7.5

For 100mm wide blocks (for 100mm thick walls), the minimum strength may be 3.5 N/mm².

7.7.12.5 WATER ABSORPTION: The water absorption being the average of three blocks, when determined in the manner prescribed in Appendix C, of IS: 12440 shall be not more than 6% by mass.

7.7.13 TESTS

7.7.13.1 Tests as described in Appendix IS: 12440 shall be conducted on samples of blocks selected according to the sampling procedure given in 7.7.13.2 to ensure conformity with the physical requirements laid down in 7.7.12.

7.7.13.2 A sample of 15 blocks shall be taken from a lot of 5000 or part thereof manufactured under similar conditions of the same size and batch.

7.7.14 CRITERIA FOR CONFORMITY

7.7.14.1 The lot shall be considered as conforming to the requirements of the specification if the conditions mentioned in 7.7.14.1, 7.7.14.3 are satisfied.

7.7.14.2 Number of blocks with dimension outside the tolerance limit and/or with visual defects, among those inspected shall not be more than two.

7.7.14.3 For compressive strength, the mean value determined shall be greater than or equal to the minimum limit specified in 7.7.12.4.

7.7.14.4 For water absorption the mean value determined shall be equal to or less than maximum limit specified in 7.7.12.5.

7.7.15 Laying: The laying of precast concrete stone block masonry shall be as per para 7.8.8.

7.8 HOLLOW AND SOLID CONCRETE BLOCK MASONRY

7.8.1 HOLLOW AND SOLID CONCRETE BLOCKS

Shall conform to the requirements of IS: 2185. Specification for hollow and solid concrete blocks except with regard to the mix cement concrete and sizes of aggregates which shall be as indicated. Hollow blocks shall be sound, free from cracks, broken edges, honey combing and other defects that would interfere with the proper placing of block or impair the strength of performance of construction.

7.8.2 DIMENSIONS AND TOLERANCES

7.8.2.1 Concrete masonry building units shall be made in sizes and shapes to fit different construction needs. They include stretcher, corner, double corner or pier, jamb, header, bull nose, and partition block and concrete floor units.

7.8.2.2. Concrete Block-hollow (open or closed cavity) or solid shall be referred by its nominal dimensions. The nominal dimensions of concrete block shall be, as follows:

Length	400, 500 or 600 mm
Height	200 or 100 mm
Width	50, 75, 100, 150, 200, 250 or 300 mm.

In addition, block shall be manufactured in half lengths of 200, 250 or 300 mm to corresponding to full lengths.

The maximum variation in the length of the units shall be not more than + 5 mm and maximum variation in height and width of unit, not more than + 3 mm.

7.8.3 CLASSIFICATION

7.8.3.1 HOLLOW (OPEN AND CLOSED CAVITY) CONCRETE BLOCKS

The hollow (Open and closed cavity) concrete blocks shall conform to the following three grades:

- (a) Grade 'A' – These are used as load bearing units and shall have a minimum block density of 1500 kg/m³. These shall be manufactured for minimum
- (b) Average compressive strength of 3.5, 4.5, 5.5 and 7.0 N/mm² respectively at 28 days (See Table 3).
- (c) Grade - 'B' These are also used as load bearing units and shall have a block density less than 1500 kg/m³ but not less than 1000 kg/m³. These shall be manufactured for minimum average compressive strength of 2.0, 3.0, and 5.0 N/mm² respectively at 28 days (See Table 3).
- (d) Grade 'C' - These are used as non-load bearing units and shall have a block density less than 1500 kg/m³ but not less than 1000 kg/m³. These shall be manufactured for minimum average compressive strength of 1.5 N/mm² at 28 days (See Table 3).
- (e) Grade 'D' - The solid concrete blocks are used as load bearing units and shall have a block density not less than 1800 kg/m³. These shall be manufactured for minimum average compressive strength of 4.0 and 5.0 N/mm² respectively (See Table 3).

7.8.4 PHYSICAL REQUIREMENTS

7.8.4.1 **Compressive Strength:** The average crushing strength of eight blocks, when determined in accordance with IS: 2185 shall be not less than as specified in table given below:

**TABLE 3
PHYSICAL REQUIREMENTS**

Type	Grade	Density of Block kg/mm'	Minimum Average Compressive Strength of Units N/mM ²	Minimum strength of Individual units N/mm2
(1)	(2)	(3)	(4)	(5)
Hollow (open & closed cavity) load bearing unit	A(3.5)	Not less than 1500	3.5	2.8
	A(4.5)		4.5	3.6
	A(5.5)		5.5	4.4
	A(7.0)		7.0	5.6
	B(2.0)	Less than 1500 but not less than 1000	2.0	1.6
	B(3.0)		3.0	2.4
B(5.0)	5.0		4.0	
Hollow (open and closed cavity) non-load bearing units	C(1.5)	Less than 1500 but not less than 1000	1.5	1.2
Solid load Bearing units	D(5.0)	Not less than 1800	5.0	4.0
	D(4.0)		4.0	3.2

7.8.4.2 **DRYING SHRINKAGE:** The drying shrinkage of the blocks (average of three blocks), when unrestrained shall be determined in accordance with IS: 2185 (Shall not exceed) 0.1 per cent.

7.8.4.3 **MOISTURE MOVEMENT:** The moisture movement (average of three blocks), when determined in the manner described in IS: 2185 shall not exceed 0.09 per cent.

7.8.4.4 **WATER ABSORPTION:** The water absorption (average of three blocks), when determined in the manner described in IS: 2185 shall be not more than 10 per cent by mass.

7.8.4.5 Face shells and webs shall increase in thickness from the bottom to the top of the unit depending upon the core moulds used, the face shells and webs shall be flared and tapered or straight tapered, the former providing a wider surface for mortar. The thickness of the face shell and web shall be not less than the values given in Table below:

**TABLE 4
MINIMUM FACE SHELL AND WEB THICKNESS**

Nominal Block width	Face shell Thickness, Min.	Thickness of Web, Min.	Total Web thickness per Course in any 200 mm length of Walling Min.
(1)	(2)	(3)	(4)

100 or less	25	25	25
Over 100 to 150	25	25	30
Over 150 to 200	30	25	30
Over 200	35	30	38

7.8.4.6 The dimensions said above are subject to the tolerance specified in 7.8.2.2.

7.8.4.7. The face of Masonry units shall be flat and rectangular, opposite face shall be parallel, and all arises shall be square. The bedding surfaces shall be at right angles to the faces of the blocks.

7.8.4.8 Blocks with special faces shall be manufactured and supplied as directed by the Engineer-in-Charge.

7.8.5 CURING AND DRYING

The blocks shall be cured in an immersion tank or in a curing yard and shall be kept continuously moist for at least 14 days. When the blocks are cured in an immersion tank, the water of tank shall be changed at least once in every four days.

After curing, the blocks shall be dried in shade before being used on the work. They shall be stacked with voids horizontal to facilitate through passage of air. The blocks shall be allowed to complete their initial shrinkage before they are laid in wall.

7.8.6 CONSTRUCTION OF MASONRY

For single storeyed building, the hollows of blocks in foundation and basement masonry shall be filled up with sand and only the top foundation course shall be of solid blocks. But for two or more storeyed buildings, solid concrete blocks shall be used in foundation courses, plinth, and basement walls, unless otherwise indicated. If hollow blocks are used, their hollows shall be filled up with cement concrete 1:3:6 using 12.5mm nominal size aggregates.

7.8.7 WETTING OF BLOCKS

Blocks need not be wetted before or during laying in the walls. In case the climate condition so required the top and the sides of the blocks may only be slightly moistened so as to prevent absorption of water from the mortar and ensure the development of the required bond with the mortar.

7.8.8 LAYING

Blocks shall be laid in mortar, as indicated and thoroughly bedded in mortar, spread over the entire top surface of the previous course of blocks to a uniform layer-of not less than 10mm and not more than 12 mm in thickness.

All courses shall be laid truly horizontal and all vertical joints made truly vertical. Blocks shall break joints with those above and below for not less than quarter of their length. Precast half-length closers (and not cut from full size blocks) shall be used. For battered faces, bedding shall be at right angles to the face unless otherwise directed. Care shall be taken during construction to see that edges of blocks are not damaged.

7.8.9 PROVISIONS FOR DOOR AND WINDOW FRAMES

A course of solid concrete block masonry shall be provided under door and window openings (or a 10 cm thick precast concrete sill block under windows). The solid course shall extend for at least 20 cm beyond the opening on either side. For jambs of very large doors and windows either solid units used, or the hollows shall be filled in with concrete of mix 1:3:6 using 12.5 mm nominal size aggregate.

7.8.10 PROVISIONS FOR ROOF

The course immediately below the roof slab shall be built with solid blocks. The top of the roof course shall be finished smooth with a layer of cement and coarse sand mortar 1:3, 10mm thick and covered with a thick coat of white wash or crude oil, to ensure free movement of slab.

7.8.11 INTERSECTING WALLS

When two walls meet or intersect and the courses are to be laid up at the same time, a true masonry bond between

at least 50% of the units of the intersection is necessary. When such intersecting walls are laid up separately, pockets with 20mm maximum vertical spacing shall be left in the first wall laid. The corresponding course of the second wall shall be built into these pockets.

7.8.12 PIERS

The top course of block in the pier shall be built in solid blocks. Hollow concrete block shall not be used for isolated piers, unless their hollows are specified to be filled with cement concrete.

7.8.13 Where possible fixtures, fittings etc. shall be built into the masonry in cement and coarse sand mortar 1:3 while laying the blocks. Hold fasts shall be built into the joints of the masonry during the laying.

Holes, chases, sleeves, opening, etc. of the required size and shape shall be formed in the masonry with special blocks while laying, for fixing pipes, service lines, passage of water etc. After service lines pipes etc. are fixed, voids left, if any, shall be filled up with cement concrete 1:3:6 (1 cement 3 coarse sand: 6 stone aggregate 20 mm nominal size) and neatly finished.

7.8.14 FINISHES

Rendering shall not be done to the walls when walls are wet. Joints for plastering or pointing as specified shall be raked to a depth of 12 mm.

Joints on internal faces, unless otherwise indicated, shall be raked for plastering. If internal face of masonry are not to be plastered the joints shall be finished flush as the work proceeds or pointed flush where so indicated.

NOTES ON MASONRY WORKS: Only Coarse river sand shall be used in all masonry works.

Item Sr. No. 9

Providing and laying brick on edge soling 115mm thick using bricks of CLASS DESIGNATION 3.5 (Minimum Average Compressive strength not less than 3.50N/sq. mm) laid in proper grade and camber including filling sand in joints preparing the base, providing two bricks thick vertical brick kerbing at edges etc; complete all as per specifications, at all level at all location as directed by Engineer In Charge.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – D.

2.0 Mode of measurement and Payment

The length and the height shall be measured correct to a cm. Area shall be calculated in square meters correct to two place of decimal.

ITEM Sr. No. 7

Providing and constructing RANDOM RUBBLE MASONRY in cement mortar 1:6 using hard granite stones obtained from approved quarry with RCC bond stones at every 0.50 sqm of wall surface in cement mortar in mixes stipulated below without pinning on face, but including raking out joints and pointing flush in same mortar including curing, etc; complete as per specifications in SUPER STRUCTURES FOR ALL HEIGHTS /ALL LEVELS/ALL FLOORS on EXISTING WALLS. (Rate includes cost of bond stones wherever provided). (Mix ratio specified is for cement: coarse sand).

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – D.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section D. The rate shall be for a unit of one cubic meter.

SECTION - E REINFORCED CEMENT CONCRETE WORK

5.0 GENERAL

Reinforced cement concrete work may be cast-in-situ or Precast as may be directed by Engineer In-charge according to the nature of the work. Reinforced cement concrete work shall comprise of the following which may be paid separately or collectively as per the description of the item of work

- (a) Form work (Centring and Shuttering)
- (b) Reinforcement
- (c) Concreting 1 (Cast-in-situ 2) Precast

5.1 MATERIALS

5.1.1 Water, cement, fine and coarse aggregate shall be as specified under respective clauses of Chapter 03-mortars and Chapter 04-concrete work as applicable. Portland pozzolona Cement (Fly ash based) and Portland Pozzolona cement (Calcined clay based) shall not be used for RCC work.

5.1.2 STEEL FOR REINFORCEMENT

5.1.2.1 The steel used for reinforcement shall be of any of the following types:

- (a) Mild steel and medium tensile bars conforming to IS:432 (Part 1)
- (b) High strength deformed steel bars conforming to IS:1786
- (c) Hard drawn steel wire fabric conforming to IS:1566
- (d) Structural steel conforming to Grade A of IS:2062
- (e) Thermo-mechanically treated bars (TMT Bars).

5.1.2.2 TYPES AND GRADES: Reinforcement supplied in accordance with this standard shall be classified into the following types:

- (a) Mild steel bars:** It shall be supplied in the following two grades
 - (i) Mild steel bars grade I designated as Fe 410-S
 - (ii) Mild steel bars grade II designated as FE 410-0
- (b) Medium tensile steel bars,** grade 11 designated as Fe 540-W-HT

5.1.2.3 Mild steel and Medium tensile steel: Physical requirement are given in the following Table 1.

TABLE 1

S1. No.	Type and nominal size of bar	Ultimate tensile Stress N/mm ² minimum	Yield stress N/mM2	Elongation percent minimum
1.	Mild steel grade I For bars upto and including 20mm.	410	250	23
	For bars over 20 mm upto and including 50mm	410	250	23
2.	Mild steel grade 11 For bars upto and including 20mm	370	225	23
	For bars over 20mm, upto and	370	215	23

	including 50mm			
3.	Medium tensile steel			
	For bars upto & including 16mm	540	350	20
	For bars over 16mm, upto and including 32mm	540	340	20
	For bars over 32mm, upto and including 50mm	510	330	20

Elongation percent on gauge length 5.65 SO where 'so' is the cross sectional areas of the test piece.

NOTE:

- Grade (II) Mild steel bars are not recommended for the use in structures located in earthquake zone subjected to severe damage and for structures subjected to dynamic loading (other than wind loading) such as railway and highway bridges.
- Welding of reinforcement bars covered in this specification shall be done in accordance with the requirement of IS:2751.

Nominal mass4eight: The tolerance on mass/weight for round and square bars shall be the percentage given in Table 2 of the mass/weight calculated on the basis that the masses of the bar/wire of nominal diameter and of density 0.785 kg/cm³.

**TABLE 2
TOLERANCE ON NOMINAL MASS**

Nominal size in mm		Tolerance on the nominal mass Percent		
		Batch	Individual sample +	Individual Sample for coil (-x-)
(a)	Upto and including 10	± 7	± 8	± 8
(b)	Over 10, upto and including 16	± 5	- 6	± 6
(c)	Over 16	± 3	- 4	± 4

"+" For individual sample plus tolerance is not specified

"x" For coil batch tolerance is not applicable

Tolerance shall be determined in accordance with method given in IS:1786. Tests – Following type of lab test shall be carried out

- | | | |
|------------------|---|-----------------------------------|
| (1) Tensile Test | : | This shall be done as per IS:1608 |
| (2) BendTest | : | This shall be done as per IS:1599 |
| (3) Re Test | : | This shall be done as per IS:1786 |
| (4) Rebend Test | : | This shall be done as per IS:1786 |

Should any one of the test pieces first selected fail to pass any of the tests specified above, two further samples shall be selected for testing in respect of each failure. Should the test pieces from both these additional samples pass, the materials represented by the test samples shall be deemed to comply with the requirement of the particular test. Should the test piece from either of these additional samples fail the material represented by the test samples shall be considered as not having complied with standard.

5.1.2.4 High strength deformed bars & wires shall conform to IS: 1786. The physical properties for all piece of steel bars are mentioned below in Table 3.

TABLE 3

Property	Grade		
	Fe 415	Fe 500D	Fe 550

reinforcement in any way. Labour shall not be allowed to walk over the reinforcement.

5.4.3.3 In case of columns and walls, it is desirable to place concrete without construction joint and progress of concreting in the vertical direction, shall be restricted to one meter per hour.

5.4.3.4 The concrete shall be deposited in its final position in a manner to preclude segregation of ingredients. In deep trenches and footings concrete shall be placed through chutes or as directed by the Engineer-In-Charge. In case of columns and walls, the shuttering shall be so adjusted that vertical drop of concrete is not more than 1.5 meters at a time.

5.4.3.5 During cold weather concreting shall not be done when temperature falls below 4.5.C. The concrete placed shall be protected against frost by suitable covering. Concrete damaged by frost shall be removed and work redone.

5.4.3.6 During hot weather precaution shall be taken to see that the temperature of the wet concrete does not exceed 38°C. No concrete shall be laid within half an hour of closing time of the day unless permitted by the EIC.

5.4.3.7 It is necessary that the time between mixing and placing of concrete shall not exceed 30 minutes so that the initial setting process is not interfered with.

5.4.4 **COMPACTION**

It shall be as specified in pars 4.2.7 of concrete work of this specification booklet.

5.4.4.1 Concrete shall be compacted into dense mass immediately after placing by means of mechanical vibrators designed for continuous operations. The EIC may however relax this conditions at his discretion for certain items depending on the thickness of the members and feasibility of vibrating the same and permit hand compact. Hand compacting shall be done with the help of tamping rods so that concrete is thoroughly compacted and completely worked around the reinforcement, embedded fixtures and into corners of form. The layers of the concrete shall be so placed that the bottom layer does not finally set before the top layer is placed. The vibrator shall maintain the whole of concrete under treatment in an adequate state of agitation, such that deaeration and effective compaction is attained at a rate commensurate with the supply of concrete from the mixers. The vibrating shall continue during the whole period occupied by placing of concrete; the vibrators being adjusted so that the center of vibrators approximates the center of the mass being compacted at the time of placing.

5.4.4.2 Concrete shall be judged to be properly compacted when the mortar fills the space between D the coarse aggregate and begins to cream up to form an even surface. When this condition has been attained, the vibrator shall be stopped in case of vibrating tables and external vibrators. Needle vibrators shall be withdrawn slowly so as to prevent formation of those pockets in case of internal vibrators. In case of both internal and external vibrators are used the internal vibrators shall be first withdrawn slowly after which the external vibrator shall be stopped so that no loose pocket is left in the body of the concrete. The specific instructions of the makers of the particular type of vibrator use shall be strictly complied with. Shaking of reinforcement for the purpose of compaction should be avoided. Compaction shall be completed before the initial setting starts i.e., within 30 minutes of addition of water to the dry mixture.

5.4.5 CONSTRUCTION JOINTS

5.4.5.1 Concreting shall be carried out continuously up to the construction joints, the position and details of which shall be as shown in structural drawing or as directed by Engineer-in-Charge. Number of such joints shall be kept to minimum. The joints shall be kept at places where the shear force is the minimum. These shall be straight and shall be -at right angles to the direction of the main reinforcement. Construction joints should comply with IS: 11817.

5.4.5.2 In case of columns the joints shall be horizontal and 10 to 15 cm below the bottom of the beam running into the column head. The portion of the column between the stepping off level and the top of the slab

shall be concreted with the beam.

5.4.5.3 When stopping, the concrete on a vertical plane in slabs and beams approved stop board shall be placed with necessary slots for reinforcement bars or any other obstructions pass the bars freely without bending. The construction joints shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop-board. Inclined or feather joints shall not be permitted. Any concrete flowing through the joints of stop-board shall be removed soon after the initial set. When concrete is stopped on a horizontal plane, the surface shall be roughened and cleaned after the initial set.

5.4.5.4 When the work has to be resumed, the joint shall be thoroughly cleaned with wire brush and loose particles removed. A coat of neat cement slurry at the rate of 2.75 kg of cement per square meter shall then be applied on the roughened surface before fresh concrete is laid.

5.4.6 EXPANSION JOINTS

Expansion joints shall be as per the instruction of Engineer-In-Charge or as mentioned in the drawing. However it is recommended that structures exceeding 45 m in length shall be divided by one or more expansion joints. Unless otherwise specified the filling of these joints with bitumen filler, bitumen felt or any such material and provision of copper plate etc. shall be paid for separately in running meter. The measurement shall be taken up to two places of decimal stating the depth and width of joint.

5.4.7 CURING

After the concrete has begun to harden i.e., about 1 to 2 hours after laying, it shall be protected from quick drying by covering with moist gunny bags, sand, canvass hessian or any other material approved by the Engineer-in-Charge. After 24 hours of laying of concrete the surface shall be cured by ponding with water for a minimum period of 7 days from the date of placing of concrete in case of OPC and least 10 days where mineral admixtures or blended cements are used. The period of curing shall not be less than 10 days for concrete exposed to dry and hot weather condition.

5.4.8 FINISHING

5.4.8.1 In case of roof slabs the top surface shall be finished even and smooth with wooden trowel before the concrete begins set.

5.4.8.2 Immediately on removal of forms, the R.C.0 works shall be -examined by the Engineer-in-Charge before any defects are made good.

- a) The work that has sagged or contains honey combing to an extent detrimental to structural safety or architectural concept shall be rejected on visual inspection test.
- b) Surface defects of a minor nature may be accepted. On acceptance of such a work by the Engineer-in-Charge, the same shall be rectified as follows:
 1. Surface defects which require repair when forms are removed, usually consists of bulges due to movement of forms, ridges at form joints, honey combed areas, damage resulting from the stripping of forms and bolt holes, bulges and ridges are removed by careful chipping or tooling and the surface is then rubbed with a grinding stone. Honey-combed and other defective areas must be chipped out, the edges being cut as straight as possible and perpendicular to the surface, or preferably slightly undercut to provide a key at the edge of the patch.
 2. Shallow patches are first treated with a coat of thin grout composed of one part of cement and one part of fine sand and then filled with mortar similar to that used in the concrete. The mortar is placed in layers not more than 10mm thick and each layer is given a scratch finish to secure bond with the succeeding layer. The last layer is finished to match the surrounding concrete by floating, rubbing or tooling on formed surfaces by pressing the form material against the patch while the mortar is still plastic.,
 3. Large and deep patches require filling up with concrete held in place by forms. Such patches are reinforced and carefully dowelled to the hardened concrete.
 4. Holes left by bolts are filled with mortar carefully packed into places in small amounts. The mortar is mixed as dry as possible, with just enough water so that it will be tightly compacted when forced into place.
 5. Tiered holes extending right through the concrete may be filled with mortar with a pressure gun similar to the gun used for greasing motor cars.
 6. Normally, patches appear darker than the surrounding concrete, possibly owing to the presence

on their surface of less cement laitance. Where uniform surface colour is important this defect shall be remedied by adding 10 to 20 percent of white Portland cement to patching mortar, the exact quantity being determined by trial.

7. The same amount of care to cure the material in the patches should be taken as with the whole structure. Curing must be started as soon as possible, after the patch is finished, to prevent early drying. Damp hessian may be used but in some locations it may be difficult to hold it in place. A membrane curing compound in these cases will be most convenient.
 - a) The exposed surface of R.C.C. work shall be plastered with cement mortar 1:3 (1 cement: 3 fine sand) of thickness not exceeding 6 mm to give smooth and even surface true to line and form any R.C.C. surface which remains permanently exposed to view in the completed structure shall be considered exposed surface for the purpose of this specification.
 - b) Where such exposed surface exceeding 0.5 sq.m. in each location is not plastered with cement mortar 1:3 (1 cement: 3 fine sand) 6mm thick, necessary deduction shall be made for plaster not done.
 - c) The surface which is to receive plaster or where it is to be joined with brick masonry wall, shall be properly roughened immediately after the shuttering is removed, taking care to remove the laitance completely without disturbing the concrete. The roughening shall be done by hacking. Before the surface is plastered, it shall be cleaned and wetted so as to give bond between concrete and plaster.
 - d) RCC shall be done carefully so that the thickness of plaster required for finishing the surface is not more than 6 mm.
 - e) The surface of RCC slab on which the cement concrete or mosaic floor is to be laid shall be roughened with brushes while the concrete is green. This shall be done without disturbing concrete.

5.4.9 STRENGTH OF CONCRETE

The compressive strength on work tests for different nominal mix on volume basis shall be as given in table below:

TABLE

Concrete Mix (Normal Mix on Volume Basis)	Compressive Strength in Kg/Sq.cm.	
	7 days	28 days
1:1:2	210	315
1:1 1/2 :3	175	265
1:2:4	140	210

5.4.10 TESTING OF CONCRETE

5.4.10 Regular mandatory tests on the workability of fresh concrete shall be done to ensure to achieve the specified compressive strength of concrete. These will be of two types:

- (a) Mandatory Laboratory Test
- (b) Mandatory Field Test.

Result of mandatory field test will prevail over mandatory laboratory test.

5.4.10.1 WORK TEST

Mandatory lab test shall be carried out as prescribed in relevant IS.

5.4.10.2 ADDITIONAL TEST

Additional test if required shall also be carried out as directed by Engineer-in-Charge.

5.4.10.3 SLUMP TEST

Slump Test shall be carried out as prescribed under Chapter 4.

5.4.10.4 VISUAL INSPECTION TEST

The concrete shall be inspected after removal of form work as described under para 5.4.7.2. The question of carrying out mandatory test or other tests prescribed will arise only after satisfactory report of visual inspection.

The concrete is liable for rejection if

- (i) It is porous or honey combed
- (ii) Its placing has been interrupted without providing proper construction joint.
- (iii) The reinforcement has been displaced beyond tolerance specified or construction tolerances have not been met.

However the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-in-Charge at the risk and cost of contractor.

5.4.11 STANDARD OF ACCEPTANCE – for nominal mix

5.4.11.1 MANDATORY LAB TEST

For concrete sampled and tested following requirement shall apply.

5.4.11.2 Out of six samples cubes, three cubes shall be tested at 7 days and remaining three cubes at 28 days.

5.4.11.3 7 DAYS TESTS

Sampling: The average of the strength of three specimen shall be accepted as the compressive strength of the concrete provided the variation in strength of individual specimen is not more than + 15% of the average. Difference between the maximum and minimum strength should not exceed 30% of the average strength of three specimens. If the difference between maximum and minimum strength exceeds 30% of the average strength, then **28 days'** test shall have to be carried out.

Strength: If the actual average strength of sample accepted in para 'sampling' above is equal to or higher than specified strength up to 15% then strength of the concrete shall be considered in order. In case the actual average strength of sample accepted in the above para is lower than the specified or higher by more than 15% then **28 days'** test shall have to be carried out to determine the compressive strength of concrete cubes.

5.4.11.4 28 DAYS' TEST

- (a) The average of the strength of three specimen be accepted as the compressive strength of the concrete provided the strength of any individual cube shall neither be less than 70% nor higher than 130% of the specified strength.
- (b) If the actual average strength of accepted sample exceeds specified strength by more than **30%** the Engineer-in-Charge, if he so desires, may further investigate the matter. However the strength of any individual cube exceeds more than 30% of specified strength, it will be restricted 130% only for computation of strength.
- (c) If the actual average strength of accepted sample is equal to or higher than specified strength up to 30% then strength of the concrete shall be considered in order and the concrete shall be accepted at full rates.
- (d) If the actual average strength of accepted sample is less than 70% of the specified strength, the concrete may be accepted at reduced rate at discretion of Engineer-in-Charge (See para 5.4.13.2).
- (e) If the actual average strength of accepted sample is less than 70% of specified strength the Engineer-in-Charge shall reject the defective portion of work represented by sample and nothing shall be paid for the rejected work. Remedial measures necessary to retain the structure shall be taken at the risk and cost of contractor. If, however, the Engineer-In-Charge so desires he may order additional tests to be carried out to ascertain if the structure can be retained. All the charges in connection with these additional tests shall be borne by the contractor.

5.11.4.1 Acceptance Criteria of Field Test (Additional Test – Not Mandatory). These shall be done if found necessary at the discretion of Engineer-in-Charge.

- (A) **Preparation of Standard Test Cubes for Calibration of Rebound Hammer at Site.**
 - (a) In the beginning the standard test cubes of the specified mix shall be prepared by field units before undertaking any concrete work in each project.

- (b) At least 18 standard cubes necessary for formation of one specimen of specified mix, shall be cast by site staff well in advance. From these 18 cubes any 3 cubes may be selected at random to be tested for crushing strength of 7 days. The crushing strength obtained should satisfy the specified strength for the mix as per specification or agreement. If the strength is satisfactory then the remaining cubes will form the standards samples for calibration of rebound hammer. In case of failure, the site staff should totally reject the samples and remove them also and then make another set of samples by fresh mixing or alternatively, out of the remaining 15 cubes, 3 cubes will be tested on 28 days. If the 28 days tests are found satisfactory then remaining 12 cubes will form the standard sample for calibration at 28 days' strength otherwise all samples shall be rejected and whole procedure repeated to form a fresh specimen. All the results shall be recorded in register.
- (c) No concreting will be allowed unless the standard specimen cubes are obtained. The criteria for acceptance and calibration of hammer will be 28 days' strength. The 7 days' strength is only to facilitate the work to start.
- (d) No work (for the concrete cast between 8th and 28th day) shall be allowed to be paid unless 28 days' cube strength is obtained. For the concrete cast between 8th and 28th day, the decision to make the payment may be taken by the Engineer-in-Charge on the basis of existing criteria and all such payments are only advance payment subject to achievement of 28 day's prescribed strength. Concrete work will be rejected if 28 days' strength falls short as per acceptance criteria and any advance payment made on the same shall be recovered. No further work will be allowed till the acceptable standard cubes are obtained.
- (e) **Frequency:** It will be once in each quarter or as per the direction and discretion of Engineer-in-Charge. Whenever the acceptance criteria is changed or concrete mix or type of cement is changed or Engineer-In-Charge feels it necessary for recorded reasons with the approval of the authority according technical sanction, fresh specimen shall be prepared.

(B) CALIBRATION OF HAMMER

- (a) Simultaneously, same three cubes to be tested on 28 days as referred in para A. (b) above shall be used to correlate the compressive strength of their concrete with rebound number as per procedure described in para 5.2 of the IS 13311 (para 2) 'Indian Standard for non-destructive testing of concrete method of test by rebound hammer which is given below in para B (b). The average of values of the rebound number (minimum readings) obtained in respect of same three cubes passing on 28 days' work test shall form the datum reference for remaining cubes for the strength of cubes.
- (b) The concrete cubes specimens are held in a compression testing machine under a fixed load, measurements of rebound hammer taken and then compressive strength determined as per IS 516. The fixed load required is of the order of 7N/mm² when the impact energy of the hammer is about 2.2NM.
If the specimen are wet cured, they should be removed from wet storage & kept in the laboratory atmosphere for about 24 hours before testing.

Only the vertical faces of the cubes'as cast should be tested for rebound number. At least nine readings should be taken on each of the three vertical faces accessible in the compression testing machine when using rebound hammers. The points of impact on the specimen must not be nearer than 20mm from the edge & should not be less than 20 mm from each other. The same points must not be impacted more than once.
- (c) The rebound number of hammer will be determined on each of the remaining (18-3-3=12) cubes. Whenever the rebound number of hammer of any individual cube varies by more than +25% from the datum readings referred to in para B(a) above, that cube will be excluded and will not be considered for standard specimen cubes for calibration. It must be

ensured that at least 8 cubes out of 12 that is 66.67% are within the permissible range of variation of rebound number i.e., +25% or otherwise whole procedure shall have to be repeated and fresh specimen prepared.

These 8 cubes will form one standard sample in the beginning before commencement of work and shall be kept carefully for the visiting officers who will calibrate their hammers on these cubes.

- (d) This calibration will be done by field staff with their hammer and then chart of calibration giving the details of the average readings, date & month of casting, mix of the concrete etc. shall be prepared and signed by Engineer-in-Charge and will be duly preserved for future reference as and when required.

(C) PRESERVATION OF CUBES AT SITE

Standard sample cubes cast shall be carefully preserved at site under the safe custody of site Engineer or his representative for making them available together with the charts, to the officers of inspecting or any other senior departmental officer, during their inspection of the work. They will calibrate their hammer on these cubes if required.

(D) TESTING AT SITE

(D-1) Testing Equipments

- (D-2)** Testing will be done generally by non-destructive methods like rebound hammer etc. It is desirable that each major work site will purchase rebound hammers and keep them in working order at work site. The testing will be done only by hammers which are duly calibrated.

- (D-3)** The relative strength of actual field work will be tested with reference to strength of these standard cubes and calibration charts of a hammer for determining the rebound number on the field work. The hammer will be used as per manufacturer's guideline at various locations chosen at random. The number of location/reading on each wall, beam column etc. shall not be less than 12. All the readings should be within the +25% range of values prescribed in calibration chart normally. However, reading indicating good strength will be when it is at par with calibrated value or between 100% & 125% and very good more than 125%. Any value between 100% & 75% of calibrated value shall be considered satisfactory. Values from 75% to 50% shall be considered for payment at rates reduced on prorata basis. The concrete indicating rebound number less than 50% of calibrated shall be rejected and not paid for.

(E) ACCEPTANCE OF FIELD TESTS AND STRENGTH

If the relative strength of actual field work is found satisfactory considering the calibration charts with reference to the standard cube test kept at site, the representative work will be considered satisfactory. If the work is considered below satisfactory, the same will be dealt as stated in para D3 above.

(F) 7 DAYS' STRENGTH IN RARE CASES ONLY

Normally cube crushing strength on 28 days' test shall form the basis of acceptance. However in rare cases of time bound projects/urgent repairs 7 days' cube test strength criteria may be adopted on similar lines using 7 days' standard test cubes and calibration graphs/curves charts for 7 days' in lieu of 28 days' and testing work done at 7 days'.

(G) PRECAUTIONS

(G-1) The testing shall be done generally as per the guidelines of manufacturer of the apparatus and strictly in accordance with the procedure laid down in clause 6 or IS 13311 (part 2) Indian Standard for Non-Destructive Testing of concrete-Method of Test by Rebound Hammer.

(G-2) The rebound hammers are influenced by number of factors like type of cement aggregate surface

conditions, moisture content, age of concrete & extent of calibration of concrete. Hence care shall be taken to compare the cement, aggregate etc. and tested under the similar surface conditions having more or less same moisture content and age. However effect of age can be ignored for concrete between 3 days & 3 months old.

5.4.12 MODE OF MEASUREMENT

5.4.12.1 Dimensions shall be measured nearest to a cm except for the thickness of slab which shall be measured correct to 0.5cm. The areas shall be worked out nearest to 0.01sq.mt. The cubical contents shall be worked out to nearest 0.01 cubic meter.

5.4.12.2 Reinforced cement concrete whether cast-in-situ or precast shall be classified and measured accurately as follows unless otherwise specified

- (a) Raft, footing, bases of columns etc. and mass concrete.
- (b) Walls (any thickness) including attached pilasters, buttresses, plinth and string course, fillets etc.
- (c) Suspended floors, roofs, landings and balconies
- (d) Shelves
- (e) Chajjas
- (f) Linthel, beams and bressummers
- (g) Columns, pillars, piers, abutments, posts and struts
- (h) Stair-cases including waist or waistless slab but excluding landing except in (1) below.
- (i) Spiral stair-case (including- landing).
- (j) Arches, arch ribs, domes and vaults
- (k) Chimneys and shafts.
- (l) (1) Well steining
- (m) Vertical and horizontal fins individually or forming box, louvers and facias.
- (n) Kerbs, steps and the like.
- (m) String courses, bands, coping, bed plates, anchor blocks, plain window sills and the like.
- (o) Mouldings as in cornices window sills etc.
- (n) Shell, dome and folded plates.
- (p) Extra for shuttering in circular work in plan.

5.4.12.4 No deduction shall be made for the following:

- (a) Ends of dis-similar materials (e.g. Joists, beams, post griders, rafters, purlins trusses, corbels steps etc.) upto 500 sq cm in cross-section.
- (b) Opening upto 0.1 sqm.

Note: In calculating area of openings upto 0.1 sqm the size of opening shall include the thickness of any separate lintels or sills. No extra labour for forming such openings or voids shall be paid for.

- (c) The volume occupied by reinforcement.
- (d) The volume occupied by water pipes, conduits etc. not exceeding 25 sq cm each in cross sectional area. Nothing extra shall be paid for leaving and finishing such cavities and holes.

5.4.12.5 Measurement shall be taken before any rendering is done in concrete members. Measurement will not include rendering. The measurement of R.C.C. work between various units shall be regulated as below.

- (a) Slabs shall be taken as running continuously through except when slab is monolithic with the beam. In that case it will be from the face to face of the beam.
- (b) Beams shall be measured from face to face of columns and shall include haunches, if any, between columns and beam. The depth of the beam shall be from the bottom of slab to the bottom of beam if beam and slab are not monolithic. In case of monolithic construction where slabs are integrally connected with beam, the depth of beam shall be from the top of the slab to the bottom of beam.
- (c) The column measurement shall be taken through.
- (d) Chajjas along with its bearing on wall shall be measured in cubic metre nearest to two places of decimal. When chajjas is combined with lintel, slab or beam, the projecting portion shall be measured as chajjas, built in bearing shall be measured as per item of

lintel, slab or beam in which chajjas bears.

- (e) Where the band and lintel are of the same height and the band serve as lintel, the portion of the band to be measured as lintel shall be for clear length of opening plus twice the overall depth of band.

General: Concrete as actually done shall be measured for payment. The concrete shall be measured for its length, breadth and height/ depth limiting dimensions to those specified on drawings or as directed by the Engineer-in-Charge.

Deductions:

No deductions shall be made for the following:

- a) Ends of dissimilar materials e.g. joists, beams, posts, girders, rafters, purlins, trusses, corbels, steps etc. up to 500 sq. cm. in cross section.
- b) Opening up to 0.1 sq. m. (1000 sq. cm)
- c) Volume occupied by reinforcement.
- d) Volume occupied by pipes, conduits, sheathing etc. not exceeding 25 sq. cm. each in cross sectional area. Nothing extra shall be paid for leaving and finishing such cavities and holes.

i) COLUMN FOOTING:

R.C.C. in foundation and footings shall be measured for its length, breadth and depths limiting dimensions to those specified in drawing or as ordered in writing by the Engineer-in-Charge. In case of tapering portions of column footings, the quantities shall be calculated by the Formula: **Volume V = H/3 x [A1 + A2 + sqrt {A1 x A2}]**; where

A1 = Area at top of footing, A2 = Area at bottom of footing and H = Height of footing.

ii) COLUMN:

Column shall be measured from top of footings to the plinth level and from plinth level to the structural slab level and to the subsequent structural slab levels. Measurements for higher grade concrete in columns at its junction with lower grade concrete beams shall be restricted to the column section supporting the beam in question.

iii) WALL:

All walls shall be measured from top of the wall footing to the plinth level and from plinth level to the top of structural first floor and to subsequent floors.

iv) BEAM AND LINTEL:

Beam shall be measured from face to face of the columns, walls, cross beams including haunches if any. The depth of the beams shall be measured from the top of the slab to the bottom of the beam except in the case of inverted beam where it shall be measured from top of slab to top of beams. The beams and lintels with narrow width even though acting as fascia in elevation in some cases, will be measured as beams and lintels only.

v) SLAB:

The length and breadth of slab laid to correct thickness as shown in the detailed drawings or as ordered by the Engineer-in-Charge shall be measured between beams, walls and columns.

vi) CHAJJAS, FACIAS, FINS AND MULLIONS:

- a) Chajjas shall be measured net from supporting faces up to the edges of chajjas without any fascia.
- b) Fascia shall be measured full excluding chajja thickness.
- c) End fins shall be measured full.
- d) Intermediate fins, mullions shall be measured between chajjas or other supporting structural members.
- e) Parapets shall be measured from top of slab/ chajja.

vii) STAIRCASE:

The concrete in all members of staircase like waist slabs, steps, cantilever steps, stringer beams etc. shall be measured for their length, breadth and depth, limiting dimensions to those specified on drawings. No deductions shall be made for embedded plugs, pockets.

5.4.13 TOLERANCES

Subject to the condition that structural safety is not impaired and architectural concept does not hamper, the tolerances in dimensions of R.C.C. members shall be as specified in the drawings by the designer. Whenever these are not specified the permissible tolerance shall be decided by the Engineer-in-Charge after consultations with the Designer, if necessary.

When tolerances (n dimensions are permitted, following procedure for measurements shall apply

- (a) If the actual dimensions of R.C.C. members do not exceed or decrease the design dimension of the members plus or minus tolerance limit specified above, the design dimensions shall be taken for the purpose of measurements.
- (b) If the actual dimensions exceed the design dimensions by more than the tolerance design dimensions only shall be measured for the purpose of payment.
- (c) If the actual dimensions decrease more than the tolerance limit specified the actual dimension of the RCC members shall be taken for the purpose of measurement and payment.
- (d) For acceptance of RCC members whose dimensions are not exactly as per design dimensions, the decision of Engineer-in-Charge shall be final. For the purpose of payment however, the clarification as given in parts a, b & c above shall apply.

5.4.14 RATE

5.4.14.1 The rate includes cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as directed, curing and all other incidental expenses for producing concrete of specified strength, for all floors, at any height and level, in any position, including or excluding the cost of form work and/ or reinforcement as mentioned in the schedule of quantities. The rates also shall include the cost of testing materials, mix design, cube test and allied incidental expenses.

5.4.14.2 No extra payment for richer mix which projects into any member from another member during concreting of junctions of beams and columns etc. will be made except to the extent structurally considered necessary and when so indicated in the structural drawings. The payments for works done under items of different mixes shall be limited strictly to what is indicated in the structural drawings.

5.5 ENCASING ROLLED STEEL SECTIONS

5.5.1 Before concrete work is started, the Engineer In-Charge shall check that all rolled steel sections to be encased, have been erected truly in position. The sections shall be unpainted and shall be wire brushed to remove the loose rust/scales etc. When so specified, ungalvanised metal, having mesh or perforations large enough to permit the free passage of 12.5mm nominal size aggregate through them, shall be wrapped round the section to be encased in concrete and paid for separately unless otherwise specified.

5.5.2 WRAPPING

5.5.2.1 In case of columns, the wrapping shall be arranged to pass through the centre of the concrete covering. The wrapping of the entire length of the columns to be carried out in stages and no stage shall cover more than 1.5 meter of height of columns. Successive wrappings shall be carried out only after the immediate adjacent wrapping has been encased in concrete. The surface and edges of the flanges of the steel columns shall have a concrete cover of not less than 50mm. The wrappings of successive stages shall be tied together.

5.5.2.2 In the case of beams and grillages, the wire mesh or expanded metal shall be wrapped round the lower flange of the beam and the wrapping shall be suspended by wire hangers 5mm diameter placed at about 1.2 meters centers. The surfaces and edges of the steel sections shall have a concrete cover of

not less than 50mm. The wrapping shall pass through the center of the concrete covering at the edges and soffits of the flanges.

5.5.3 Form work shall be as prescribed in 5.2.

5.5.4 CONCRETING

Concrete shall consist of a mix of 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate of 12.5 mm nominal size) unless a richer mix is specified. The mix shall be poured solidly around the steel sections and around the wrapping by vibrating the concrete into position. Consistency of concrete, placing of concrete and its compaction, curing finishing and strength of concrete shall be as described in 5.4.

5.5.5 MEASUREMENTS

The length shall be measured correct to one cm and other dimensions correct to 0.5 cm. The cement concrete shall be measured as per gross dimensions of the encasing exclusive of the thickness of plaster. No deduction shall be made for the volume of steel sections, expanded metal, mesh or any other reinforcement used therein. However, in case of boxed stanchions or girders, the boxed portion only shall be deducted.

Unless otherwise stated the fabric reinforcement such as expanded metal shall be measured separately in square meters stating the mm and size of strands.

The description shall include the bending of the fabric as necessary, Raking or circular cutting and waste shall be included in the description.

5.5.6 RATE

Unless otherwise state in work order the rate shall include the cost of materials for all the operations described above except the cost of fabric reinforcement. The cost of providing and erecting steel section and wire hanger shall be paid for separately.

5.6 PRECAST REINFORCEMENT CONCRETE 5.6.1 GENERAL REQUIREMENT

Precast reinforced concrete units such as columns, fencing posts, door and window frames, lintels chajjas, copings, sills, shelves, slabs, louvers etc. shall be of grade of mix as specified and cast in forms or moulds. The forms/moulds shall be of fiber glass or of steel sections for better finish. Provision shall be made in the forms and moulds to accommodate fixing devices such as nibs, clips, hooks, bolts and forms of notches and holes. The contractor may precast the units on a cement or steel platform which shall be adequately oiled provided the surface finish is of the same standard as obtained in the forms. Each unit shall be cast in one operation.

5.6.2 Concrete used for pre casting the units should be well proportioned, mixed, placed and thoroughly compacted by vibrations or tamping as approved by Engineer-In-charge to give a dense concrete free from voids and honey combing.

5.6.3 Precast articles shall have a dense surface finish showing no coarse aggregate and shall have no cracks or crevices likely to assist in disintegration of concrete or rusting of steel or other defects that would interfere with the proper placing of the units. All angles of the precast units with the exception of the angles resulting from the splayed or chamfered faces shall be true right angles. The arises shall be clean and sharp except those specified or shown to be rounded. The wearing surface shall be true to the lines. On being fractured, the interior of the units should present a clean homogeneous appearance.

5.6.4 The longitudinal reinforcement shall have a minimum* cover of 12mm or twice the diameter of the main bar, whichever is more, unless otherwise directed in respect of all items except fencing posts or electric posts where the minimum cover shall be 25mm.

5.6.5 CURING

After having been cast in the mould or form the concrete shall be adequately protected during setting

in the first stages of hardening from shocks and from harmful effects of frost, sunshine, drying winds and cold. The concrete shall be cured at least for 7 days from the date of casting.

5.6.6 The precast articles shall be matured for 28 days before erection or being built in so that the concrete shall have sufficient strength to prevent damage to units when first handled.

5.6.7 MARKING

Precast units shall be clearly marked to indicate the top of member and its location and orientation in the structure.

5.6.7.1 Precast units shall be stored, transported and placed in position in such a manner that they will not be overstressed or damaged.

5.7 PRECAST CEMENT CONCRETE JALI

5.7.0 The jali shall be of cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 6 mm size) reinforced with 1.6 mm thick mild steel wire, unless otherwise specified.

5.7.1 FIXING

The jali shall be set in position true to plumb and level before the joints sills and soffits of the openings are plastered. It shall then be properly grouted with cement mortar 1:3 (1 cement: 3 coarse sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered embedding the jali uniformly on all sides.

5.8 DESIGN MIX / READY MIX CONCRETE 5.8.0 DEFINITION

Design mix concrete is that concrete in which the design of mix i.e., the determination of proportion of cement, aggregate & water is arrived as to have target mean strength for specified grade of concrete. The minimum mix of M25 shall be used in all structural elements in both load bearing & RCC framed construction.

5.8.1 MIX DESIGN AND PROPORTIONING

5.8.1.1 Mix proportions shall be designed to ensure that the workability of fresh concrete is suitable for conditions of handling and placing, so that after compaction it surrounds all reinforcements and completely fills the formwork. When concrete is hardened, it shall have the stipulated strength, durability and impermeability.

5.8.1.2 Determination of the proportions by weight of cement, aggregates and water shall be based on design of mix.

5.8.1.3 As a trial the manufacturer of concrete may prepare a preliminary mix according to provision of SP: 23.1982. Reference may also be made to ACI 211.1.77 for guidance.

5.8.1.4 Mix design shall be tried and the mix proportions checked on the basis of tests conducted at a recognized laboratory approved by the Engineer-in-Charge.

5.8.1.5 All concrete proportions for various grades of concrete shall be designed separately and the mix proportions established keeping in view the workability for various structural elements, methods of placing and compacting.

5-8.2 STANDARD DEVIATION

5.8.2.1 Standard deviation calculations of test results based on tests conducted on the same mix design for a particular grade designation shall be done in accordance with clause 9.2.4 of IS 456.

5.8.3 ACCEPTANCE CRITERIA

5.8.3.1 COMPRESSIVE STRENGTH: The concrete shall be deemed to comply with the strength requirements when both the following conditions are met:

(a) The mean strength determined from any group of four consecutive test results complies with the appropriate limits in col 2 of Table below (characteristic compressive strength compliance

requirement).

- (b) Any individual test result complies with the appropriate limits in col 3 of the Table.

5.8.3.2 FLEXURAL STRENGTH: When both the following conditions are met, the concrete complies with the specified flexural strength:

- (a) The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm².
- (b) The strength determined from any test result is not less than the specified characteristic strength less 0.3 N/mm².

5.8.3.3 QUANTITY OF CONCRETE REPRESENTED BY STRENGTH TEST RESULTS

The quantity of concrete represented by a group of four consecutive test results shall include the batches from which the first and last samples were taken together with all intervening batches.

For the individual test result requirements given in col 3 of Table below or in item (b) of 5.8.3.2, only the particular batch from which the sample was taken shall be at risk.

Where the mean rate of sampling is not specified the maximum quantity of concrete that four consecutive test results represent shall be limited to 60m³.

5.8.3.4 If the concrete is deemed not to comply pursuant to 5.8.3.3 the structural adequacy of the parts selected shall be investigated and any consequential action as needed shall be taken.

5.8.3.5 Concrete of each grade shall be assessed separately.

5.8.3.6 Concrete is liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joint, the reinforcement has been displaced beyond the tolerances specified, or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-in-Charge.

5.8.4 CEMENT CONTENT OF CONCRETE

5.8.4.1 For all grades of concrete manufactured/produced, minimum cement content in the concrete shall be 310 kg per cubic meter of concrete. Also, irrespective of the grade of concrete, the maximum cement content shall not be more than 500 kg per cubic meter of concrete. These limitations shall apply for all types of cements of all strengths.

5.8.4.2 Actual cement content in each grade of concrete for various conditions of variables shall be established by design mixes within the limits specified in para 5.8.4.1 above.

5.8.5 WATER CEMENT RATIO AND SLUMP

5.8.5.1 In proportioning a particular mix the manufacturer/ producer/ contractor shall give due consideration to the moisture content in the aggregates, and the mix shall be so designed as to restrict the maximum free water cement ratio to be less than 0.5.

5.8.5.2 Due consideration shall be given to the workability of the concrete thus produced. Slump shall be controlled on the basis of placement in different situations. For normal methods of placing concrete maximum slump shall be restricted to 100mm when measured in accordance with IS: 1199.

**TABLE
CHARACTERISTIC COMPRESSIVE STRENGTH COMPLIANCE REQUIREMENT**

Specified Grade	Mean of the Group of 4 Non-Overlapping Consecutive Test Results in Nmm ³	Individual Test Results in N/m M ³
(1)	(2)	(3)
M15	> $f_{ok} + 0.825 \times$ established standard deviation (rounded off to nearest 0.5 N/mm ²) or $f_{ck} + 3$ N/mm ² whichever is greater	> $f_{ok} - 3$ N/mm ²

M20 Or Above	> $f_{ok} + 0.825 \times$ established standard deviation (rounded off to nearest 0.5 N/mm ²) or $f_{ok} + 4$ N/mm ² , whichever is greater	> $f_{ck} - 4$ N/mm ²
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Note: In the absence of established value of standard deviation, the values given 'in Table may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish the value of standard deviation.

5.8.6 APPROVAL OF DESIGN MIX

5.8.6.1 The producer/manufacturer/contractor of concrete shall submit details of each trial mix of each grade of concrete designed for various workability conditions to the Engineer-in-Charge for his comments and approval. Concrete of any particular design mix and grade shall be produced/manufactured for works only on obtaining written approval of the Engineer-in-Charge.

5.8.6.2 For any change in quality/quantity/source in the ingredients of a particular concrete, for which mix has been designed earlier and approved by the Engineer-in-Charge, the mix has to be redesigned and approval obtained again.

5.8.7 READY MIX CONCRETE

5.8.7.0 The concrete manufactured for delivery to a purchaser in a plastic and unhardened state is Ready Mixed Concrete (RMC).

The RMC shall be ordered only on approved suppliers; The RMC plant should have equipments with automatic batching system having microprocessor/ computer control. The design mix of the RMC shall be approved by Engineer-In-Charge prior to supply and conformity to the same shall be periodically checked as per the mandatory requirements for periodical testing of quality of concrete.

All the specifications for concrete and RCC indicated in this booklet shall hold good for **RMC** to the extent they are relevant and not specifically indicated otherwise in this detailed specification for RMC or indicated otherwise in the description of the work in the work order. Further interalia following shall be strictly ensured for RMC.

5.8.7.1 MIXING

Thorough mixing is essential for production of uniform concrete. Equipment and methods used shall be capable of effectively mixing concrete materials to produce uniform mixes of the lowest slump practical of the work.

5.8.7.2 CHARGING OF MIXER

5.8.7.2.1 Mixers both stationary and truck mounted shall be so charged that there is a pre blending of the ingredients as the stream flows into the mixer.

5.8.7.2.2 Water shall enter the mixer first, but must continue to flow while other ingredients are entering the mixer. Water charging pipes shall be of proper design and of adequate size -so that water enters at a point well inside the mixer. Water charging shall be complete within the first 25% of the mixing time.

5.8.7.2.3 Cement shall be charged along with other materials, but it shall be ensured that cements enter the stream after approximately 10% of the aggregate is in the mixer. When it is necessary to charge cement into truck mixers separately, additional mixing time shall be allowed to obtain desired uniformity of mix.

5.8.7.2.4 Admixtures shall be charged to the mixer at the same time in the mixing sequence for every batch. Liquid admixtures shall be charged with the water. Powdered admixtures shall be sprinkled into the mixer with other dry ingredients. When more than one admixture is used, they shall be batched separately and they shall not be premixed before entering the mixer.

5.8.7.3 MIXER PERFORMANCE

5.8.7.3.1 Mixer performance checks shall be made at regular intervals to ensure uniformity of the concrete. Visual examination of the concrete shall be one of the aids for maintaining and checking mixer performance.

5.8.7.3.2 Results of tests on air content, slump, unit weight of air free mortar shall be guide lines on mixer performance.

5.8.7.4 Mixing Time

5.8.7.4.1 Mixing time shall be measured from the time all ingredients are in the mixer.

5.8.7.4.2 Mixing time shall be established from mixer performance tests conducted at frequent intervals throughout the period of the works. However, as an initial guide, mixer manufacturer's recommendation may be followed. Other guide line being 1.33 mins, for 1 cum capacity of mixer and 0.33 min for every additional. 1 cum of mixer capacity.

5.8.7.4.3 Mixer shall be designed to have audible indicators and combination inter locks which prevent mixer discharge prior to completion of a preset mixing time. Mixer shall also be designed to start and stop operation with full load.

5.8.7.4 RE-TEMPERING

5.8.7.5.1 Provided that design water-cement ratio is not exceeded, small increments of re-tempering water may be added to mixed batches to obtain the desired slump.

5.8.7.5.2 Addition of water in excess of designed water-cement ratio to compensate for slump loss resulting from delays in delivery or placing of concrete shall not be permitted.

5.8.7.6 MIX TEMPERATURE

5.8.7.6.1 Batch to batch uniformity of concrete with regard to slump, water requirement and air content is dependent on temperature of concrete. It shall, therefore, be ensured that the maximum and minimum temperatures of concrete throughout all seasons of the year do not vary beyond the limits given below:

Maximum: 30° C

Minimum: - 20° C

5.8.7.6.2 Necessary measures shall be taken to lower or raise the temperature of water to maintain the mixed concrete between the specified temperature limits.

5.8.7.7 DISCHARGING OF MIXER

5.8.7.7.1 Mixer shall be capable of and handled properly so that concrete of lowest desired slump can be effectively discharged without causing segregation.

5.8.7.8.1 READY – MIX CONCRETE MAY BE

- Mixed in a central plant and transported to the job in agitating or non- agitating truck bodies.
- Mixed entirely in transit.
- Mixed entirely after reaching the job site.
- Mixed partially in a central plant and completed in transit or after reaching the job site (shrink mixing).

5.8.7.8.2 In ready mix concrete, special attention shall be given to the addition of mixing water quantity, which if incorrect, shall result in reduction of concrete quality.

5.8.7.8.3 CONCRETE CONSISTENCY (SLUMP) IS ALSO AFFECTED BY

- Amount and rate of mixing.
- Length of haul.
- Time period for unloading.
- Temperature conditions.

5.8.7.8.4 In cool weather **or** short haul and **with prompt** delivery concrete quality may not be significantly affected. But with reverse conditions, quality of concrete may be significantly affected.

Addition of water to compensate for slump loss shall not exceed that quantity necessary to compensate for a maximum 25mm slump loss. However, by this additional quantity of water, the design water cement ratio shall not be exceeded.

5.8.7.8.5 Loss in workability in warm weather shall be minimized by expediting delivery and placement and by controlling the concrete temperature.

5.8.7.8.6 If it becomes necessary to use retarders to prolong the time the concrete will respond to vibrations after placement, - prior approval shall be obtained from Engineer-in-Charge for the use.

5.8.7.8.7 In hot weather conditions or delays in delivery placement, use may be made of the procedure of withholding some of the mixing water till the mixer arrives at the job site. In such cases, after addition of the balance (withhold) quantity of water, an additional 30 revolutions of mixer at mixing speed shall be given to adequately incorporate the additions water into the mix.

5.8.7.8.8 When loss of slump or workability cannot be controlled by measures stated above, complete mixing shall be done at the job site using centrally dry batched ingredients.

5.8.7.9 SUPPLY AND PLACING OF READY-MIX CONCRETE

5.8.7.9.1 Responsibility of in-place quality of ready-mix concrete shall be shared by the manufacturer supplier of ready mix concrete and the placing contractor.

5.8.7.9.2 They shall work in close coordination. The placing crew shall be in direct radio/telecommunication contact with the batch plant to ensure:

- Avoidance of delay in dispatching concrete from batch plant.
- Inform hatching plant delays in formwork, reinforcement work, handling or placing.

5.8.7.9.3 The placement contractor shall give in writing his requirement of a particular batch of concrete to the supplier.

5.8.7.9.4 The ready-mix concrete manufacturer/supplier shall, along with each batch of concrete delivered to the placement contractor, give him a concrete delivery ticket. The supplier shall give copies of all such delivery tickets to the Engineer-in-Charge for his record and also shall get duplicate copies of all such delivery tickets duly received and signed from the placement contractor.

5.8.7.9.5 Ready mixed concrete as supplied by the manufacturer and as placed by the contractor shall in no way be different from the specifications of concrete as approved by the Engineer-in-Charge.

5.8.8 TRANSPORTATION: The transportation of RMC to job site should be as quick as possible to avoid stiffening of concrete slump loss, loss of consistency and resultant difficulties for full consolidation and proper finishing. This shall be achieved by keeping the concrete in slow state of agitation during transit. The transit time shall be kept within 1¹/₂ hours.

Equipment for transporting and placing RMC:

Keeping in view the type and range of concrete following equipments may be adopted for transporting and placing RMC. Selection of methods and equipments for transit and placing of RMC shall be from the point of view to avoid segregation of concrete.

SI. No.	Type and Range of Work	Equipment
1	Transportation of RMC for all uses	Truck agitator

2	Conveying RMC from central discharge to formwork at all levels in high rise building	Concrete pump with/without mobile boom
3	Work in high rise building and using concrete pump	Crane with/ without bucket
4	Short flat/ horizontal haul with restricted accessibility	Burrows and buggies
5	Spreading concrete over flat area as in pavements	Screw spreaders
6	Laying large volume of concrete without joints	Mobile continuous mixer
7	Restoration work, protective coating, thin lining etc. in difficult localities in large areas	Pneumatic guns
8	Concrete in vertical forms	Drop chutes
9	Concrete under water	Tremies
10	Conveying huge concrete from main discharge point to secondary discharge point or like conveying	Belt conveyors (with cover for long reaches in adverse weather situations like hot, windy condition etc.)

5.8.8.1 Fresh concrete can be transported to the placement area by a variety of methods. Common among them are:

- Mixer tucks
- Stationary truck bodies with or without agitators
- Buckets hauled by trucks
- Conveyor belts
- Hose or pipe line by pumping

Each type of transportation has specific advantages and limitations depending on the conditions of mix, accessibility and location of placing.

5.8.8.2 TRANSPORTATION BY MIXER TRUCKS

5.8.8.2.1 These are essentially revolving drums mounted on truck chasis. Truck mixers used in the job shall be labeled permanently to indicate the manufactures' specifications for mixing like:

- Capacity of drum
- Total number of drum revolutions required for complete mixing
- Mixing speed
- Maximum time limit before completion of discharge and after cement has entered the drum
- Reduction in time period of discharge
- Due to warm weather or other variables

All above information shall only form guidelines for the manufacture/producer of concrete.

5.8.8.2.2 Fulfillment of the stipulated number of revolutions or elapsed time shall not be acceptable criterion.

As long as the mixing water limit is not exceeded and the concrete has satisfactory plastic physical properties and is of satisfactory consistency and homogeneity for satisfactory placement and consolidation and is without initial set, the concrete shall be acceptable.

5.8.8.2.3 When the concrete is totally mixed in transporting trucks or in case of shrink-mix concrete, volume of concrete being transported shall not exceed 63% of the rated capacity of the drum. In case the concrete is totally mixed in the central hatching plant, the transporting truck may be loaded up to 80% of the rated capacity of the drum. In this case the drum shall be rotated at charging speed during loading and reduced agitating speed after loading is complete.

5.8.8.2.4 When transporting concrete by truck mixers, delivery time shall be restricted to 1.50 hours from the time cement has entered the mixer to completion of discharge.

5.8.8.3 TRANSPORTING BY AGITATING / NON-AGITATING TRUCKS

5.8.8.3.1 Transporting ready mix concrete by this method shall consist of truck chassis mounted with open top bodies. The metal body shall be smooth and streamlined for easy discharge. Discharge may be from the rear when the body is mechanically tilted. Body of the truck shall have a provision of discharge gate. Mechanical vibrators shall be installed at the discharge gate for control of discharge flow.

5.8.8.3.2 Agitators, if mounted, also aid in the discharging of concrete from the truck in addition to keeping the concrete alive.

5.8.8.3.3 Water shall not be added to concrete in transport through this system.

5.8.8.3.4 Bodies of trucks shall be provided with protective covers during period of inclement weather.

5.8.8.3.5 Delivery period, when adopting this system of transporting, concrete shall be restricted to 30 minutes from the moment all ingredients including cement and water enters in mixer to completion of discharge.

5.8.8.4 TRANSPORTING BY BUCKETS

5.8.8.4.1 This method of transportation is very common for transportation of centrally mixed concrete. Buckets of suitable capacities may be fitted with concrete which is totally mixed in central plant and hauled to the job site. Buckets then may be conveyed to the actual point of placement either with the help of crane/hoist or they may be carted.

5.8.8.4.2 As in the case of open truck transportation, water shall not be added to concrete transported in buckets. Concrete shall be protected from inclement weather by necessary covering arrangements. Also maximum delivery period for this system of transportation from the time cement is introduced into the mixer to completion of discharge shall not exceed 30 minutes.

5.8.8.5 CLEANING

5.8.8.5.1 Before loading concrete in either truck mixer, open bodied trucks or buckets, the containers shall be thoroughly cleaned, washed and dried, so that there is no water or moisture in the container which may be the designed water content of the concrete.

5.8.8.6 OTHER METHOD OF TRANSPORTATION

5.8.8.6.1 Transportation of concrete either by belt conveyors or by pumping is envisaged in this work.

5.8.8.6.2 If, however, producer/manufacturer/purchaser of ready mix- concrete desires to use such method of transportation, they may do so provided their scheme and complete specifications are submitted to the Engineer-in-Charge for his record and approval.

5.8.9 OBJECTIVE

5.8.9.1 Method of transportation used shall ensure:

Efficient deliver of concrete: No significant alteration of properties with regard to water cement ratio, slump air content and homogeneity.

5.8.9.2 All variables in transportation, considering type and accessibility of placement locations, distance, interval time etc., shall be carefully studied before arriving at the method used.

5.8.10 PLACING CONCRETE BY PUMPING METHODS

5.8.10.1 GENERAL

5.8.10.1.1 Concrete conveyed by pressure through either rigid pipes or flexible hoses and discharged directly in to the desired area is termed as pumped concrete. The method of conveying the concrete through pipe lines is dealt with in these specifications.

5.8.10.1.2 Method of applying pressure to concrete is by pumps. Pumps to be used shall be either of the two types as mentioned below:

- a) .Piston type pumps
- b) Squeeze pressure type pumps.

Compressed air pressure pumps shall not **be** used in the works.

5.8.10.2 PUMPING EQUIPMENTS

5.8.10.2.1 Piston pumps

5.8.10.2.1.1 Piston pump to be used in the works shall consist of a receiving hopper for mixed concrete, an inlet valve, an outlet valve and the pump shall be a twin – piston pump.

The two pistons shall be so arranged that one piston retracts when the other is moving forward and pushing concrete into the pipe line to maintain a reasonably steady flow of concrete. Single piston pumps shall not be acceptable.

Inlet and outlet valves shall be any one of the following types:

- ❖ Rotating plug type
- ❖ Sliding plate type
- ❖ Guided plunger type
- ❖ Swing type
- ❖ Flapper type
- ❖ Or any combination of the above.

The pistons shall be mechanically driven using a crank or chain hydraulically driven using oil or water.

The receiving hopper shall have a minimum capacity of 1.0 cum and the hopper shall -be fitted with remixing rotating blades capable of maintaining consistency and uniformity of concrete.

The primary power for pumps may be supplied by gasoline, diesel, or electric motors.

The primary power unit and the pump unit may be truck, trailer or skid mounted.

5.8.10.2.2 SQUEEZE PRESSURE PUMPS

5.8.10.2.2.1 Squeeze pressure pumps shall consist of a receiving hopper fitted with remixing blades. Re-mixing blades shall be such that these can push the concrete into the flexible hose connected at the bottom of the hopper.

The' flexible hose shall pass through a metal drum around the inside periphery of the drum and come out through the top part of the drum.

The drum shall be maintained under a very high degree of a vacuum during operation. The drum shall be so fitted with hydraulically operated metal rollers which when rotating, create a squeeze pressure on the flexible hose carrying concrete and force the concrete out into the pipe line.

5.8.10.2.3 EFFECTIVE RANGE AND DISCHARGE OF PUMPS

5.8.10.2.3.1 Effective range of pumps to be used in the work shall be decided by the contractors after studying the site conditions. However, the minimum horizontal range shall not be less than 150 meters and minimum vertical range shall not be less than 50 meters.

5.8.10.2.3.2 Selection of pumps based on discharge capacity shall be decided by the contractor after studying the requirements for the project. Discharge capacity shall be worked out by the contractors

and approval obtained from the Engineer-in-Charge. As guide line figure the contractors may assume a discharge capacity of 15 cubic meter/hour/pump.

5.8.10.3 PIPE LINES

5.8.10.3.1 All concrete carrying pipe lines shall generally be rigid pipe lines. Flexible pipe lines may only be, used at bend curves in lines or at discharge ends if required. Placements of flexible units shall be done judiciously and connected to the pipe lines only when it meets the approval of the Engineer In-Charge

5.8.10.3.2 Rigid line/ Hard Line/ Slick Line: Such Lines shall be made either of steel or plastic. Aluminum alloy pipes shall not be used.

Minimum pipelines diameter shall be 100 millimeters and shall have normal maximum length of 3 meter in each section connected through couplers.

5.8.10.3.3 Flexible Pile Line: Flexible lines shall be made out of rubber or spiral wound flexible metal or plastic. The pipe shall again be such that they are in Sections of 3 meter length each and connected through couplers. These pipes shall be such that they are interchangeable with rigid lines. While installing flexible units, care shall be taken that there are no kinks in the pipeline, which is a normal tendency with these pipes having diameters 10mm and above.

5.8.10.4 COUPLERS

5.8.10.4.1 Couplers to be used for connection pipeline sections (either hard or flexible) shall have adequate strength to withstand stresses due to handling, misalignments, poor support to pipe lines etc.

For horizontal runs of pipes and for vertical runs up to 30 meter height the couplers shall be rated for minimum pressure of 35 kg/cm square. Couplers used for rising runs between 30m meter and 50m meter height shall have a minimum pressure rating of 50 kg/cm square. Couplers shall be designed to allow for replacement of any pipe section without displacing other sections. These shall provide for the full internal cross section with no constructions or service, which may disrupt the smooth flow of concrete. For pipelines of size 150mm and above, double toggged type coupler with a thick rubber gasket and secondary wedge-take-up is recommended. Types of couplers that may be used shall be any of the following:

- + Grooved end coupler
- + One piece extended lever swing type couplers
- + And full oil line type couplers.

5.8.10.5 OTHER ACCESSORIES

5.8.10.5.1 Other accessories which shall be catered for, are as under;

- ❖ Rigid and flexible pipes of varying lengths
- ❖ Curved sections of rigid pipes
- ❖ Swivel joints and rotary; distributors
- ❖ Pin and gate valves to prevent back flow in pipelines
- ❖ Switch valves to direct the flow into another pipelines
- ❖ Connection devices to fill forms from the bottom up
- ❖ Splints, rollers, and other devices for protection of conduit over rock concrete Reinforcing steel and form and to provide lifting and lashing points in the pipe line
- ❖ Transitions for connecting different sizes of pipe line
- ❖ Air vents for downward pumping
- ❖ Clean out equipment.

5.8.10.5.2 For concrete of columns, walls and scattered small placements, recommendation is made for special cranes or power controlled booms carrying pipelines with a pendant type concrete delivery hose.

5.8.10.6 LUBRICATING OF PIPE LINE

5.8.10.6.1 Before pumping concrete into the pipeline, the line shall be lubricated with a properly designed mortar/grout lubricant. This shall be ensured by starting the pumping operation with a properly designed mortar or with a batch of regular concrete with the coarse aggregate omitted. The quantity of mortar required as lubricant is dependent on the smoothness and cleanliness of the pipelines. As a guide line, for 100mm diameter pipe line of 100 meter length, 0.08 cum to 0.10cum of mortar should normally be adequate but this shall not be taken as specified, and the contractor shall establish his requirement.

The quantity of mortar that comes out of the delivery end of the pipeline shall not be used in place of the concrete work. However, with the approval of Engineer-In-Charge, this mortar may be used as bedding mortar against construction joints. The rest of the mortar shall be wasted. Lubrication shall be maintained as long as the pumping of concrete continues.

5.8.10.7 GUIDE LINES FOR FIELD PRACTICE

5.8.10.7.1 Proper planning of concrete supply, pump locations, line layout, placing sequence and the entire pumping operation will result in savings of time and expense.

5.8.10.7.2 The pump shall be placed as near the placement area as practicable. The surrounding areas of the pump shall be free of obstructions to allow for movement of concrete delivery trucks. The surface must be strong enough to withstand the loaded trucks operating on it. If the surface is a suspended slab, the truck route shall be adequately supported in consultation with the Engineer-in-Charge.

5.8.10.7.3 Pipe lines from the pump to the placing area shall be laid with minimum number of bends. For large placement areas, alternate lines shall be installed for rapid connection when required. A flexible pipe at the discharge end will permit placing over a large area directly without re handling of pipelines. Pipeline shall firmly supported. If more than one size of pipe has to be used, the smaller diameter pipe shall be placed at the pump end and the larger diameter at the discharge end.

5.8.10.7.4 When pumping downwards, an air releases valve shall be provided at the middle of the top end to prevent vacuum or air build up. Similarly, while pumping upwards, a no-return valve shall be provided near the pump to prevent the reverse flows of concrete during the fitting of clean up equipments or when working on the pump.

5.8.10.7.5 It is essential that direct radio/telecommunication be maintained between the pump operator and the concrete placing crew. Good communication between the pump operator and the batching plant is also essential. The placing rate shall be estimated by the pump operator so that concrete can be ordered at an appropriate delivery rate.

5.8.10.7.6 The pump shall be started for a check run and operated without concrete to ensure that all moving parts are in operation properly. Before placing concrete, the pump shall be run with some grout /mortar for lubricating the line.

5.8.10.7.7 When concrete is received in the hopper, the pump shall be run slowly until the lines are completely full and the concrete is steadily moving. A continuous pumping must be ensured, because if the pump is stopped, concrete in the line may be difficult to move again.

5.8.10.7.8 When a delay occurs because of concrete delivery or some form repair works or for any other reason, the pump shall be slowed down to maintain some movement of concrete in the pipeline. For longer delays, concrete in the receiving hopper shall be made to last as longer as possible, by moving the concrete in the lines occasionally with intermittent strokes of the pump. It is sometimes essential to run a return line back to the pump so that

concrete can be re-circulated during long delays.

5.8.10.7.9 If after a long delay, concrete cannot be moved in the line, it may be necessary to clean out the entire line. However, quite often only a small section of pipeline may be plugged and require cleaning. The pump operator who knows such details as the length of line, age of concrete in the line etc., should be consulted for deciding the appropriate section to be cleaned.

5.8.10.7.10 When the form is nearly full, and there is enough concrete in the line to complete the placement, the pump shall be stopped and a "go-devil" inserted at the appropriate time so that concrete ahead of the go-devil shall be forced completion of the work. The go-devil shall be forced through pipeline to clean it out. Use of water pressure is a safer method. The go-devil shall be stopped at discharged end to ensure that water does no spill on the placement area. If air pressure is used extreme care shall be taken and the pressure must be carefully regulated. A trap shall be installed at the end of the line to prevent the go-devil being ejected as a dangerous projectile. An air release valve shall also be installed in the line to prevent air pressure build up.

5.8.10.7.11 It is essential to clean the line after concrete placing operation is complete. Cleaning shall be done in the reverse direction from the work end to the pump-end where the concrete in the line can be dumped in a bucket. After removal of all concrete, all pipe lines and other equipments shall be cleaned thoroughly and made ready for the next use.

5.8.10.8 INFORMATION TO BE FURNISHED BY CONTRACTORS

5.8.10.8.1 Along with their bid the contractors if called for shall be required to submit the following information regarding the equipments proposed to be used by them:

- ❖ Type, number, capacity, range, mounting, nature of primary power used and the operating weights of pump and mounting.
- ❖ Manufacturer's specifications for pipe lines giving pressure ratings, sizes and material for straight and curved sections.
- ❖ Manufacture's certificates.

5.8.11 SAMPLING AND TESTING (MATERIALS)

5.8.11.1 AGGREGATES

5.8.11.1.1 If called for the supplier of aggregates shall furnish the following informations before the materials are delivered to site:

- ❖ Precise location of source from where the material is to be supplied.
- ❖ Trade group of principal rock type.
- ❖ Presence or reactive minerals.
- ❖ Trade group names of aggregates to be used for concrete viz., Granite, Gabbro Dolerite, Rhyolite, Basalt, Quartzite, and Gneisis.

5.8.11.1.2 If called for the supplier shall also furnish reports on test results giving the following informations for approval to Engineer-in-Charge before delivery of material at site:

- Specific gravity
- Bulk density
- Moisture content
- Absorption value
- Aggregate crushing strength
- Aggregate impact value
- Abrasion value
- Flakiness index
- Elongation index
- Limits of deleterious substances in the aggregate

- Soundness of aggregate
- Potential reactivity of aggregate.

All tests shall be conducted in accordance with IS 2386 (Part –1 to VIII).

5.8.11.1.3 Change in quality of aggregates under the trade group name shall not be acceptable in the work. Change in source of aggregates shall also not be acceptable under normal circumstances, even if the aggregates belong to the same trade group. Engineer-in-Charge may with his discretion allow a change in the source. But, in that case, all test mentioned in para 5.8.11.2 above shall have to be repeated for the aggregates from the changed source and the test results submitted to Engineer-in-Charge for his approval before the delivery of material at site.

5.8.11.1.4 If called for, in addition to provision in paras 5.8.11.1.1, 5.8.11.1.2 and 5.8.11.1.3 above the following tests have to be performed on representative samples from every lot of aggregates after delivery at site. These tests results are to be submitted to the Engineer-in-Charge for his approval. Acceptance criteria for aggregates shall be based-i In-Charge, the results are not within permissible limits, the lot of aggregates from which the samples have been obtained for testing shall stand rejected and the material shall be removed from the site.

MANDATORY TESTS ON AGGREGATES AT SITE

SI No.	Tests	No. of test on each 10 cum of Material or part of thereof
1	Specific gravity	3
2	Bulk density	3
3	Aggregate crushing strength	3
4	Limits of deleterious substances	3
5	Aggregate impact value	3

Mean value of the results from above test shall be taken as the representative value and the acceptance criteria shall be based on these. All test procedures and computations for test results shall be as per IS: 2386

5.8.11.1.5 All other test in para 5.8.11.1.4 being in compliance with requirements set in specifications, if only the limits of deleterious substances do not meet the requirements, an attempt may be made to 'wash the aggregate to bring the limits within permissible values. Under such circumstances, moisture content check shall be made and allowance made before batching.

5.8.11.1.6 Apart from mandatory tests specified in para 5.8.11.1.4 above, the Engineer-In-Charge may at his discretion, call for any additional tests that he may consider necessary. Sampling, procedure and computations for such test shall be done in accordance with IS: 2430 and IS: 2386 as applicable.

5.8.11.2 CEMENT

5.8.11.2.1 Supplier of cement shall furnish the following documents before the cement is delivered to site.

5.8.11.2.1.1 Certificate confirming that chemical composition and physical characteristics are within the stipulated values for types of cement supplied as per relevant codes.

5.8.11.2.1.2 Certificate confirming that the chloride content in the cement is not in excess of 0.05 percent of mass of cement.

5.8.11.2.2 If during subsequent testing of cement supplied in lots any of the properties are found to be outside the acceptable limits, the lot of cement shall be rejected.

5.8.11.2.3 Each 1000 bags or part thereof of cement or each wagon load of cement shall constitute one lot of cement for the purpose of conducting tests at site before cement is accepted.

5.8.11.2.4 Samples for testing at site shall be taken at random from 2% of the total quantity supplied in one lot. For example supplied in bags, samples shall be drawn for minimum of 5 bags and the 2% value shall be rounded off to the next higher integer.

5.8.11.2.5 Results of test conducted on samples drawn as mentioned in para 5.8.11.2.4 shall be

submitted to the Engineer-in-charge for his approval. If in the opinion of the Engineer-in-Charge, the test results are not within permissible limits, the lot of cement from which samples have been obtained for testing shall stand rejected and the material shall be removed from site.

5.8.11.2.6 Following tests shall be conducted at site on each lot of cement delivered:

Sl. No.	Mandatory Tests	Number of testlot
1	Consistency of standard Cement paste	5
2	Initial and final setting time	5 each
3	Compressive strength test	10

Mean values of the results from the above results shall be taken as the representative value and the acceptance criteria shall be based on these test. All test procedures and computation of test results shall be as per IS: 4031.

5.8.11.2.7 Apart from mandatory tests specified in para 5.8.11.2.6 above, the Engineer In-charge may at his discretion, call for any additional tests that he may consider necessary. All such tests shall be done on representative samples taken from each lot described para 5.8.11.2.4 and testing and computation of test results shall be done as per IS: 4031.

5.8.11.3 WATER

5.8.11.3.1 Water to be used in manufacturing and curing of concrete shall be tested before use. All such test results shall be submitted to the Engineer-in-Charge for his approval before water is used.

5.8.11.3.2 Manufacturer/Contractor responsible for concrete work shall identify and inform the Engineer-in-Charge, precisely the location of source of water intended to be used. Each such source of water shall be separately tested. In the event of a change in the source of water all tests specified herein shall have to be repeated.

5.8.11.3.3 In the event water is drawn from tube wells or open-wells, water samples shall be tested for seasonal fluctuations in water table or at intervals to be directed by the Engineer-in-Charge.

5.8.11.3.3 Water samples from each source shall be tested as under:

Test	Number of tests each source
Acidity	3
Alkalinity	3
Presence of solids	3

Mean values of the above test shall be taken as the representative value and the acceptance criteria shall be based on these test results. All testing procedures and computation of test results shall conform to IS: 3025

5.8.11.4 ADMIXTURES

5.8.11.4.1 If called for suppliers of Admixtures for concrete, contractor shall supply the following before any admixture is approved by Engineer-in-Charge for their use:

- a) Certificate confirming that the use of a particular brand of admixture shall not be harmful to concrete in any way.
- b) Certificate confirming the exact dosage of admixture of a particular brand.
- c) Certificate stating the specific purpose for which the admixture is to be used

- d) Special precautionary measures to be taken in the manufacture of concrete when using the particular brand of admixture.
- e) Certificate confirming that the admixture conforms to specifications of IS: 9103 or to ASTM-C260, ASTM-C 10, ASTM-C 595 or to ASTM-C 618.

5.8.11.4.2 Engineer-in-Charge at his discretion may require tests to be performed to reconfirm the characteristic properties of any admixture. All such tests shall be done in accordance with IS: 9103.

5.8.11.5 All tests described in paras 5.8.11.1 to 5.8.11.4 above shall be done at the site laboratory or at laboratory to be identified by the Engineer-in-Charge depending on the test to be conducted.

5.8.11.6 All test shall be done in the presence of a representative nominated by the Engineer-in-Charge and a representative of the concrete Manufacturer/ Contractor when test are performed at the site laboratory. All observation and reports of test shall be jointly signed by the two representatives before the test results are submitted to the Engineer-in-Charge for his approval.

5.8.1 1.7 Unless otherwise stated in the contract expenses for all materials used for testing, sampling procedures and testing including preparing report shall be borne by the Concrete Manufacturer/Contractor.

5.8.12 SAMPLING AND TESTING FOR QUALITY CONTROL OF CONCRETE 5.8.12.1 FRESH CONCRETE

5.8.12.1.1 Fresh concrete shall be tested for slump
Compacting Factor/Workability
Consistency
Weight per cubic meter, cement factor and air content.

5.8.12.1.2 SLUMP

5.8.12.1.2.1 For concrete totally mixed in a central plant, slump shall be checked at:

- a) Immediately during loading of trucks
- b) Point of discharge from the delivery truck
- c) Final placement location

At placement location the slump measured shall conform to the design slump. Manufacturer of concrete shall adjust for loss of slump in transit and establish the requirements of design mix. All slump measurements shall be done within a period of 20 minutes from the time cement is added to the mixer placement contractor shall transport concrete from truck discharge point to actual placement location within 10 minutes of delivery, before the final slump reading is taken at placement location.

5.8.12.1.2.2 For concrete entirely mixed in transit or for shrink mix concrete, slump readings shall be taken at:

- a) Point of discharge from delivery trucks
- b) Final placement location.

In this case also, the slump measured at the final placement location shall conform to the designed slump. The placement contractor shall be responsible for transporting concrete from delivery truck discharge point to final placement location within 10 minutes. However, in this case, the truck shall discharge the concrete within 1 hour and 30 minutes from the time cement is added in the mixer and slump measured at the point of discharge immediately on delivery. Manufacturer of concrete shall ensure that the final slump measurement corresponds to the ordered slump.

5.8.12.1.2.3 For measuring concrete slump at point of discharge from delivery trucks, samples shall be taken from concrete omitting the first and the last 15% of the load. For concrete delivery or placed by pumping, sampling shall be similar to those specified for delivery

trucks.

- 5.8.12.1.2.4** Slump measurement of ready mix concrete transported by buckets shall be at a location specified in Para 5.8.12.1.2.1 with same limits on time. Sampling from buckets shall be such that the bucket containing discharge from mixer for the first and last 15% are omitted.
- 5.8.12.1.2.5** At placement locations, samples for checking slump shall be collected from every 20 cum of concrete or part thereof placed at location for each type of concrete.
- 5.8.12.1.2.6** For all slump checks in the field at least two recordings shall be made and the average value taken as the recorded slump.
- 5.8.12.1.2.7** Slump checks for concrete in the laboratory shall be carried out as and when required by the manufacturer of concrete during the mix design stage and during the progress of work for control on field results.
- 5.8.12.1.2.8** Slump readings shall only be a guideline for concrete consistency and shall not be taken as the acceptability criteria for concrete placed at location. All slump tests shall be carried out in accordance with IS: 1199.

5.8.12.1.3 COMPACTING FACTOR

- 5.8.12.1.3.1** For concrete whose ordered slump is 50mm or less, compacting factor test shall be conducted at both field and central batch plant in addition to slump tests mentioned in para 5.8.12.1.2.
- 5.8.12.1.3.2** Compacting factor check shall be done in field only at placement location, and shall also be conducted at central batch plant if concrete is totally mixed in plant.
- 5.8.12.1.3.3** For this test sampling shall be done as for slump measurements in field and within the same time frame as for slump test.
- 5.8.12.1.3.4** Only one compaction factor test shall be conducted for every 20 cum of concrete or part thereof placed at location for each type of concrete. Since the tests are sensitive, every care shall be taken to conduct this test totally in compliance with procedure mentioned in IS: 1199.
- 5.8.12.1.3.5** Laboratory tests for determining compacting factor of concrete shall be done as per manufacturer's requirement for establishing and controlling the design mix of concrete.
- 5.8.12.1.3.6** Compacting factor test shall not be taken as acceptance criteria and shall be treated only as a guide line to workability of concrete.

5.8.12.1.4 CONSISTENCY OF CONCRETE

- 5.8.12.1.4.1** This test shall be performed only at the batching plant laboratory using a Vee-Bee consistometer for determining and predicting the slump of concrete. Number and frequency of these tests shall be based on requirements of the manufacturer of concrete. Care shall be taken in producing mix design of required characteristic strengths of concrete within limits of Vee-Bee – Degree between 1.6 and 4.5 for concrete transported and placed by normal methods and between 0.8 and 3.5 for concrete transported and placed by pumping methods.

5.8.12.1.5 WEIGHT, CEMENT FACTOR AND AIR CONTENT TEST

- 5.8.12.1.5.1** If directed by Engineer-in-Charge freshly mixed concrete for every type shall be tested in the batch plant laboratory for each batch of concrete produced to determine weight per cubic metre

of freshly mixed concrete, cement factor in concrete and the air content of the concrete. Frequency and number of test shall be finalized by the manufacturer of concrete in consultation with the Engineer In-Charge for his requirement on the mode of measurement of concrete produced.

5.8.12.1.6 The Engineer-in-Charge may at his discretion require further tests over and above those specified above in para 5.8.12.1.1 to be conducted on fresh concrete. The manufacturer and the placement contractor shall have to comply with all such requirement.

5.8.12.2 HARDENED CONCRETE

5.8.12.2.1 For quality control a strict check on the strength of concrete shall be maintained along with other filed requirements such as workability, consistency, slump etc., mentioned in para 5.8.12.1.1 above.

5.8.12.2.2 Acceptability criterion of concrete as specified in para 5.8.1.5, shall only be applicable.

5.8.12.2.3 Test on cube crushing strength of concrete in accordance and compliance with IS:456 and IS:516 shall be done as under:

- 1) Samples of fresh concrete shall be taken from concrete at central batch plant mixer while loading delivery trucks or other transport and also from concrete transported to placement location.
- 2) Test on specimens made from samples collected at placement location shall be considered strength. Test in specimens made from samples at the batch plant shall only be taken as guide lines test. Only in the case of doubtful result, the Engineer-in-Charge may refer to such guide lines results for deciding on the quality of concrete.
- 3) For truck mix concrete and shrink mix concrete guide line test specimens shall be made from samples collected at discharge location from mixing trucks. For this purpose first and last 15% of the load shall be omitted while collecting samples.
- 4) Frequency of sampling shall be as given below in Table below for each grade of concrete of different workability and for each type of specimens (field test specimens and guideline test specimens) for conducting 28 days crushing strength tests.

TABLE

Quantity of concrete Delivered (cum)	Number of Samples
Less than 5	1
6 to 15	2
16 to 30	3
31 to 50	4
51 and above	4 plus one additional samples for each additional 15 cum or part thereof

Each sample shall be of adequate quantity so that a minimum of 3 specimen cubes can be made for the test of the sample in accordance with IS: 516.

5) All test specimens shall be made compacted cured and tested in compliance with IS: 516 and test results interpreted in accordance with IS: 456. For acceptance of concrete strength, field specimens test results shall not be less than values given in table above (Characteristic compressive strength compliance requirement).

6) In addition to 28 days crushing strength test on specimens made at frequencies specified in para 4 above, early strength tests at 7 days shall also be conducted on field specimens as well as guide line test specimens. Frequency of sampling for this set of test shall also be same as those specified earlier Table above. 7-day strengths also shall conform to values given in Table for the same above. But these test results even if conforming to specified

values shall only be taken as guide line values for projecting concrete strength and shall not be construed as conforming to specifications.

- 7) For each grade of concrete and for all workability conditions with different water – cement ratios and compositions of admixtures, preliminary test shall be conducted for crushing strengths on finalization to design mix for each type of concrete. Such tests shall be conducted both at 7 days and 28 days under laboratory conditions. Six test specimens shall be made for 7 days test and six test specimens shall be made for 28 days test.

Average of the six test results of different periods shall not be less than those specified above.

- 8) Crushing strengths on cubes shall also be conducted during the process of finalisation of concrete design mix. Frequency and number of such tests shall be as per requirement of concrete manufacturer.
- 9) All test specimens for conducting crushing strength shall be properly labeled for identification indicating:
 - ❖ Date of making specimen
 - ❖ Grade of concrete
 - ❖ Placement location exact
 - ❖ Purchasers order number
- 10) In addition to crushing strength test on concrete, the Engineer-in-Charge may call for other tests on hardened concrete. The placement contractor and the manufacturer of concrete shall comply with all such instructions.

5.8.12.2.4 NON-DESTRUCTIVE TEST

- 5.8.12.2.4.1** When the 28 days crushing values on field specimens and /or specimens made for guideline test fall short of specified values, or in case of doubtful placement of concrete, the Engineer-in-Charge shall call for non-destruction tests on the structure. Such tests may be any one or a combination of the following:

- ❖ Rebound hammer test
- ❖ Windsor penetration probe test
- ❖ Pulse velocity (Sonic or Ultrasonic) test
- ❖ Core test
- ❖ Load test

- 5.8.12.2.4.2** Interpretation of rebound hammer, Windsor Probe and Pulse velocity test results shall rest with the Engineer-in-Charge.

- 5.8.12.2.4.3** Core test, if ordered by the Engineer In-charge, shall be done in accordance with IS: 516 samples for such test shall be taken from locations to be identified by the Engineer-in-Charge and such samples shall be collected in compliance with IS: 1199.

- 5.8.12.2.4.4** If felt necessary, the Engineer-in-Charge may instruct load testing for any part of the structure based on doubtful concrete strengths. Such test shall be carried out as per details to be provided by the Engineer-in-Charge in consultation with the structural consultants.

- 5.8.12.3** Unless otherwise specified in contract, the concrete manufacturer/ concrete placement contractor shall arrange for all test to be conducted in accordance with these specifications, including all necessary tools, plants, equipments and material, and shall be responsible

- 5.8.12.4** All test conducted at the field laboratory shall be carried out by qualified technicians employed by the concrete manufacturer/concrete placement contractor, in presence of authorized representative of the Engineer-in-Charge. All test reports and observation reports shall be jointly signed by the Engineer -in-charge or his authorized representative and the technician conducting such test.

- 5.8.12.5** Engineer-in-Charge shall alone decide where such tests are to be conducted. He may instruct tests to

be conducted at laboratories other than the field laboratory and such instructions shall be followed without claiming extra charges on this account.

5.8.12.6 When directed by Engineer In-Charge, the concrete Manufacturer/Placement contractor shall set up a laboratory at this own expense which shall have facilities, for conducting all necessary field test on materials and field and laboratory test on concrete. The laboratory shall be staffed by the concrete Manufacturer/Placement Contractor with qualified and experienced scientists and technicians.

5.8.12.7 Special Care with respect to centering / formwork in case of RMC Apart from attending to all the requirements of formwork detailed under RCC chapter, while RMC is being used special additional care shall be taken to ensure that form work is adequately strong for receiving RMC by pumping. While concreting it should be ensured that dumping of large quantities of concrete at the mouth of delivery pipe for subsequent spreading should be avoided as the centering / formwork might not have been designed for this additional load of dumping concrete at one point. As far as possible uniform spreading of concrete over the entire area shall be ensured to avoid unintended additional loads at random locations.

5.10 VACUUM DEWATERED CONCRETE

5.10.1 The concrete from which the excess water, not required for hydration is extracted, by vacuum process, when the concrete is freshly laid and consolidated is known as vacuum dewatered concrete (VDC).

5.10.2 In addition to the specification with respect to concrete works, concrete pavement works, stipulated in this booklet, following specific requirements shall be ensured when attending to VDC works.

5.10.3 The water cement ratio adopted in concrete based on workability consideration will always be more than the minimum water content required for full hydration of cement. This excess water is not required once the concrete is mixed, laid and consolidated. This water is extracted from concrete by application of vacuum process at the surface of the concrete. Approximately 20% to 25% of water from the concrete may be removed by this process and this results in settlement of the concrete to the extent of about 3% of the depth over which the suction acts. Power troweling will be done to the surface of VDC. This reduction in water cement ratio and power troweling will increase the strength of concrete, improve wear resistance, imparts high abrasion value, ensure rapid stiffening of concrete, enabling early usage of the area.

VDC are generally used where high strength floors, concrete roads and pavements' are required with high abrasion value and wear resistance. Due to its high impermeability it may be used where impermeable concrete is required.

There shall be a base leveling concrete for VDC for floor, road and pavements etc.

Based on design consideration and effective. depth of suction the thickness of VDC slabs shall be decided.

The VDC are to be laid in alternate panels. The size of the panel is guided by length of the screed vibrator which is generally 4 m long. The base concrete where VDC to be laid shall be cleaned and M.S channel forms are to be fixed in panels of suitable sizes keeping the top level of the channel in level with top of VDC. The reinforcement shall be placed in position with covers at top, bottom and around as specified. All embedments, requirement of construction joint, expansion joints etc. to be attended. There on the design mix concrete of approved grade shall be uniformly poured into the form/panel and leveled. The concrete shall be vibrated by poker vibrator for proper consolidation. There 'on surface vibration of the concrete shall be done using double beam screed broad motor guided vibrator moving along the M.S. channels. Over this vibrated concrete surface a bottom sieve mat has to be placed to act as a fine filter bed to prevent removal of cement together with water during extraction of excess water by vacuum dewatering process. A porous mat connected to a vacuum pump is placed over the sieve mat and dewatering of concrete is done with vacuum pump of appropriate capacity. A Vacuum of 0.8 Mpa is applied for a period of about 15 to 20 minutes. The extracted water

may be collected to broadly cross check that adequate water is still retained in the concrete for full hydration.

The process of dewatering leaves a few voids behind on the concrete surface. Hence poker vibrator shall be gently applied again as may be required. Thereon a power trowel fitted with circular disc shall be applied judiciously to get a level hard top surface. Finally the power trowel with adjustable plates shall be operated over the concrete surface for obtaining perfect finish to the VDC surface.

With respect to curing, provision of construction joints, expansion joints, removal of form work and all other related works the relevant specification under concrete; RCC; concrete pavement concrete flooring etc in this booklet shall hold good for VDC also.

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NOTES ON REINFORCED CEMENT CONCRETE WORKS: Only coarse river sand shall be used in all RCC works. Fly ash of approved source shall confirm the relevant IS code.

ITEM Sr. No. 12

Providing and laying in position REINFORCED CEMENT CONCRETE of Grade RCC 1:1.5:3 using graded hard stone aggregate of 20mm nominal size obtained from approved quarry including mechanical mixing, vibrating, compaction, finishing, curing, etc; complete all as per specifications but excluding the cost of form works and steel reinforcement. (Rate to include labour for keeping embedments if any, wherever required while casting). Mix ratio is specified is for (cement: coarse sand: graded stone aggregate) up to SUPER STRUCTURES FOR ALL HEIGHTS /ALL LEVELS/ALL FLOORS on EXISTING WALLS. In walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers,

abutments, posts and struts, etc.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – E.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section E. The rate shall be for a unit of one cubic meter.

**SECTION – F
FORM WORK**

5.2 FORM WORK (CENTRING & SHUTTERING)

5.2.1 FORM WORK

Form work shall include all temporary or permanent forms or mould required for forming the concrete which is cast-in-situ, together with all temporary construction required for their support.

5.2.2 DESIGN & TOLERANCE IN CONSTRUCTION

Form work shall be designed and constructed to the shapes, lines and dimensions shown on the drawings with the tolerance given below:

Deviation from specified dimension of cross section of columns +12mm and beams 6mm

- I. Deviation from dimensions of footings Dimension in plan +50mm
12mm
- II. Eccentricity in plan 0.02 times the width of the footings in the direction of deviation but not more than 50 mm
- III. Thickness
+ 0.05 times the specified thickness.

(**Note:** Tolerance apply to concrete dimensions only, and not in positioning of vertical steel dowels.)

5.2.3 GENERAL REQUIREMENT

It shall be strong enough to withstand the dead and live loads and forces caused by ramming and vibrations of concrete and other incidental loads, imposed upon it during and after casting of concrete. Shall be made sufficiently rigid by using adequate number of ties and braces, Screw jacks or hard board wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete.

Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections. Care shall be taken to see that no piece is keyed into the concrete.

5.2.3.1 MATERIALS FOR FORM WORK

(a) Propping and Centering

All propping and centering should be either of steel tubes with extension pieces or built up sections of rolled steel.

5.2.3.2 CENTRING/STAGING

(a) Staging should be as designed with required extension pieces as approved by Engineer In-Charge to ensure proper slopes, as per design for slabs/beams etc. and as per levels as shown in drawings. All the staging to be either of Tubular steel structure with adequate bracings as approved or made

of built up structural sections made from rolled structural steel sections.

- (b) In case of structures with two or more floors, the weight of concrete, centering and shuttering of any upper floor being cast shall be suitably supported on one floor below the top most floor already cast.
- (c) Form work and concreting of upper floor shall not be done until concrete of lower floor has set at least for 14 days.

5.2.3.3 SHUTTERING

Shuttering used shall be of sufficient stiffness to avoid excessive deflection and joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer-in-Charge shall be provided in the joints.

Steel shuttering used for concreting should be sufficiently stiffened. The steel shuttering should also properly repaired before use and properly cleaned to avoid strains, honey combing, seepage of slurry through joints etc.

- (a) Runner Joists: RSJ, MS Channel or any other suitable section of the required size shall be used as runners.
- (b) Assembly of beam head over props. Beam head is an adopter that fits snugly on the head plates of props to provide wider support under beam bottoms.

5.2.3.4 Form work shall be properly designed for self-weight. Weight of reinforcement, weight of fresh concrete and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment). In case the height of centering exceeds 3.50 meters, the prop may be provided in multi-stages.

5.2.3.5 CAMBER

Suitable camber shall be provided in horizontal members of structure especially in cantilever spans to counteract the effect of deflection. The form work shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per meter (1 to 250) or as directed by the Engineer-in-Charge so as to offset the subsequent deflection. For cantilevers the camber at free end shall be 1/50th of the projected length or as directed by the Engineer-in-Charge.

5.2.3.6 WALLS

The form faces have to be kept at fixed distance apart and an arrangement of wall ties with spacer tubes or bolts are considered best. The two shutters of the wall are to be kept in place by appropriate ties, braces and studs.

5.2.3.6.1 REMOVAL OF FORM WORK (STRIPPING TIME): In normal circumstances and where ordinary Portland cement is used, forms may generally be removed after the expiry of the following periods subject to prior approval of Engineer-In-charge:

Type of Formwork		Minimum Period Before Striking Formwork
(a)	Vertical formwork to columns, walls, beams	16-24 h
(b)	Soffit formwork to slabs (Props to be refixed Immediately after removal of formwork)	3 days
(c)	Soffit formwork to beams (Props to be refixed Immediately after removal of formwork)	7 days
(d)	Props to slabs: Spanning up to 4.5m Spanning over 4.5m	7 days 14 days
(e)	Props to beams and arches:	

Spanning up to 6m	7 days
Spanning over 6m	21 days

Note 1: For other types of cement, the stripping time recommended for ordinary Portland cement may be suitably modified. If Portland pozzolana or low heat cement has been used for concrete, the stripping time will be 10/7 of the period stated above.

Note 2: The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slabs, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

Note 3: For rapid hardening cement 3/7 of above periods will be sufficient in all cases except for vertical side of slabs, **beams** and columns which should **be** retained for atleast **24** hours.

Note 4: In case of cantilever slabs and beams, the centring shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength.

Note 5: Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all types of cement in cold weather and accordingly stripping time shall be increased.

Note 6: Work damaged through premature or careless removal of forms shall be reconstructed.

5.2.4 SURFACE TREATMENT

5.2.4.1 OILING THE SURFACE

Shuttering gives much longer service life if the surfaces are coated with suitable mould oil which acts both as a parting agent and also gives surface protections.

A typical mould oil is heavy mineral oil or purified cylinder oil containing not less than 5% pentachlorophenol conforming to IS: 716 well mixed to a viscosity of 70-80 centipoise.

After 3-4 uses and also in cases when shuttering has been stored for a long time, it should be recoated with mould oil before the next use.

5.2.4.2 The design of form work shall conform to sound Engineering practices and relevant IS codes.

5.2.5 INSPECTION OF FORM WORK

The completed form work shall be inspected and approved by the Engineer In-Charge before reinforcement bars are placed in position.

Proper form work should be adopted for concreting so as to avoid honey combing, blow holes, loss, stains or discolouration of concrete etc. Proper and accurate alignment and profile of finished concrete surface will be ensured by proper designing and erection of form work which will be approved by Engineer-in-charge.

Shuttering surface before centering should be free from any defect/deposits and fully cleaned so as to give perfectly straight smooth concrete surface. Shuttering surface should be therefore checked for any damage to its surface and excessive roughness before use.

5.2.5.1 ERECTION OF FORM WORK (CENTERING AND SHUTTERING) following points shall be borne in mind while checking during erection.

- (a) Any member which is to remain in position after the general dismantling is done, should be clearly marked.
- (b) Material used should be checked to ensure that, wrong items/rejects are not used.
- (c) If there are any excavations nearby which may influence the safety of form works, corrective and strengthening action must be taken.
- (d)
 - I. The bearing area must be hard surface like PCC and the sole plates shall bear well on this hard surface.
 - II. Sole plates shall be properly seated on their bearing pads or sleepers.
 - III. The bearing plates of steel props shall not be distorted.

IV. The steel parts on the bearing members shall have adequate bearing areas.

- (e) Safety measures to prevent impact of traffic, scour due to water etc., should be taken. Adequate precautionary measures shall be taken to prevent accidental impacts etc.
- (f) Bracing, struts and ties shall be installed along with the progress of form work to ensure strength and stability of form work at intermediate stage. Steel sections (especially deep sections) shall be adequately restrained against tilting, overturning and formwork should be restrained against horizontal loads. All the securing devices and bracing shall be tightened.
- (g) The stacked materials shall be placed as catered for, in the design.
- (h) When adjustable steel props are used, they should:
 - 1. be undamaged and not visibly bent.
 - 2. have the steel pins provided by the manufacturers for use.
 - 3. be restrained laterally near each end.
 - 4. have means for centralising beams placed in the forkheads.
- (i) Screw adjustments of adjustable props shall not be over extended.
- (j) Double wedges shall be provided for adjustment of the form to the required position wherever any settlement/elastic shortening of props occurs. Wedges should be used only at the bottom end of single prop. Wedges should not be too steep and one of the pair should be tightened/clamped down after adjustment to prevent their shifting.
- (k) No member shall be eccentric upon vertical member.
- (l) Props shall be directly under one another in multistage constructions as far as possible.
- (m) Guy ropes or stays shall be tensioned properly.
- (n) For form work of span exceeding 4.5m and/or height exceeding 3.75m shall be designed and approval of Engineer-in-Charge in writing shall be obtained.
- (o) Whenever proprietary form work are intended to be used, all the requisite technical information should be obtained from the manufacturers beforehand.

5.2.6 MEASUREMENTS

5.2.6.1 The form work shall include the following:

- (a) Splayed edges, notchings, allowances for overlaps and passing at angles, sheathing battens, strutting, bolting, nailing, wedges, easing, striking and removal.
- (b) All supports, struts, braces, wedges, piles or other suitable arrangements to support the form work.
- (c) Bolts, wireties, clamps, spreaders, nails or any other items to hold the sheathing together.
- (d) Working scaffolds, ladders, gangways and similar items
- (e) Filletting to form stop chamfered edges of splayed external angles not exceeding 20mm wide to beams, columns and the like
- (f) Where required temporary openings provided in the forms for pouring concrete, inserting vibrators and cleaning holes for removing rubbish from the interior of the sheathing before pouring concrete
- (g) Dressing with oil to prevent adhesion and
- (h) Raking or circular cutting.
- (i) Making necessary grooves, ghis using 10 mmX10 mm PVC battens of Accucell, cut-outs, pockets and drip moulds (grooves) .if the grooves, ghis ,drip-mould (groove) are not provided during execution the same shall be carried out by cutting with concrete cutter & finishing smooth /rendering at no extra cost as per the instruction and approval of EIC..

5.2.6.2 CLASSIFICATION OF MEASUREMENTS

Where it is stipulated that the form work shall be paid for separately measurements shall be taken of the area of shuttering in contact with the concrete surface. Dimensions of the form work shall be measured correct to a cm.

5.2.6.3 Centring and shuttering where exceeding 3.5 metre height in one floor shall be measured and paid separately unless otherwise stated in work order.

5.2.6.4 Where it is not specifically stated in the description of the item that form work shall be paid for separately, the rate of the RCC item shall be deemed to include the cost of form work.

5.2.6.5 No deductions from the shuttering due to the openings obstructions shall be made if the area of such openings/obstructions does not exceed 0.1 square metre. Nothing extra shall be paid for forming such openings.

5.2.6.6 The net area of exposed surface of concrete members as shown in drawings coming in contact with form work shall be measured under item of formwork in square meters.

5.2.6.7 All temporary formwork such as bulk heads, stop boards provided at construction joints which are not shown in the drawings shall not be measured.

5.2.7 **RATE:** The rate shall include the cost of erecting, centering, shuttering materials, transport, deshuttering and removal of materials from site and labour required for all such operations etc.

NOTES ON FORM WORKS: Rates for all form work items to include staging as may be necessary from FFL. (Finished Floor Level) of ground floor (in case of basement from FFL of basement) or NGL (Natural Ground Level)

ITEM Sr. No. 14

Providing rigid and water tight centring and shuttering using best quality wood/ plywood/ steel forms and centring with steel props, acro tubes etc., including strutting, propping, bracing, staging etc., complete for all RCC items fixed in position as required including labour for careful removal of form work etc., complete all as per specifications at all heights. In Horizontal / Vertical/ slanting surfaces. Lintels, coping / Beams, Plinth Beams, Girders, Bressumers and cantilevers.

1.0 Materials & Workmanship:

Materials & Workmanship is as per described in above section – E.

2.0 Mode of measurement and Payment

The measurement shall be taken as mentioned above in Section E. The rate shall be for a unit of one square meter.

SECTION – G Miscellaneous work

ITEM Sr. No. 15

Providing & Fixing with 0.6mm thick G.I. corrugated sheets of size 300 mm wide for the full height of the compound wall from the existing ground level up to 4.5m height, to cover the Expansion joints gaps (from Inside face) between Random Rubble Masonry of existing Compound wall along the periphery of the Institute's campus.

The rate should be quoted for per square meter of GI Sheet and should be inclusive of cutting the G.I. sheets, making holes and fixing as shown in drawing (Including necessary tools/ tackles, and scaffolding, wastage etc.) and necessary cleaning of expansion joints, including removing of blockages (if any) thermocol etc., complete all as directed by the Engineer-in-charge.

Note: Only the clear Plan area in square meter of the GI sheet shall be measured and paid.

A. Materials & Workman Ship

As per Item Sr. No.15

B. Mode of measurement and Payment

The measurement shall be taken in Square Meter.

Note:

1. Wastage will not be measured & paid.
2. Note: Only the clear Plan area in square meter of the GI sheet shall be measured and paid.

Item Sr. No. 06

Dismantling of existing barbed wire or flexible wire rope from the existing Y angle fencing over the existing compound wall upto 6m high including making rolls and stacking and submitting the same to the stores IPR at a location within the Institute Campus as directed by EIC.

A. Materials & Workman Ship

As per Item Sr. No.06

The dismantled existing barbed wires should be stacked and submitted to stores IPR as per the instruction of Engineer-In-Charge.

B. Mode of measurement and Payment

The measurement shall be taken in Kilo Grams. The rate shall be for a unit of one Kilo Grams.

ITEM Sr. No. 11

Shifting of Existing gates(4nos of wicket gates at location as per drawing) from the existing location on the pathway to another location adjacent to pathway beside the compound wall, including dismanteling, excavation , removing the support post , and excavating at new location, erecting and filling with cement concrete to hold in postion , and all necessary to complete the job. The rate to include the cost of cement concrete 1:3:6, tools and tackles complete as per direction and instruction of Engineer in charge.

A. Materials & Workman Ship

As per Item Sr. No.11

B. Mode of measurement and Payment

The measurement shall be taken in a Complete Job as mentioned in the above Sr.no. 11. The rate shall be for a complete job.

ITEM Sr. No. 17

Providing and applying 3.0 mm thick epoxy self-smoothing flooring as per manufacturer specification of M/s Fosroc, on concrete surface. Carrying out necessary surface preparation, including grinding (if required) of concrete surface, proper cleaning, removing of loose materials, repairing of construction joints using epoxy putty, application of Nitoprime 25-epoxy penetrating primer for concrete surface, using brush or roller, allow to become touch dry depending upon temperature, mixing all components of Nitoflor SL 3000 – Heavy duty flow applied epoxy resin based floor topping using slow speed drill and poured prepared screed surface at 3.0 mm DFT, and levelling the material using serrated trowel and rolling the same with spiked nylon roller to remove slight trowel marks and entrapped air from the material etc. complete including all tools and tackles as per manufacturer's specification. Complete at all level at all floor, complete as per Instruction and Direction of Engineer-In-charge

Note: The vata of 150mm on the vertical wall (all around) surface should also be applied with the same chemical in two coats using brush. The measurement of same shall be considered in sqm along the floor measurement and paid accordingly.

NOTE: (1) The contractor shall prepare a sample and get it approved by the department free of cost. After approval the work shall be carried out. The sample work shall be carried out well in advance and got approved. (2) All laying procedures should conform to manufacturers specifications which may have to be got approved from EIC before starting the work. (3) The work must be carried out only by an authorised applicator firm, who have the experience of having carried out similar works satisfactorily and only after his specific approval, the work shall be executed.

A. Materials & Workman Ship

As per Item Sr. No.17 material should be confirmed to material manufacture's specification.

Workmanship:

The epoxy coating should be carried out as per the details mentioned above, also the floor should be perfectly levelled after execution of the epoxy flooring work.

B. Mode of measurement and Payment

The measurement shall be taken in Square Meter. The rate shall be for a unit of one Square Meter.

SECTION: 7
SCHEDULE OF CONSTRUCTION WORK

SECTION - 7 - SCHEDULE OF CONSTRUCTION WORK

Sr. No.	Item Description	1				2				3			4				Remarks	
		1-W	2-W	3-W	4-W	5-W	6-W	7-W	8-W	9-W	10-W	11-W	12-W	13-W	14-W	15-W		16-W
	Miscellaneous works (Providing and fixing Concertina Coil & Chain link Fencing on existing Compound wall, Epoxy flooring and allied works) at IPR campus Bhat, Gandhinagar																	
1	Epoxy Flooring Works																	
1a	Procurement of material																	
1b	Execution and Completion of entire works																	
2	Increase in height of compound wall at specified locations as per drawing.																	
2a	Mobilization of Materials																	
2b	Execution of Work.																	
3	Closing of Expansion Joint in compound wall.																	
3a	Mobilization of Materials																	
3b	Execution of Work.																	
4	Providing and Fixing Concertina Coil and Chain Link Fencing																	
4a	Execution of sample work for approval																	
4b	Procurment of material																	
4c	Execution of Entire work																	
4d	Removing of barbed wire over the Y angle and handing over to stores IPR																	
5	Other allied works and Completion																	