



Government of Maharashtra, India

Public Works Department

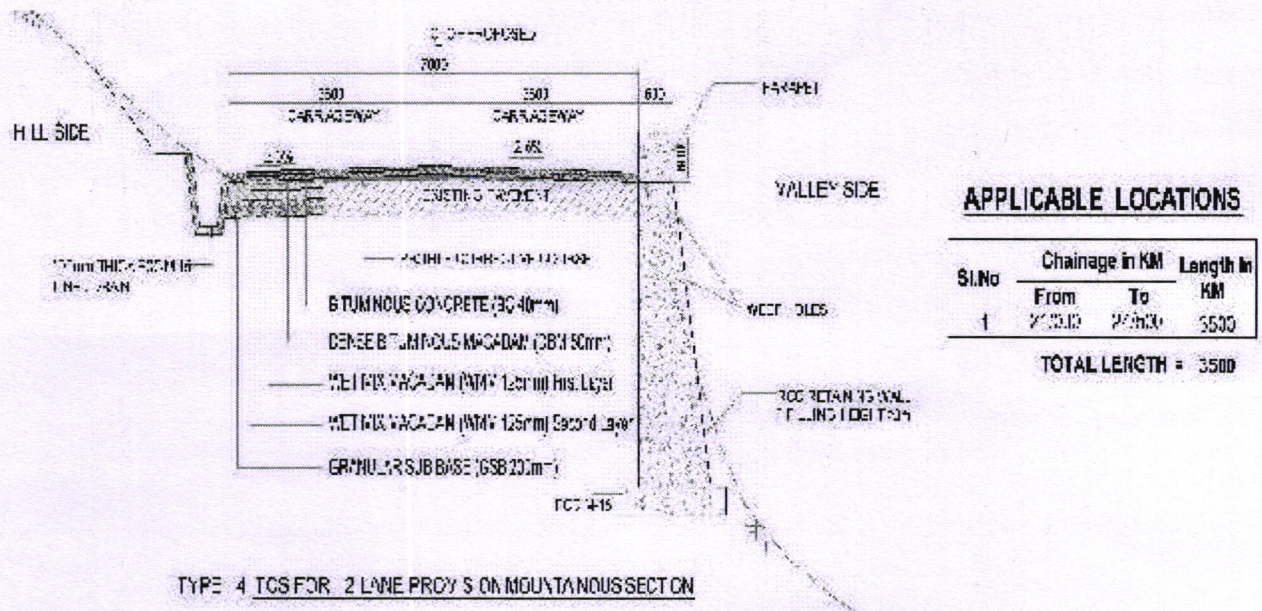
Improvement to Phaltan, Pusegaon, Aundh, Gopuj, Nimsod, Mhasurne Road SH-147 Km 0/000 to 89/000 Dist Satara (Part I- Phaltan to Pusegaon Km 0/000 to Km 47/000) under Maharashtra Road Improvement Programme - MRIP under Hybrid Annuity Mode- PN39

MAIN REPORT

DECEMBER 2017



SHRIKHANDE
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PROPOSED CROSS SECTION

Widening to 2 Lane with Paved Shoulder

9.3 Pavement

9.3.1 Flexible Pavement

Flexible pavement is designed for project road as per IRC-37-2012. All layers of pavement both bituminous and granular are designed for full design life of 15 years as the traffic volume is minimum. Details of pavement design along with calculations are given in Design Report (Vol-II). Following are salient features of Flexible pavement design.

- PN39**
1. Design Life-15Years
 2. Traffic MSA-2MSA
 3. CBR of soil -9%
 4. Carriage way-Two Lane Undivided

Values of lane distribution factors and Vehicle Damaging factor are taken as per IRC and as analyzed. Summary of design flexible pavement is given as under

- Subgrade-500mm (CBR 10%Min)
- Granular Sub Base (GSB) -200mm (Grading-IV)
- Wet Mix Macadam (WMM) - 250mm
- Dense Bituminous Macadam (DBM) -50mm

- Bituminous Concrete(BC) -40mm

9.3.2 Overlay Design

Overlay design has been carried out as per IRC 81;

Following is the over lay design for both stretches

- a) From Phaltan to Mhasurme -50mmDBM+40mmBC+profile correction in DBM

2. Rigid Pavement

Rigid pavement has been designed as per IRC 58

Concrete pavement is proposed in village portions. Following is the summary of concrete pavement in villages.

- Sub grade -500mm (CBR 10%Min)
- Granular Sub Base (GSB) -200mm (Grading-V)
- Dry Lean Concrete (DLC) -100mm
- Pavement Quality Concrete (PQC) - 250 mm

Detail Design is attached in the design report.

9.4 Geometric Design

Geometric design of project road is done as per guidelines of IRC-73. Horizontal curves are designed with largest radius possible. Curve radius in general is larger than minimum requirement of IRC. However, at various places such as inside the villages, ghat sections and so on small radius curves have been designed. It is proposed that measures of speed restrictions shall be placed at such locations.

Maximum super elevation is limited to 7%. Proper transition curves are provided on both flanks of horizontal curves but it was not possible to do so with curve at smaller radius . . At sharper curve where radius is less than 300m, additional widening of pavement is proposed. In built up areas normal camber would be provided.

It has been tried to keep proposed centerline as close as possible to existing centerline to economize the design and cost. Details of geometric design is given in Design Report-Vol-II.

राज्यातील रस्ते (रस्ते व पुल) यांची सुधारणा Hybrid Annuity तत्वावर करणेबाबत.

महाराष्ट्र शासन

सार्वजनिक बांधकाम विभाग

शासन निर्णय क्र. योजना २०१६/प्र.क्र.१६५/नियोजन - १अ

मादाम कामा मार्ग, हुतात्मा राजगुरु चौक,

मंत्रालय, मुंबई - ४०० ०३२.

दिनांक : २९ नोव्हेंबर, २०१६

वाचा : केंद्र शासनाचे परिपत्रक्र क्र. NH-२४०२८/१४/२०१४-H (Vol -II), दि. ९ फेब्रुवारी, २०१६.

प्रस्तावना :

राज्यात सुमारे ३ लाख कि.मी. लांबीचे राष्ट्रीय महामार्ग, प्रमुख राज्य मार्ग, राज्य मार्ग, प्रमुख जिल्हा मार्ग, इतर जिल्हा मार्ग व ग्रामीण रस्त्यांचे जाळे आहे. त्यापैकी सार्वजनिक बांधकाम विभागाच्या अखत्यारित सुमारे ९०,६०८ कि.मी. इतक्या लांबीचे प्रमुख राज्य मार्ग, राज्य मार्ग, प्रमुख जिल्हा मार्ग आहेत. सदर रस्त्यांची देखभाल दुरुस्ती तसेच नुतनीकरण योजनांतर्गत व योजनेतर निधीतून करण्यात येते. या रस्त्यांचे नुतनीकरण दर ५ वर्षांनी करणे आवश्यक आहे. रस्त्यांवर दिवसेंदिवस वाहनांची संख्या व त्यात अवजड वाहनांची संख्या मोठ्या प्रमाणावर वाढत आहे. त्यामुळे रस्त्यांची अवस्था वाईट झाली आहे.

सार्वजनिक बांधकाम विभागामार्फत सद्या EPC (Engineering procurement construction) सुधारणा कामांचे कंत्राट देण्यात येते. या पद्धतीत कामाच्या कालावधीतच कंत्राटदाराला संपूर्ण रक्कम अदा करण्यात येते. तथापि पुरेश्या निधी अभावी अनेक रस्त्यांची देखभाल दुरुस्ती व नुतनीकरणाची कामे करता येत नाहीत. राज्यातील रस्त्यांचा सर्वांगीण विकास करण्याकरीता मोठ्या प्रमाणात रस्ते सुधारणा करण्याकरीता केंद्र शासनाच्या Hybrid Annuity Model धर्तीवर राज्यात Hybrid Annuity योजना कार्यान्वित करण्याची बाब शासनाच्या विचाराधीन होती.

शासन निर्णय :

राज्यातील रस्त्यांच्या सर्वांगीण विकासाकरीता सन २०१६-१७ पासून पुढील दोन वर्षाकरीता सार्वजनिक बांधकाम विभागाच्या अखत्यारितील ९० हजार कि.मी. इतक्या लांबीच्या रस्त्यांपैकी १०,००० कि.मी. लांबीच्या रस्त्यांची सुधारणा करण्याकरीता केंद्र शासनाच्या Hybrid Annuity Model धर्तीवर राज्यात Hybrid Annuity योजना कार्यान्वित करण्यास शासन मान्यता देण्यात येत आहे .

२. सदर योजना मार्च, २०१७ पासून कार्यान्वित होईल. प्रत्यक्ष बांधकामाचा कालावधी (Construction Period) २ वर्षे राहील. यामध्ये शासनाचा सहभाग ४०% म्हणजे रु.१२००० कोटी व खाजगी सहभाग ६०% म्हणजे रु.१८००० कोटी इतका राहील.

३. Hybrid Annuity योजना खालीलप्रमाणे राहील.

१. निविदा निश्चितीसाठी केंद्र शासनाच्या MORTH व NHA यांच्या कार्यपद्धतीचे काटेकोरपणे पालन करण्यात येईल.
२. एकूण प्रकल्प किंमतीच्या ४०% रक्कम उद्योजकाला पाच समान हप्त्यात बांधकामाच्या कालावधीत अदा करण्यात येणार आहे.
३. सुरवातीला उद्योजकाला उर्वरित ६०% रक्कम समभाग व कर्जाद्वारे उभारून प्रकल्प बांधकाम कालावधीत पूर्ण करावयाचा आहे.

४. उद्योजकाला प्राधिकार्याने दर सहा महिन्याला उर्वरित ६०% पैकी ठराविक रक्कम प्रकल्पाच्या पूर्ततेनंतर अदा करण्यात येणार आहे.
५. ॲन्युईटीच्या रक्कमे बरोबर शिल्लक रक्कमेवर मिळणाऱ्या व्याजाची रक्कमही अदा करण्यात येणार आहे. या करीता व्याजाचा दर बँक दर + ३ % असा निश्चित केलेला आहे.
६. प्रकल्पाची किंमत महागाई निर्देशांकाशी जोडण्यात येऊन ती घाऊक बाजार मुल्यनिर्देशाक व ग्राहक मुल्यनिर्देशांकाच्या सरासरी इतकी असून त्याचे प्रमाण ७०:३० आहे.
७. प्रकल्पाच्या सवलत कालावधीमध्ये रस्त्यांच्या देखभाल व दुरुस्तीची जबाबदारी उद्योजकाची असणार आहे.
८. देखभाल व दुरुस्तीच्या खर्चाची देयके उद्योजकाने निविदेत भरलेल्या रक्कमेनुसार महागाई निर्देशांकाशी जोडल्याप्रमाणे प्राधिका-यामार्फत देण्यात येणार आहे.
९. सवलत कालावधी मध्ये प्रकल्प निहाय बांधकाम कालावधी आणि १५ वर्षांचा निश्चित कालावधीचा यांचा समावेश राहील.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेत स्थळावर उपलब्ध करण्यात आला असून त्याचा सांकेतांक २०१६११३०११५८०५५८१८ असा आहे. हा आदेश डिजिटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने

Prashant

Vinayakrao Patil

(प्रशांत पाटील)

अवर सचिव, महाराष्ट्र शासन

Digitally signed by Prashant Vinayakrao Patil
DN: c=IN, o=Government Of Maharashtra, ou=Public Works
Department, postalCode=400032, st=Maharashtra,
2.5.4.20=2b1bad66664b1e11e3bf66db1d526143e814db5f8c5
05422af66a5628314537e, cn=Prashant Vinayakrao Patil
Date: 2016.11.30 12:03:59 +05'30'

प्रति,

१. मा. राज्यपाल, महाराष्ट्र राज्य यांचे सचिव
२. मा. मुख्यमंत्री, महाराष्ट्र राज्य यांचे खाजगी सचिव
३. मा. मंत्री (सा.बां.) यांचे खाजगी सचिव, मंत्रालय, मुंबई
४. मा. मंत्री (वित्त व नियोजन) यांचे खाजगी सचिव, मंत्रालय, मुंबई
५. मा. राज्यमंत्री (सा.बां.) यांचे खाजगी सचिव, मंत्रालय, मुंबई
६. मुख्य सचिव यांचे सह सचिव, मंत्रालय, मुंबई
७. अ.मु.स. (नियोजन), यांचे स्वीय सहायक, नियोजन विभाग, मंत्रालय, मुंबई
८. अ.मु.स. (वित्त), यांचे स्वीय सहायक, वित्त विभाग, मंत्रालय, मुंबई.
९. मा. प्रधान सचिव, यांचे स्वीय सहायक सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई
१०. मा. सचिव (रस्ते), यांचे स्वीय सहायक सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई
११. मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग, सर्व
१२. मा. उप सचिव (रस्ते), यांचे स्वीय सहायक सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई.
१३. अधीक्षक अभियंता, सार्वजनिक बांधकाम मंडळ, सर्व
१४. निवडनस्ती - नियोजन - १अ, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई.

हायब्रीड ॲन्युईटी पध्दतीने रस्त्याची सुधारणा
करणेकरीता IRC:SP:७३ (२०१५) मधील
मार्गदर्शक तत्वांबाबत.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्र. योजना २०१६/प्र.क्र.१६५/नियोजन-१ अ
मंत्रालय, मुंबई - ४०० ०३२.
दिनांक : ०३ मे, २०१७

संदर्भ : शासन निर्णय क्र. योजना २०१६/प्र.क्र.१६५/नियोजन १अ, दि. २९ नोव्हेंबर, २०१६

प्रस्तावना :-

राज्यातील रस्त्यांचा सर्वांगीण विकास करण्याकरीता केंद्र शासनाच्या हायब्रीड ॲन्युईटी मॉडेल धर्तीवर राज्यात हायब्रीड ॲन्युईटी योजना कार्यान्वित करण्यास शासन निर्णय दि. २९ नोव्हेंबर, २०१६ अन्वये मान्यता देण्यात आली आहे. यास अनुसरून डिसेंबर, २०१६ च्या हिवाळी अधिवेशनामध्ये एकूण १९५ कामे अर्थसंकल्पित करण्यात आली आहेत. त्यानुसार या कार्यक्रमांतर्गत निवडण्यात आलेल्या रस्त्यांचे पेव्हड शोल्डर्ससह दुपदरीकरण करण्याचे निश्चित करण्यात आलेले आहे.

भारतीय रस्ते संस्था (IRC) द्वारे प्रकाशित केलेल्या IRC:SP:७३ (२०१५) नुसार पेव्हड शोल्डर्ससह दुपदरीकरण करावयाच्या रस्त्यांचे तांत्रिक मानके (specifications and standards) निश्चित करण्यात आलेले आहे. हायब्रीड ॲन्युईटी अंतर्गत निवडण्यात आलेल्या रस्त्यांची सुधारणा IRC:SP:७३ (२०१५) नुसार प्रस्तावित केली असता अतिरिक्त जागेकरिता भुसंपादन करण्याची आवश्यकता भासते आहे. भुसंपादन प्रक्रियेस लागणारा कालावधी, येणारा खर्च, कृषी जमिनीचे होणारे अकृषीकरण व जनसामान्यांचा असंतोष या बाबींचा विचार करता रस्त्यांची सुधारणा करण्यासाठी सार्वजनिक बांधकाम विभागाकडे उपलब्ध असलेल्या रस्ता हद्दीतील जागेतच प्रस्तावित काम करण्यात यावे असा विचार शासनाच्या विचाराधीन होता. त्या अनुषंगाने खालीलप्रमाणे मार्गदर्शक सुचना देण्यात येत आहेत.

शासन परिपत्रक :-

हायब्रीड ॲन्युईटी अंतर्गत निवडण्यात आलेल्या रस्त्यांची सुधारणा करण्याचे नियोजन करीत असतांना खाली नमूद केलेल्या बाबींचा अपवाद वगळता IRC:SP:७३ (२०१५) मध्ये नमूद करण्यात आलेल्या तांत्रिक मानकांचा अवलंब करावा.

१. शहर/गावाभोवती वळणमार्ग प्रस्तावित न करता गावातून जाणाऱ्या लांबीत उपलब्ध जागेतच ROW मध्ये Four Lane Divided Carriageway अथवा Two lane with paved shoulder प्रस्तावित करावा.
२. गावातून जाणाऱ्या लांबीत जागेच्या उपलब्धतेनुसार Central Median, Utility Corridor, Paved Shoulder यांची रुंदी जागेच्या उपलब्धतेनुसार मर्यादित करावी.

३. अपघातप्रवण स्थळांच्या जागा वगळता हायव्रीड ॲन्युईटी अंतर्गत रस्त्यांची कामे सा.बां. विभागाकडे उपलब्ध असलेल्या जागेतच करावयाचे नियोजन करावे.
४. वळणे (CURVES) संकल्पित करताना उपलब्ध जागेचा विचार करता वाहनांची किमान वेग मर्यादा (वेगमर्यादा मर्यादित करण्यासाठीच्या आवश्यक उपाययोजनांसह) Plain & Rolling Terrain साठी ४० कि.मी./तास व Mountainous & Steep Terrain साठी किमान वेगमर्यादा २० कि.मी./तास पर्यंत कमी करून वळणांचे संकल्पन करावे.
५. संकल्पित वाहनवेगानुसार आवश्यक sight distance उपलब्ध होत नसेल तर उपलब्ध sight distance चा विचार करून संकल्पित वेगमर्यादा (वेग मर्यादीत करण्यासाठीच्या आवश्यक उपाययोजनांसह) मर्यादित करावी.
६. Grade Change Point ची वारंवारता (frequency) ५० मीटरपर्यंत कमी करण्यास हरकत नसावी.
७. अरुंद पुलांवरील पुरामुळे वाहतुक अडथळ्याचे प्रमाण अनुज्ञेय असल्यास त्या पुलांची उंची कायम ठेवून रुंदीकरण करावे.
८. IRC:SP:७३ (२०१५) मधील तरतुदींचे अनुपालन करणे शक्य नसल्याबाबतची सविस्तर कारणमिमांसा साखळी क्रमांकासह स्वतंत्रपणे अभिलेखित करावी.
९. रस्त्याचे संकल्पन करताना flexible pavement चे संकल्पन १५ वर्षांसाठी करावे. तसेच ७ व्या वर्षी नुतनीकरणाची व १४ व्या वर्षी मजबुतीकरण व नुतनीकरणाची तरतूद करावी.

वरील परिपत्रकाची तात्काळ अंमलबजावणी करण्यात यावी.

सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आले असून त्याचा सांकेतांक २०१७०५०४१२४०२८४३१८ असा आहे. हे परिपत्रक डिजीटल स्वाक्षरी करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

Prashant

Vinayakrao Patil

(प्रशांत पाटील)

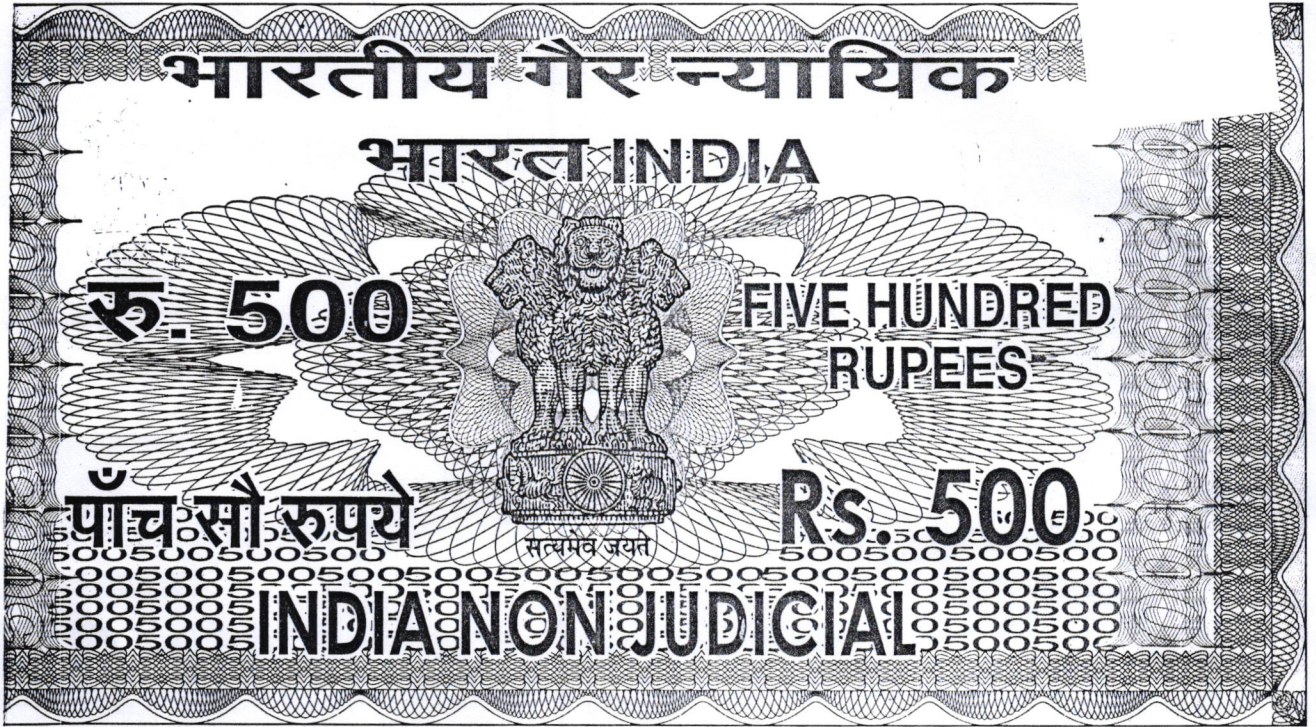
अवर सचिव, महाराष्ट्र शासन

Digitally signed by Prashant Vinayakrao Patil
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Patil
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प्रत,

१. सर्व मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग,
२. सर्व अधीक्षक अभियंता, सार्वजनिक बांधकाम मंडळ,
३. सर्व कार्यकारी अभियंता, सार्वजनिक बांधकाम विभाग,
४. निवडनस्ती, का.क्र. नियोजन -१

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20 JAN 2020

प्र. वि. मंडळ

CONCESSION AGREEMENT

THIS AGREEMENT is entered into on this the 20th January day of, 2020.

BETWEEN

The Principal Secretary, Public Works Department, Government of Maharashtra, having office at 6th Floor, Mantralaya, Fort, Mumbai – 411 032 (the "Authority") (hereinafter referred to as the "Authority" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns). Whereas, the Principle Secretary, Public Works Department, for the execution of the agreement has assigned the powers to the Executive Engineer, Public Works Division, Beed.

of One Part

Page

on of two-lanning with paved shoulders Road on AUX 10 in the State of Maharashtra under

Shreegan Infrastructure Pvt.Ltd

brid

Director

Director

EXECUTIVE ENGINEER
PUBLIC WORKS DIVISION, BEED.

Signature

AND

- 2 **Shegaon Infrastructure Private Limited**, a company incorporated under the provisions of the Companies Act, 2013 with CIN U45209MH2019PTC330763 and having its registered office at **598/1, Near Railway Colony, Raghuwanshi Nagar, Nandurbar-425412 (MH)** (hereinafter referred to as the "Concessionaire" which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns and substitutes) of the Other Part.

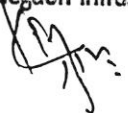
WHEREAS:

- (A) [The Government of Maharashtra has entrusted to the Authority] the development, maintenance and management of State Highway and Major District Roads in Maharashtra and upgradation to Two Lane with paved shoulders as per IRC standards wherever required. The Authority has resolved to augment the existing road, **Shedgaon Umapur Georai Talwada Majalgaon** from Km. 245/600 to 318/00 in Georai & Majalgaon talukas of Beed district section of SH-50 (Km. 268/400 to Km. 305/500) (hereinafter called the "AUX 10") in the state of Maharashtra by (Two Lane with Paved Shoulder thereof) along with (the "Project") on design, build, operate and transfer (the "DBOT " , "Hybrid Annuity") basis, which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be made by the Authority, in accordance with the terms and conditions to be set forth in a concession agreement to be entered into.
- (B) The Authority had adopted a single stage two envelope bidding process and accordingly invited proposals by its Request for Proposals dated 08.03.2019 (the "Request for Proposals" or "RFP") for qualification and short listing of bidders for construction, operation and maintenance of the above referred Project on Hybrid Annuity basis.
- (C) The Authority had prescribed the technical and commercial terms and conditions in the RFP, and invited bids comprising technical and financial bids from the bidders for undertaking the Project.
- (D) After evaluation of the bids received, the Authority had technically qualified certain bidders including, inter alia, the {the selected bidder/ consortium comprising Kalyan KETI Toll Infrastructure Pvt Ltd JV Dream Construction and (collectively the "Consortium") Kalyan KETI Toll Infrastructure Pvt Ltd as its lead member (the "Lead Member")} and accepted the financial bid of the {selected bidder/ Consortium} and issued its **Letter of Award No. OSP/PWC/Tender/4730 dated 26/08/2019** (hereinafter called the "LOA") to the {selected bidder/ Consortium requiring, inter alia, the execution of this Concession Agreement within 45 (forty five) days of the date of issue thereof.
- (E) {The selected bidder/ Consortium has since promoted and incorporated the Concessionaire as a limited liability company under the Companies Act 2013, and} has requested the Authority to accept the Concessionaire as the entity which shall undertake and perform the obligations and exercise the rights of the {selected bidder/ Consortium under the LOA,} including the obligation to enter into this Concession Agreement pursuant to the LOA for undertaking the Project.

- (F) {By its letter dated the Concessionaire has also joined in the said request of the selected bidder/ Consortium to the Authority to accept it as the entity which shall undertake and perform the obligations and exercise the rights of the selected bidder/ Consortium including the obligation to enter into this Concession Agreement pursuant to the LOA. The Concessionaire has further represented to the effect that it has been promoted by the selected bidder/ Consortium for the purposes hereof and has delivered to the Authority a legal opinion with respect to the authority of the Concessionaire to enter into this Concession Agreement and the enforceability of the provisions thereof.}
- (G) The Authority has {agreed to the said request of the selected bidder/ Consortium and the Concessionaire, and has} accordingly agreed to enter into this Concession Agreement with the Concessionaire for implementation of the Project on Hybrid Annuity basis, subject to and on the terms and conditions set forth hereinafter.

NOW, THEREFORE, in consideration of the foregoing and the respective covenants and agreements set forth in this Concession Agreement, the receipt and sufficiency of which is hereby acknowledged, and intending to be legally bound hereby, the Parties agree as follows:


EXECUTIVE ENGINEER
PUBLIC WORKS DIVISION, BEED.

Shegaon Infrastructure Pvt.Ltd

Director

ARTICLE 4

CONDITIONS PRECEDENT

4.1 Conditions Precedent

4.1.1 Save and except as expressly provided in Articles 4, 5, 6, 7, 8, 9, 10, 22, 28, 38 and 41, or unless the context otherwise requires, the respective rights and obligations of the Parties under this Agreement shall be subject to the satisfaction in full of the conditions precedent specified in this Clause 4.1 (the "Conditions Precedent").

4.1.2 The Concessionaire may, upon providing the Performance Security to the Authority in accordance with Article 9, at any time after 30 (thirty) days from the date of this Agreement or on an earlier day acceptable to the Authority, by notice require the Authority to satisfy all of the Conditions Precedent set forth in this Clause 4.1.2 within a period of [120 (one hundred and twenty) days thereafter]. The Conditions Precedent required to be satisfied by the Authority shall be deemed to have been fulfilled when the Authority shall have:

- (a) procured for the Concessionaire the Right of Way to the Site in accordance with the provisions of Clauses 10.3.1 and 10.3.2;
- (b) procured all Applicable Permits relating to environmental protection, and conservation in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2;
- (c) procured forest clearance for and in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2, save and except permission for cutting trees; and
- (d) procured approval of the General Arrangement Drawings for the road over bridges/under bridges at level crossings on the Project.²

Provided that the Authority shall be entitled to an additional period, not exceeding 90(ninety) days beyond the period of 150 days without being liable for payment of any damages, for fulfillment of the Conditions Precedent set forth in this Clause.

4.1.3 The Conditions Precedent required to be satisfied by the Concessionaire within a period of [150(one hundred and fifty) days] from the date of this Agreement shall be deemed to have been fulfilled when the Concessionaire shall have:

- (a) provided Performance Security to the Authority alongwith the Additional Performance Security, if required in terms of Clause 9.1 and Clause 9.7 of this Agreement. For the avoidance of doubt it is clarified and agreed that the Concessionaire is required to provide the Performance Security and the Additional Performance Security, if required, within 30 days of signing of this Agreement;
- (b) executed and procured execution of the Escrow Agreement;

²May be omitted if no over bridges/under bridges are included in the Scope of the Project

- (c) executed and procured execution of the Substitution Agreement;
- (d) procured all the Applicable Permits specified in Part-I of Schedule-E unconditionally or if subject to conditions, then all such conditions required to be fulfilled by the date specified therein shall have been satisfied in full and such Applicable Permits are in full force and effect;
- (e) executed the Financing Agreements and delivered to the Authority 3 (three) true copies thereof, duly attested by a Director of the Concessionaire;
- (f) delivered to the Authority 3 (three) true copies of the Financial Package and the Financial Model, duly attested by a Director of the Concessionaire, along with 3 (three) sets of soft copies in CDs of the Financial Model in MS Excel version or any substitute thereof, which is acceptable to the Senior Lenders; and
- (g) delivered to the Authority {from the Consortium Members, their respective} confirmation of the correctness of the representations and warranties set forth in Sub-clauses (k), (l) and (m) of Clause 7.1 of this Agreement.

4.1.4 Each Party shall make all reasonable endeavours to satisfy the Conditions Precedent within the time stipulated and shall provide the other Party with such reasonable cooperation as may be required to assist that Party in satisfying the Conditions Precedent for which that Party is responsible. Subject only to payment of Damages, it is agreed between the Parties that the obligation to fulfill each parties' Conditions Precedent is an independent obligation of the respective Party.

4.1.5 The Parties shall notify each other in writing at least once a month on the progress made in satisfying the Conditions Precedent. Each Party shall promptly inform the other Party when any Condition Precedent for which it is responsible has been satisfied.

4.2 Damages for delay by the Authority

In the event that (i) the Authority does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2% (zero point two per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent, subject to the maximum limit equal to the amount of the Bid Security and upon reaching such limit, the Concessionaire may, in its sole discretion terminate the Agreement. The Damages payable hereunder shall be the sole remedy available to the Concessionaire for delay by the Authority.

Provided further that in the event of delay by the Concessionaire in procuring fulfillment of the Conditions Precedent specified in Clause 4.1.3, no Damages shall be due or payable by the Authority under this Clause 4.2 until the date on which the Concessionaire shall have procured fulfillment of the Conditions Precedent specified in Clause 4.1.3.

4.3 Damages for delay by the Concessionaire

In the event that (i) the Concessionaire does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this Agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent. Provided, however, that the Damages payable hereunder shall be subject to the maximum limit equal to the amount of the Bid Security and upon reaching such limit, the Authority may, in its sole discretion and subject to the provisions of Clause 9.2, terminate the Agreement. Provided further that in the event of delay by the Authority in procuring fulfillment of the Conditions Precedent specified in Clause 4.1.2, no Damages shall be due or payable by the Concessionaire under this Clause 4.3 until the date on which the Authority shall have procured fulfillment of the Conditions Precedent specified in Clause 4.1.2.

4.4 Commencement of Concession Period

The date on which Financial Close is achieved and all the Conditions Precedent specified in Clause 4.1 are satisfied shall be the Appointed Date which shall be the date of commencement of the Concession Period. For the avoidance of doubt, the Parties agree that the Concessionaire may, upon occurrence of the Appointed Date hereunder, by notice convey the particulars thereof to the Authority, and shall thereupon be entitled to commence construction on the Project.

4.5 Deemed Termination upon delay

Without prejudice to the provisions of Clauses 4.2 and 4.3, and subject to the provisions of Clause 9.2, the Parties expressly agree that in the event the Appointed Date does not occur, for any reason whatsoever, within 150 days or the extended period provided in accordance with this Agreement, all rights, privileges, claims and entitlements of the Concessionaire under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Concessionaire, and the Concession Agreement shall be deemed to have been terminated by mutual agreement of the Parties. Provided, however, that in the event the non-occurrence of the Appointed Date is for reasons attributable to the Concessionaire, the Performance Security and the Additional Performance Security, if any, of the Concessionaire shall be encashed and appropriated by the Authority as Damages thereof.

ARTICLE 5

OBLIGATIONS OF THE CONCESSIONAIRE

5.1 Obligations of the Concessionaire

- 5.1.1 Subject to and on the terms and conditions of this Agreement, the Concessionaire shall, at its own cost and expense, procure finance for and undertake the design, engineering, procurement, construction, operation and maintenance of the Project and observe, fulfill, comply with and perform all its obligations set out in this Agreement or arising hereunder.
- 5.1.2 The Concessionaire shall comply with all Applicable Laws and Applicable Permits (including renewals as required) in the performance of its obligations under this Agreement.
- 5.1.3 Save and except as otherwise provided in this Agreement or Applicable Laws, as the case may be, the Concessionaire shall, in discharge of all its obligations under this Agreement, conform with and adhere to Good Industry Practice at all times.
- 5.1.4 The Concessionaire shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement:
- (a) make, or cause to be made, necessary applications to the relevant Government Instrumentalities with such particulars and details as may be required for obtaining Applicable Permits, other than those set forth in Clause 4.1.2, and obtain and keep in force and effect such Applicable Permits in conformity with Applicable Laws;
 - (b) procure, as required, the appropriate proprietary rights, licenses, agreements and permissions for materials, methods, processes, know-how and systems used or incorporated into the Project;
 - (c) perform and fulfill its obligations under the Financing Agreements;
 - (d) make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement;
 - (e) upon written request from the Authority, make reasonable efforts to facilitate the acquisition of land and procuring of environmental and forest clearances required for the purposes of the Agreement;
 - (f) ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this Agreement;
 - (g) always act in a manner consistent with the provisions of this Agreement and not cause or fail to do any act, deed or thing, whether intentionally or otherwise, which may in any manner be violative of any of the provisions of this Agreement;

PUBLIC PRIVATE PARTNERSHIP IN HYBRID ANNUITY PROJECTS

- (h) support, cooperate with and facilitate the Authority in the implementation and operation of the Project in accordance with the provisions of this Agreement; and
- (i) transfer the Project to the Authority upon Termination of this Agreement, in accordance with the provisions of this Agreement.

5.2 Obligations relating to Project Agreements

- 5.2.1 It is expressly agreed that the Concessionaire shall, at all times, be responsible and liable for all its obligations under this Agreement notwithstanding anything contained in the Project Agreements or any other agreement, and no default under any Project Agreement or agreement shall excuse the Concessionaire from its obligations or liability hereunder.
- 5.2.2 The Concessionaire shall submit to the Authority the drafts of all Project Agreements, or any amendments or replacements thereto, for its review and comments, and the Authority shall have the right but not the obligation to undertake such review and provide its comments, if any, to the Concessionaire within 30 (thirty) days of the receipt of such drafts. Within 7 (seven) days of execution of any Project Agreement or amendment thereto, the Concessionaire shall submit to the Authority a true copy thereof, duly attested by a Director of the Concessionaire, for its record. For the avoidance of doubt, it is agreed that the review and comments hereunder shall be limited to ensuring compliance with the terms of this Agreement. It is further agreed that any failure or omission of the Authority to review and/ or comment hereunder shall not be construed or deemed as acceptance of any such agreement or document by the Authority. No review and/ or observation of the Authority and/ or its failure to review and/ or convey its observations on any document shall relieve the Concessionaire of its obligations and liabilities under this Agreement in any manner nor shall the Authority be liable for the same in any manner whatsoever.
- 5.2.3 The Concessionaire shall not make any addition, replacement or amendments to any of the Financing Agreements without the prior written consent of the Authority if such addition, replacement or amendment has, or may have, the effect of imposing or increasing any financial liability or obligation on the Authority, and in the event that any replacement or amendment is made without such consent, the Concessionaire shall not enforce such replacement or amendment nor permit enforcement thereof against the Authority. For the avoidance of doubt, the Authority acknowledges and agrees that it shall not unreasonably withhold its consent for restructuring or rescheduling of the debt of the Concessionaire and shall respond to the request for consent no later than 30 days from the receipt of such request from the Concessionaire.
- 5.2.4 The Concessionaire shall procure that each of the Project Agreements contains provisions that entitle the Authority and / or Lenders Representative to step into such agreement, in its sole discretion, in substitution of the Concessionaire in the event of Termination or Suspension (the "Covenant"). Further, it is clarified that in case both the Authority and Lenders' Representative decide to exercise their right to step-in, the Authority shall have the sole right to step into the Project Agreements. For the

avoidance of doubt, it is expressly agreed that in the event the Authority does not exercise such rights of substitution within a period not exceeding 90 (ninety) days from the Transfer Date, the Project Agreements shall be deemed to cease to be in force and effect on the Transfer Date without any liability whatsoever on the Authority and the Covenant shall expressly provide for such eventuality. The Concessionaire expressly agrees to include the Covenant in all its Project Agreements and undertakes that it shall, in respect of each of the Project Agreements, procure and deliver to the Authority an acknowledgment and undertaking, in a form acceptable to the Authority, from the counter party(ies) of each of the Project Agreements, where under such counter party(ies) shall acknowledge and accept the Covenant and undertake to be bound by the same and not to seek any relief or remedy whatsoever from the Authority in the event of Termination or Suspension.

- 5.2.5 Notwithstanding anything to the contrary contained in this Agreement, the Concessionaire agrees and acknowledges that selection or replacement of the EPC Contractor and an O&M Contractor and execution of the EPC Contract and O&M Contract shall be subject to the prior approval of the Authority from national security and public interest perspective, the decision of the Authority in this behalf being final, conclusive and binding on the Concessionaire, and undertakes that it shall not give effect to any such selection or contract without prior approval of the Authority. For the avoidance of doubt, it is expressly agreed that approval of the Authority hereunder shall be limited to national security and public interest perspective, and the Authority shall endeavor to convey its decision thereon expeditiously and no later than 30 days from the date of receipt of the proposal alongwith the draft agreement by the Authority. It is also agreed that the Authority shall not be liable in any manner on account of grant or otherwise of such approval and that such approval or denial thereof shall not in any manner absolve the Concessionaire or its Contractors from any liability or obligation under this Agreement.

5.3 Obligations relating to Change in Ownership

- 5.3.1 The Concessionaire shall not undertake or permit any Change in Ownership, except with the prior written approval of the Authority.
- 5.3.2 Notwithstanding anything to the contrary contained in this Agreement, the Concessionaire agrees and acknowledges that:
- (a) all acquisitions of Equity by an acquirer, either by himself or with any person acting in concert, directly or indirectly, including by transfer of the direct or indirect legal or beneficial ownership or control of any Equity, in aggregate of 25% (twenty five per cent) or more of the total Equity of the Concessionaire; or
 - (b) acquisition of any control directly or indirectly of the Board of Directors of the Concessionaire by any person either by himself or together with any person or persons acting in concert with him, shall constitute a Change in Ownership requiring prior approval of the Authority from national security and public interest perspective, the decision of the Authority in this behalf being final, conclusive and binding on the Concessionaire, and undertakes that it shall not give effect to any such acquisition of

PUBLIC PRIVATE PARTNERSHIP IN HYBRID ANNUITY PROJECTS

Equity or control of the Board of Directors of the Concessionaire without such prior approval of the Authority. For the avoidance of doubt, it is expressly agreed that approval of the Authority hereunder shall be limited to national security and public interest perspective, and the Authority shall endeavor to convey its decision thereon expeditiously. It is also agreed that the Authority shall not be liable in any manner on account of grant or otherwise of such approval and that such approval or denial thereof shall not in any manner absolve the Concessionaire from any liability or obligation under this Agreement.

For the purposes of this Clause 5.3.2:

- (i) the expression "acquirer", "control" and "person acting in concert" shall have the meaning ascribed thereto in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeover) Regulations, 2011 or any statutory re-enactment thereof as in force as on the date of acquisition of Equity, or the control of the Board of Directors, as the case may be, of the Concessionaire;
- (ii) the indirect transfer or control of legal or beneficial ownership of Equity shall mean transfer of the direct or indirect beneficial ownership or control of any company or companies whether in India or abroad which results in the acquirer acquiring control over the shares or voting rights of shares of the Concessionaire; and
- (iii) power to appoint, whether by contract or by virtue of control or acquisition of shares of any company holding directly or through one or more companies (whether situate in India or abroad) the Equity of the Concessionaire, not less than half of the directors on the Board of Directors of the Concessionaire or of any company, directly or indirectly whether situate in India or abroad, having ultimate control of 25% (twenty five per cent) or more of the Equity of the Concessionaire shall constitute acquisition of control, directly or indirectly, of the Board of Directors of the Concessionaire.

5.4 Obligations relating to employment of foreign nationals

The Concessionaire acknowledges, agrees and undertakes that employment of foreign personnel by the Concessionaire and/or its contractors and their subcontractors shall be subject to grant of requisite regulatory permits and approvals including employment/residential visas and work permits, if any required, and the obligation to apply for and obtain the same shall and will always be of the Concessionaire and, notwithstanding anything to the contrary contained in this Agreement, refusal of or inability to obtain any such permits and approvals by the Concessionaire or any of its contractors or sub-contractors shall not constitute Force Majeure Event, and shall not in any manner excuse the Concessionaire from the performance and discharge of its obligations and liabilities under this Agreement.

5.5 Obligations relating to employment of trained personnel

The Concessionaire shall ensure that the personnel engaged by it in the performance of its obligations under this Agreement are at all times properly trained for their respective function

5.6 Facilities for differently abled and elderly persons

The Concessionaire shall, in conformity with the guidelines issued from time to time by the Ministry of Social Justice and Empowerment, or a substitute thereof, procure a barrier free environment for the differently abled and for elderly persons using the Project.

5.7 Branding of Project

The Project or any part thereof shall not be branded in any manner to advertise, display or reflect the name or identity of the Concessionaire or its shareholders. The Concessionaire undertakes that it shall not, in any manner, use the name or entity of the Project to advertise or display its own identity, brand equity or business interests, including those of its shareholders, save and except as may be necessary in the normal course of business. For the avoidance of doubt, it is agreed that the Concessionaire may display its own name at a spot where other public notices are displayed for the Users. It is further agreed that the Project shall be known, promoted, displayed and advertised by the name of *****.

5.8 Sole purpose of the Concessionaire

The Concessionaire having been set up for the sole purpose of exercising the rights and observing and performing its obligations and liabilities under this Agreement, the Concessionaire or any of its subsidiaries shall not, except with the previous written consent of the Authority, be or become directly or indirectly engaged, concerned or interested in any business other than as envisaged herein.³

³Clause 5.8 may be omitted if a special purpose vehicle is not considered necessary for implementation of the Project, especially when the Project is comparatively small and can be implemented by an existing company of the selected bidder. In case Clause 5.8 is omitted, then Recitals E & F may also be omitted.

ARTICLE 23

PAYMENT OF BID PROJECT COST

23.1 Bid Project Cost

The Parties expressly agree that the cost of construction of the Project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire, shall be deemed to be Rs.....(Rupees.....) (The " Bid Project Cost ")[£]. The Parties further agree that the Bid Project Cost specified hereinabove for payment to the Concessionaire shall be inclusive of the cost of construction, interest during construction, working capital, physical contingencies and all other costs, expenses and charges for and in respect of construction of the Project, save and except any additional costs arising on account of variation in Price Index, Change of Scope, Change in Law, Force Majeure or breach of this Agreement, which costs shall be due and payable to the Concessionaire in accordance with the provisions of the Agreement. For the avoidance of doubt, the Bid Project Cost specified herein represents the amount due and payable by the Authority to the Concessionaire and may be less than, equal to, or more than the Estimated Project Cost.

The bid project cost shall be exclusive of Goods and Service Tax, which shall be paid at prevailing rates on production of relevant documents by the concessionaire.

23.2 Adjusted Bid Project Cost

23.2.1 The Bid Project Cost specified in Clause 23.1 shall be revised from time to time in accordance with the provisions of this Clause 23.2 to reflect the variation in Price Index occurring after the Reference Index Date immediately preceding the Bid Date.

23.2.2 The Bid Project Cost adjusted for variation between the Price Index occurring between the Reference Index Date preceding the Bid Date and the Reference Index Date immediately preceding the Appointed Date shall be deemed to be the Bid Project Cost at commencement of construction.

23.2.3 For every month occurring after the Appointed Date, the Authority shall compute the variation in Price Index occurring between the Reference Index Date preceding the Bid Date and the Reference Index Date preceding the date of Invoice, and shall express the latter as a multiple of the former (the "Price Index Multiple"). All Invoices to be submitted by the Concessionaire to the Authority for and in respect of the Construction Period shall be the product of the relevant proportion of the Bid Project Cost and the Price Index Multiple applicable on the date of Invoice. For the avoidance of doubt and by way of illustration, if (a) the Price Index on the Reference Index Date preceding the Bid Date, say January 31, 2016, is 200 (two hundred); (b) the Invoice is submitted on October 15, 2017; and (c) the Price Index as on September 30, 2017 is 210 (two hundred and ten), then the Price Index Multiple for determination of the amount due in respect of such Invoice shall be 1.05 (one point zero five).

23.3 Payment of Bid Project Cost

[£]Bid Project Cost shall be the amount specified in the Bid of the selected Bidder.

23.3.1 [60% (Sixty per cent)] of the Bid Project Cost , adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire in 5 (five) equal installments of [12% (Twelve percent)] each during the Construction Period in accordance with the provisions of Clause 23.4.

23.3.2 The remaining Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable in [20 (Twenty)] biannual installments commencing from the 180th (one hundred and eightieth) day of COD in accordance with the provisions of Clause 23.6.

23.4 Payment during Construction Period

Upon receiving a report from the Independent Engineer certifying the achievement of the below mentioned Payment Milestones¹², the Authority shall disburse, within 15 (fifteen) days of the receipt of each such report, an installment equal to 12% (Twelve per cent) of the Bid Project Cost, adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of that report.

For the purpose of this Clause 23.4, the Payment Milestone for release of payment during Construction Period shall be as under:

- a) I (first) Payment Milestone - On achievement of 10% Physical Progress
- b) II (second) Payment Milestone - On achievement of 30% % Physical Progress
- c) III (third) Payment Milestone – On achievement of 50% Physical Progress
- d) IV (fourth) Payment Milestone - On achievement of 75% Physical Progress ,
- e) V (fifth) Payment Milestone – On achievement of 90% Physical Progress

Provided that in case of Change of Scope, the Physical Progress shall be recalculated to account for the changed scope.

23.5 Bonus on early completion

In the event that the Concessionaire shall achieve COD on or more than 30 (thirty) days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% (Zero point five per cent) of [40 % (Forty per cent)] of the Bid Project Cost for the first 30 (thirty) days by which COD shall precede the Scheduled Completion Date and thereafter the said bonus shall be calculated on the pro-rata basis for each day preceding the said 30 (thirty) days period. The Bonus shall be due and payable to the Concessionaire along with the 1st(first) Annuity Payment.

23.6 Annuity Payments during Operation Period

23.6.1 The (the "Completion Cost" shall be the summation of A, B, C, D, E, and F below:

¹² Independent Engineer, during finalization of design, shall upfront decide weightages of all the items in due consultation with the Authority responsible for making payments and recommended percentage physical progress achievements based on the above decided weightages for the entire construction period. The weightages shall be fixed as per format in Annexure – I of Schedule G of this Agreement.

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- A. 20% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 10% Physical Progress.
- B. Another 20% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 30% Physical Progress.
- C. Another 20% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 50% Physical Progress.
- D. Another 15% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 75% Physical Progress.
- E. Another 15% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 90% Physical Progress.
- F. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the COD.

The Parties acknowledge and agree that the Authority has paid a portion of the Completion Cost as payments during Construction Period pursuant to Clause 23.4 of this Agreement. The balance Completion Cost remaining shall be due and payable during the Operation Period in accordance with the provisions of Clause 23.6.2.

23.6.2 The Completion Cost remaining to be paid in pursuance of the provisions of Clause 23.6.1 shall be due and payable in biannual installments over a period of [10 (ten)] years commencing from COD, (the "Annuity Payments"). The 1st (first) installment of Annuity Payments shall be due and payable within 15 (fifteen) days of the 180th (one hundred and eightieth) day of COD and the remaining installments shall be due and payable within 15 (fifteen) days of completion of each of the successive six months ("the Annuity Payment Date").

23.6.3 Each of the Annuity Payments due and payable during the years following the COD shall be as under¹³:

Annuity following the COD	Percentage of Completion Cost remaining to be paid on COD
1st Annuity	3.00%
2nd Annuity	3.00%
3rd Annuity	3.00%
4th Annuity	3.00%
5th Annuity	3.00%
6th Annuity	3.00%
7th Annuity	5.00%
8th Annuity	5.00%
9th Annuity	5.00%

¹³ The schedule may be customized based on the duration of the Operations Period

10th Annuity	5.00%
11th Annuity	5.00%
12th Annuity	5.00%
13th Annuity	5.00%
14th Annuity	5.00%
15th Annuity	7.00%
16th Annuity	7.00%
17th Annuity	7.00%
18th Annuity	7.00%
19th Annuity	7.00%
20th Annuity	7.00%

Each of the biannual installments payable hereunder shall be paid along with interest as specified in Clause 23.6.4.

- 23.6.4 Interest shall be due and payable on the reducing balance of Completion Cost at an interest rate equal to the applicable Bank Rate [plus 3% (three per cent)]. Such interest shall be due and payable biannually along with each installment specified in Clause 23.6.3. For the avoidance of doubt and by way of illustration, the Parties agree that interest on the Completion Cost remaining to be paid, calculated from COD and until the 180th (one hundred and eightieth) day of COD, shall be due and payable to the Concessionaire along with the first Annuity Payment and interest on ^{**14%} (** per cent) of the Percentage of Completion Cost remaining to be paid on COD, calculated from first Annuity payment date and until the 1st (first) anniversary of COD, shall be due and payable along with the second Annuity Payment due and payable under this Agreement. The Parties further agree that interest shall be calculated based on the number of days a particular Bank Rate was applicable during the period of calculation. For the purpose of illustration, assuming that the balance capital cost remaining to be paid is Rs 100 crores on the 1st Annuity Payment Date, the applicable Bank Rate for the first 75 days is 8% and thereafter it is revised to 7.5% and remains unchanged till the 2nd Annuity Payment Date, the interest would be calculated as $((100 \times 11\% \times 75) / 365) + ((100 \times 10.5\% \times 105) / 365)$. For the avoidance of doubt¹⁵, the Interest would be calculated on simple interest basis and no compounding of the same would be undertaken.

23.7 O&M Payments

- 23.7.1 The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on the amount quoted by the selected bidder under its O & M Bid in accordance with the provisions of this Clause 23.7 (the "O&M Payments"). The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For

¹⁴ To be finalized on the basis of the outstanding Completion Cost Annuity pursuant to the payment of 1st Annuity as provided in the Annuity payment schedule in Clause 23.6.3

¹⁵ Assuming that the total number of days between 1st Annuity payment date and 2nd Annuity date are 180. In case the number of days are different the calculation may be appropriately changed

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avoidance of doubt it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.

- 23.7.2 Subject to the Provisions of Clause 23.7.3, the O&M Payments due and payable to the Concessionaire shall be paid in 2 (two) equal biannual installments and disbursed by the Authority together with the corresponding installments of Annuity Payments. The schedule of payment of O & M payment shall be as follows,

Annuity following the COD	Percentage of amount quoted towards O & M for first year
1st Annuity	33.33%
2nd Annuity	33.33%
3rd Annuity	33.33%
4th Annuity	33.33%
5th Annuity	33.33%
6th Annuity	33.33%
7th Annuity	50.00%
8th Annuity	50.00%
9th Annuity	50.00%
10th Annuity	50.00%
11th Annuity	50.00%
12th Annuity	50.00%
13th Annuity	50.00%
14th Annuity	50.00%
15th Annuity	66.67%
16th Annuity	66.67%
17th Annuity	66.67%
18th Annuity	66.67%
19th Annuity	66.67%
20th Annuity	66.67%

Concessionaire shall provide Micro seal Surfacing in 3rd year and renew entire length by using Bituminous concrete (40 mm thick) in 7th year. In case concessionaire fails to execute the treatment of micro seal surfacing in 3rd year, all further annuity payments will be kept on hold till the micro seal surfacing (single coat as per IRC SP-81-2008) is done, and in case the concessionaire fails to carry out the Bituminous Concrete (40 mm thick) in 7th year all further annuity payments will be kept on hold till completion of renewal by providing the Bituminous Concrete. In such case the Engineer-in-Charge/Authority would complete the said pending works and would recover the costs from all the payments payable to concessionaire. All annuity payments to concessionaire may be released after such recovery.

23.7.3 Each installment of O&M Payment shall be the product of the amount determined in accordance with Clause 23.7.1 and the Price Index Multiple on the Reference Index Date preceding the due date of payment thereof. For the avoidance of doubt and by way of illustration, if (i) the O&M Cost is Rs.1Cr. (Rupees one crore); (ii) the O&M Payment is to be determined for the 2nd (second) year of the Operation Period; (iii) the Price Index on the Reference Index Date preceding the Bid Date is 200 (two hundred) and the Price Index on the Reference Index Date preceding the due date of payment is 240 (two hundred forty), implying a Price Index Multiple of 1.2 (one point two), then the O&M Payment for that installment shall be the product of First Year O&M Cost and the applicable Price Index Multiple, which product shall be Rs.1.2cr. (Rupees one point two crore)

23.8 Mobilization Advance

The Authority shall, on request of the Concessionaire, make an advance payment in a sum not exceeding 10% (ten per cent) of the Bid Project Cost (the "Mobilization Advance"). This advance payment shall be made in two equal instalments. The Concessionaire may request the Authority for the first instalment of the advance payment at any time after the Appointed Date, along with furnishing a Bank Guarantee of 10% of the Mobilization Advance in a form satisfactory to the Authority. The Concessionaire may request the Authority for the second instalment of the advance payment at any time, after 60(sixty) days from the Appointed Date, along with furnishing a Bank Guarantee of 10% of the Mobilization Advance in a form satisfactory to the Authority. The first and second instalments of the Mobilization Advance shall be paid by the Authority within 30 (thirty) days of receipt of the respective requests in this behalf from the Concessionaire. The rate of interest on the Mobilization Advance shall be equal to the Bank Rate, compounded annually. The Mobilization Advance shall be deducted by the Authority in 4 (four) equal instalments from each of the payments to be made by the Authority to the Concessionaire in accordance with the provisions of Clause 23.4 and the interest thereon shall be recovered as the 5th (fifth) and final instalment upon expiry of 120 (one hundred and twenty) days commencing from the date of recovery of the 4th (fourth) instalment. Bank guarantee will be released after recovering of complete capital and interest on mobilization advance.

The Concessionaire shall provide an undertaking to the Authority to the effect that the mobilization advance will not be directed for any other purpose than the execution of the project for which concession agreement is signed. In case of breach or default, the concessionaire shall be liable for immediate full refund of the Mobilization Advance with interest due. All of any material and machinery purchased through the said advance shall be deemed to be the property of the Authority until full recovery of the mobilization advance. The mobilization advance shall be disbursed by the Authority only through the Escrow Account to be maintained as per Concession Agreement.

The Concessionaire shall submit the details of machinery procured and materials purchased through utilization of mobilization advance without any delay in 30 days

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period. The safe custody of material and machinery the stocking yard shall be fenced and guarded with full surveillance.

The material procurement and utilization record shall be maintained by the Concessionaire and combined cost the unused material and machinery procured shall be to the extent of 7.5% of the project cost at the time of achievement of first mile stone. The Concessionaire shall at all times display a board on site stating that, "Material and Machinery on site is the property of the Authority" till complete recovery in 5th mile stone. In addition to this, the concessionaire shall submit to the Authority the postdated cheque in the name of the Authority of balance 90 % advance which will be returned back to the Concessionaire upon recovery of mobilization advance along with the Bank Guarantee to secure the full interest of the Authority.

23.9 Treatment of incomplete works

23.9.1 The Parties acknowledge and agree that in the event COD occurs upon issuance of a Provisional Certificate, the Annuity Payments and O&M Payments specified in this Article 23 shall be made as if all works comprising the Project have been completed. The works remaining incomplete shall be completed by the Concessionaire in accordance with the provisions of this Agreement and thereupon, the Completion Certificate shall be issued forthwith.

23.9.2 In the event the Authority determines that any incomplete works referred to in Clause 23.9.1 are not required to be completed for any reason, it shall modify the Scope of the Project in accordance with the provisions of Article 16 and the Completion Cost, Annuity Payments and O&M Payments shall be reduced on account of such Change of Scope as per the provisions of Article 16.

ARTICLE 24

[Deleted]

ARTICLE 25

ESCROW ACCOUNT

25.1 Escrow Account

- 25.1.1 The Concessionaire shall, prior to the Appointed Date, open and establish an Escrow Account with a Bank (the "Escrow Bank") in accordance with this Agreement read with the Escrow Agreement.
- 25.1.2 The nature and scope of the Escrow Account are fully described in the agreement (the "Escrow Agreement") to be entered into amongst the Concessionaire, the Authority, the Escrow Bank and the Senior Lenders through the Lenders' Representative, which shall be substantially in the form set forth in Schedule-O.

25.2 Deposits into Escrow Account

The Concessionaire shall deposit or cause to be deposited the following inflows and receipts into the Escrow Account:

- (a) All funds constituting the Financial Package;
- (b) All revenues from or in respect of the Project, including the proceeds of any rentals, deposits, capital receipts or insurance claims; and
- (c) All payments by the Authority, after deduction of any outstanding payments.

25.3 Withdrawals during Concession Period

- 25.3.1 The Concessionaire shall, at the time of opening the Escrow Account, give irrevocable instructions, by way of an Escrow Agreement, to the Escrow Bank instructing, *inter alia*, that deposits in the Escrow Account shall be appropriated in the following order every month, or at shorter intervals as necessary, and if not due in a month then appropriated proportionately in such month and retained in the Escrow Account and paid out therefrom in the month when due:
- (a) All taxes due and payable by the Concessionaire for and in respect of the Project;
 - (b) Any amount due on account of appropriation of the Deemed Performance Security under Clause 9.5 of this Agreement
 - (c) All payments relating to construction of the Project, subject to and in accordance with the conditions, if any, set forth in the Financing Agreements;
 - (d) O&M Expenses, subject to the ceiling, if any, set forth in the Financing Agreements;
 - (e) O&M Expenses and other costs and expenses incurred by the Authority in accordance with the provisions of this Agreement, and certified by the Authority as due and payable to it;



Maharashtra
PWD

Public Private Partnership

In

Highway Development

CONCESSION AGREEMENT

for

[AU-L2 Construction of Two Laning Roads with Paved Shoulders in
Nanded, Parbhani, and Hingoli Districts on Hybrid Annuity Mode]

Volume-II

(Part- 4 of 4)

Part II

Hybrid Annuity Project

Public Works Department
Government of Maharashtra

Executive Engineer

Public Works Division, Nanded.

[AU-L2] Construction of Two Laning Roads with Paved Shoulders in Nanded, Parbhani, and
Hingoli Districts on Hybrid Annuity Mode



SCHEDULE - G

(See Clause 12/1)

PROJECT COMPLETION SCHEDULE

1 Project Completion Schedule

During Construction Period, the Concessionaire shall comply with the requirements set forth in this Schedule-G for each of the Project Milestones and the Scheduled Completion Date (the "Project Completion Schedule")/ Within 15 (fifteen) days of the date of each Project Milestone, the Concessionaire shall notify the Authority of such compliance along with necessary particulars thereof/

2 Project Milestone-I

2/1 Project Milestone-I shall occur on the date falling on the [180th (one hundred and eightieth)] day from the Appointed Date (the "Project Milestone-I")/

2/2 Prior to the occurrence of Project Milestone-I, the Concessionaire shall have expended not less than 20% (twenty per cent) of the total capital cost set forth in the Financial Package/

2/3 Prior to the occurrence of Project Milestone -I, the Concessionaire shall have commenced construction of the Project and achieved 20% Physical Progress/

3 Project Milestone-II

3/1 Project Milestone-II shall occur on the date falling on the [400th (Four hundredth)] day from the Appointed Date (the "Project Milestone-II")/

3/2 Prior to the occurrence of Project Milestone-II, the Concessionaire shall have expended not less than 35% (thirty five per cent)] of the total capital cost set forth in the Financial Package/ Provided, however, that at least 70% (seventy per cent) of the expenditure referred to hereinabove shall have been incurred on physical works which shall not include advances of any kind to any person or expenditure of any kind on plant and machinery/

3/3 Prior to the occurrence of Project Milestone -II, the Concessionaire shall have commenced construction of the Project and achieved 35% Physical Progress

4 Project Milestone-III

4/1 Project Milestone-III shall occur on the date falling on the [600th (Six hundredth)] day from the Appointed Date (the "Project Milestone-III")/

4/2 Prior to the occurrence of Project Milestone-III, the Concessionaire shall have commenced [construction of all Project Facilities and expended not less than 75% (seventy five per cent)] of the total capital cost set forth in the Financial Package/

4/3 Prior to the occurrence of Project Milestone -III, the Concessionaire shall have commenced construction of the Project and achieved 75% Physical Progress

5 Scheduled Completion Date

5/1 The Scheduled Completion Date shall be the [730th (Seven hundred and Thirtieth)] day from the Appointed Date/

Construction of Two-laning Road with paved shoulders, under Package HAM-AU-108 in the
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Executive Engineer
Public Works Division, Nanded

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5/2 On or before the Scheduled Completion Date, the Concessionaire shall have completed the Project in accordance with this Agreement/

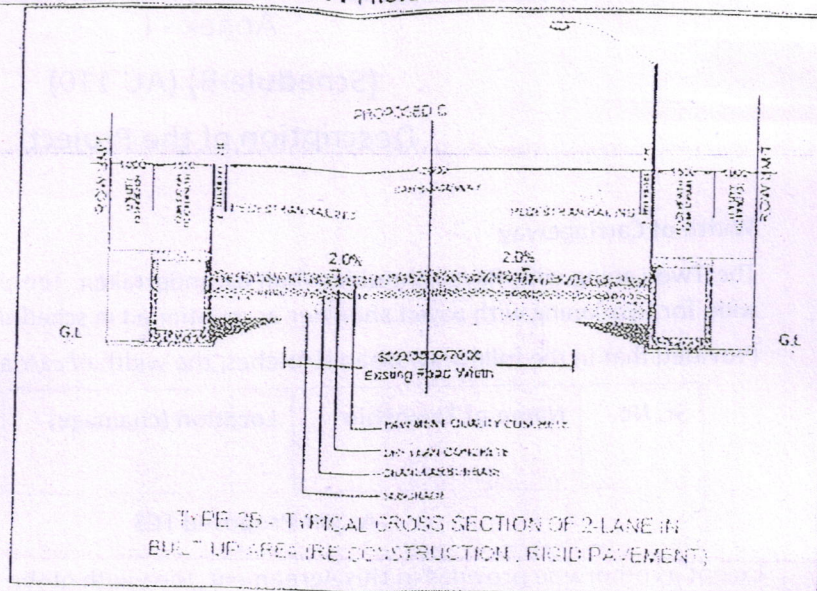
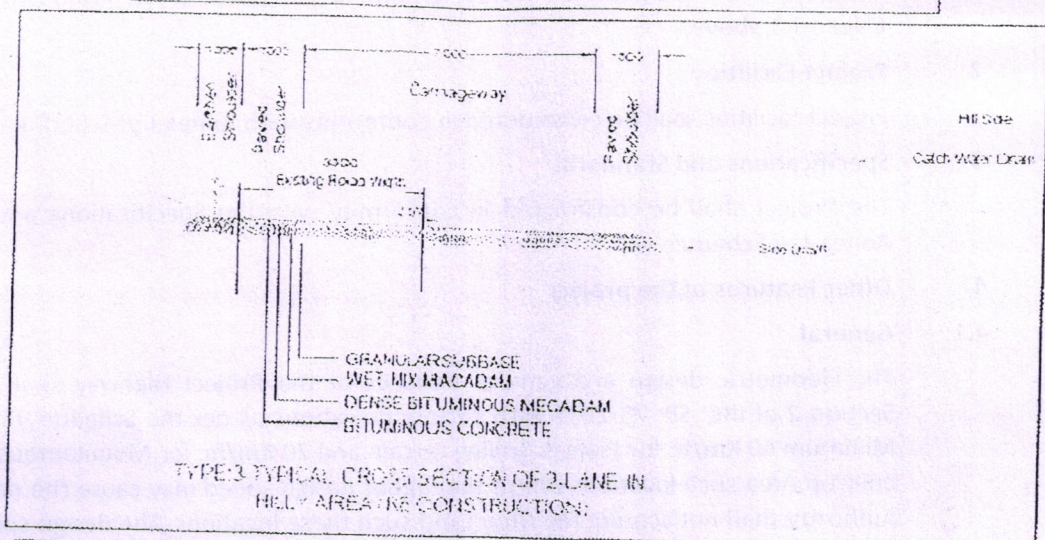
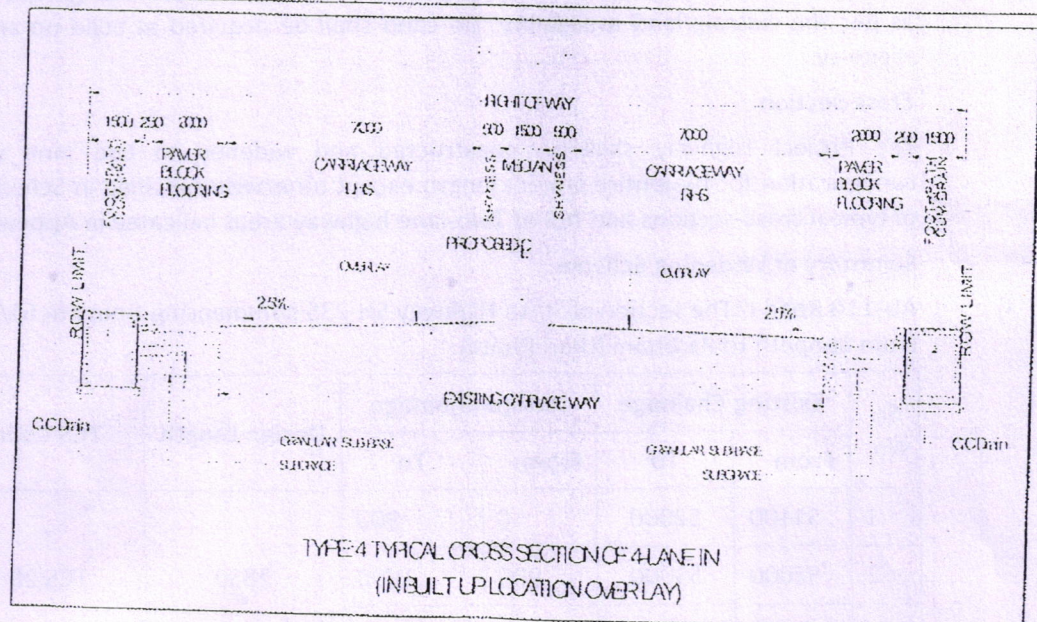
6 **Extension of period**

Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Completion Date, as the case may be, under and in accordance with the provisions of this Agreement, the Project Completion Schedule shall be deemed to have been amended accordingly/

Executive Engineer

Public Works Division, Nanded.





Executive Engineer
Public Works Division, Nanded.



Annex - I

(Schedule-B) (AU 110)

Description of the Project²

1 Width of Carriageway

- 1.1 The Two-Laning with Paved Shoulder shall be undertaken. The paved carriageway shall be 10.0 mtr wide for two-laning with paved shoulder as mentioned in schedule-B.

Provided that in the following urban stretches, the width of carriageway shall be:

Sr. No.	Name of Township	Location (chainage)	Width
As per Proposed TCS			

- 1.2 Except as otherwise provided in this Agreement, the width of the paved carriageway shall confirm to Clause 1.1 above.

2 Project Facilities

Project facilities shall be constructed in conformity with Annex-I of Schedule- C.

3 Specifications and Standards

The Project shall be constructed in conformity with the Specifications and Standards specified in Annex-I of Schedule-D.

4 Other Features of the project

4.1. General

The Geometric design and general features of the Project Highway shall be in accordance with Section 2 of IRC: SP: 73-2015 with certain deviations as per the Schedule-D. The design speed shall Minimum 40 Km/hr for Plain & Rolling terrain and 20 Km/hr. for Mountainous and Hill Terrain in Non-built-up Area such locations where the higher design speed may cause the new land acquisition. The Authority shall not acquire the New Land such these locations. The design speed for built-up shall be as per the existing land availability. No Land shall be acquired at build-up areas along the project Highway.

Cross-section

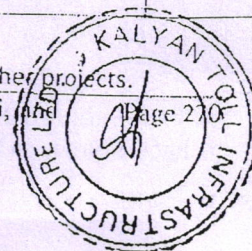
The Project Highway shall be constructed and widened to two lane with paved shoulder configuration for the entire project length except otherwise specified in Schedule – B. The schedule of typical cross-sections and TCS of Two-lane highway areas indicated in Appendix B-I.

Summary of Widening Scheme

- 1) AU-110 Road I :The section of State Highway SH-235 commencing from Km 51/100 to Km 97/606 i.e. From Sonpeth to Parbhani (Umri Phata).

Sr. No.	Existing Chainage		Design Chainage		Design Length	TCS Code	Widening Scheme
	From	To	From	To			
1	51100	52000	0	900	2850	TCS 2B	Concentric Widening
2	52000	53000	900	1900			
3	53000	53950	1900	2850			
4	53950	54000	2850	2900	300	TCS 3B	

² This template is applicable to highway projects. It may be suitably revised in ease of other projects.



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Sr. No.	Existing Chainage		Design Chainage		Design Length	TCS Code	Widening Scheme
	From	To	From	To			
5	54000	54250	2900	3150			
6	54250	55000	3150	3900	750	TCS 2B	
7	55000	56000	3900	4900			
8	56000	57000	4900	5900			
9	57000	58000	5900	6900			
10	58000	59000	6900	7900			
11	59000	60000	7900	8900	7100	TCS 2C	
12	60000	61000	8900	9900			
13	61000	62000	9900	10900			
14	62000	62100	10900	11000			
15	62100	63000	11000	11900	1900	TCS 3A	
16	63000	64000	11900	12900			
17	64000	64200	12900	13100	200	TCS 3C	
18	64200	65000	13100	13900			
19	65000	66000	13900	14900			
20	66000	67000	14900	15900			
21	67000	68000	15900	16900	6150	TCS 2C	
22	68000	69000	16900	17900			
23	69000	70000	17900	18900			
24	70000	70350	18900	19250			
25	70350	70800	19250	19700	450	TCS 3C	
26	70800	71000	19700	19900			
27	71000	72000	19900	20900			
28	72000	73000	20900	21900			
29	73000	74000	21900	22900			
30	74000	75000	22900	23900	6250	TCS 2C	
31	75000	76000	23900	24900			
32	76000	77000	24900	25900			
33	77000	77050	25900	25950			
34	77050	78000	25950	26900			
35	78000	78100	26900	27000	1050	TCS 3C	



PUBLIC PRIVATE PARTNERSHIP IN HYBRID ANNUITY PROJECTS

Sr. No.	Existing Chainage		Design Chainage		Design Length	TCS Code	Widening Scheme
	From	To	From	To			
36	78100	79000	27000	27900	4150	TCS 2C	
37	79000	80000	27900	28900			
38	80000	81000	28900	29900			
39	81000	82000	29900	30900			
40	82000	82250	30900	31150			
41	82250	82850	31150	31750	600	TCS 3C	Concentric Widening
42	82850	83000	31750	31900	3150	TCS 2C	
43	83000	84000	31900	32900			
44	84000	85000	32900	33900			
45	85000	86000	33900	34900			
46	86000	87000	34900	35900			
47	87000	88000	35900	36900			
48	88000	89000	36900	37900	4000	TCS 1B	
49	89000	90000	37900	38900			
50	90000	91000	38900	39900			
51	91000	92000	39900	40900			
52	92000	93000	40900	41900	5606	TCS 1C	
53	93000	94000	41900	42900			
54	94000	95000	42900	43900			
55	95000	96000	43900	44900			
56	96000	97000	44900	45900			
57	97000	97606	45900	46506			

- II) AU-110 Road II : The section of Major District Road MDR-30 commencing from Km 0/000 to Km 33/074 i.e. From Jintur to Selu through Pachalegaon, Niwali Kh, Walur, and Rajewadi.

Sr. No.	Existing chainage		Design Chainage		Design Length (Km)	TCS	Widening Scheme
	From(Km)	To(Km)	From(Km)	To(Km)			
1	0.000	0.300	0.000	0.300	0.3	TCS 3	Concentric widening
2	0.300	10.400	0.300	10.400	10.1	TCS 2	
3	10.400	10.660	10.400	10.700	0.3	TCS 3	
4	10.660	11.000	10.700	12.000	1.3	TCS 2	

AU-12 Construction of Two Laning Roads with Paved Shoulders in Nanded, Parbhani and Hingoli Districts on Hybrid Annuity Mode

Executive Engineer
Public Works Division, Nanded.



PUBLIC PRIVATE PARTNERSHIP IN HYBRID ANNUITY PROJECTS

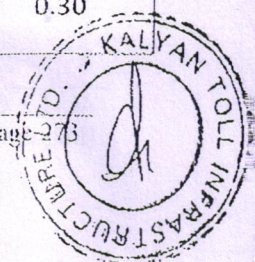
Sr. No.	Existing chainage		Design Chainage		Design Length (Km)	TCS	Widening Scheme
	From(Km)	To(Km)	From(Km)	To(Km)			
5	11.000	14.200	12.000	15.600	3.6	TCS 1	
6	14.200	20.700	15.600	23.000	7.4	TCS 5	
7	20.700	27.250	23.000	29.050	6.05	TCS 6	
8	27.250	27.450	29.050	29.250	0.2	TCS 4	Concentric widening
9	27.450	28.500	29.250	31.000	1.75	TCS 6	
10	28.500	30.500	31.000	33.074	2.074	TCS 5	

Summary of Widening Scheme

Provision of various types of Cross Sections.

- I) AU-110 Road I: The section of State Highway SH 235 commencing from Km 51/100 to Km 97/606 i.e. From Sonpeth to Parbhani (Umri Phata).

Sr. No.	Particular	TCS Code	Length (Km)
1	2-lane with paved shoulders on existing BT road, Applicable TCS type Figure 2.2 as per IRC SP: 73-2015 with slight modification in the width of Earthen Shoulder. The width of Paved shoulder is 1.5m & Earthen Shoulder has been kept 1.0 m on Non BC soil on 5.5m wide existing road.	TCS 1B	4.00
2	2-lane with paved shoulders on existing BT road, Applicable TCS type Figure 2.2 as per IRC SP: 73-2015 with slight modification in the width of Earthen Shoulder. The width of Paved shoulder is 1.5m & Earthen Shoulder has been kept 1.0 m on Non BC soil on 3.75m wide existing road.	TCS 1C	7.606
3	2-lane with paved shoulders (widening & strengthening of existing BT road) Applicable TCS type Figure 2.2 as per IRC SP: 73-2015 with slight modification in the width of Earthen Shoulder. The width of Paved shoulder is 1.5m & Earthen Shoulder has been kept 1.0 m on BC soil on 5.5m existing road.	TCS 2B	3.60
4	2-lane with paved shoulders (widening & strengthening of existing BT road) Applicable TCS type Figure 2.2 as per IRC SP: 73-2015 with slight modification in the width of Earthen Shoulder. The width of Paved shoulder is 1.5m & Earthen Shoulder has been kept 1.0 m on BC soil on 3.75m existing road.	TCS 2C	26.80
5	2-lane with cc pavement & 1.5m cc shoulder (widening & strengthening of existing 7.0m wide BT road)	TCS 3A	1.90
6	2-lane with cc pavement & 1.5m cc shoulder (widening & strengthening of existing 5.5m wide BT road)	TCS 3B	0.30



PUBLIC PRIVATE PARTNERSHIP IN HYBRID ANNUITY PROJECTS

Sr. No.	Particular	TCS Code	Length (Km.
7	2-lane with cc pavement & 1.5m cc shoulder (widening & strengthening of existing 3.75m wide BT road)	TCS 3C	2.30
Total -			46.506

II) **AU-110 Road II** : The section of Major District Road MDR-30 commencing from Km 0/000 to Km 33/074 i.e. From Jintur to Solu through Pachalegaon, Niwali Kh, Walur, and Rajewadi.

Sr. No.	Particular	TCS Code	Length (Km)
1	2-lane with paved shoulders on existing BT road, Applicable TCS type Figure 2.2 as per IRC SP: 73-2015 with slight modification in the width of Earthen Shoulder. The width of Paved shoulder is 1.5m & Earthen Shoulder has been kept 1.0 m on Non BC soil.	TCS 1	3.6
2	2-lane with paved shoulders (widening & strengthening of existing BT road) Applicable TCS type Figure 2.2 as per IRC SP: 73-2015 with slight modification in the width of Earthen Shoulder. The width of Paved shoulder is 1.5m & Earthen Shoulder has been kept 1.0 m on BC soil.	TCS 2	11.4
3	2-lane with cc pavement & 1.5m cc shoulder (widening & strengthening of existing BT road)	TCS 3	0.6
4	2-lane concentric widening with CC pavement with flexible shoulder & footpath cum drain	TCS 4	0.2
5	2-lane with 1.5m earthen shoulder (widening & strengthening of existing BT road).	TCS 5	9.47
6	2-lane with 1.5m earthen shoulder (widening & strengthening of existing BT road).	TCS 6	7.804
Total -			33.074

4.2. Alignment Plan and Longitudinal Section

An alignment plan and vertical profile of project highway is given at Appendix B-II in soft copy. The minimum FRL given in enclosed drawing shall have to be achieved by concessionaire.

4.3. Bypass and Realignment

There are no bypasses and two re-alignments in the project highway. The details of realignment to be provided are given at Appendix B-III.

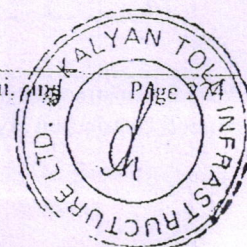
4.4. Service Road/ Slip Road

Service/Slip Roads shall be provided in length indicated in Appendix B-IV.

Cross Sections should follow IRC SP: 84-2014, "Manual of Standards & Specifications for Four Lanning of Highways on Public Private Partnership".

AU-L2 Construction of Two Laning Roads with Paved Shoulders in Nanded, Parbhani, and Hingoli Districts on Hybrid Annuity Mode

Executive Engineer
Public Works Division, Nanded.



PUBLIC PRIVATE PARTNERSHIP IN HYBRID ANNUITY PROJECTS

4.5. Type of Shoulder and Footpath

I) AU-110 Road I :The section of State Highway SH-235 commencing from Km 51/100 to Km 97/606 i.e. From Sonpeth to Parbhani (Umri Phata).

(a) In built-up sections, Footpaths shall be provided in following table.

S.No.	Built up Stretch	Design Chainage (Km)		Length (Km)
		From	To	
As per the Proposed TCS				

(b) In open country, earthen shoulders of 1.0 m width shall be provided.

II) AU-110 Road II : The section of Major District Road MDR-30 commencing from Km 0/000 to Km 33/074 i.e. From Jintur to Selu through Pachalegaon, Niwali Kh, Walur, and Rajewadi.

(a) In built-up sections, Footpaths shall be provided in following table.

S.No.	Built up Stretch	Design Chainage (Km)		Length (Km)
		From	To	
As per the Proposed TCS				

(b) In open country, earthen shoulders width shall be provided as per proposed TCS.

4.6. Six Lane stretches (if any)

Details of stretches to be construed as Six Lane without paved are as indicated in Appentdix V Deleted.

4.7. Proposed Right of Way (ROW)

The details of the proposed ROW are given in Appendix B VI.

4.8. At Grade Intersection

At grade intersection shall be provided as per locations specified in Appendix BVII for major and minor intersections.

Note: The concessionaire shall take up the 'Detailed Engineering Study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in section-3 of Manual.

4.9. Type of Pavement

Pavement design shall be carried out in accordance with Section 5 sub para 5.2.3 of the Manual.

4.10. Grade Separated Intersections

The grade separated intersections shall be as provided as given at Appendix-B VIII.

4.11. Utility Structure

The details of the Utility Structure are given in Appendix BIX

4.12. Underpasses

Vehicular underpass and Light Vehicular Underpass shall be provided at location given at Appendix-BX and Pedestrian /cattle underpass shall be provided at location given at Appendix-BXI.

4.13. Major bridges

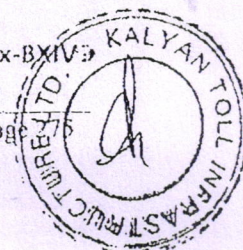
Major bridges as listed in Appendix BXII shall be provided, widened, reconstructed or extended

4.14. Minor bridges

Minor bridges as listed in Appendix BXIII shall be provided, widened, reconstructed or extended.

4.15. Culverts

Culverts shall be provided, widened, reconstructed or extended as listed in Appendix-BXIV.



4.16. ROB/RUB

Nil

Details of ROB/RUBs to be provided are given at Appendix BXV following points shall be taken care of:

- IX) The proposed span arrangements of the ROBs are tentative and subject to change as per availability of railway boundaries/ requirement of the railways.
- X) ROB shall be designed, constructed and maintained as per the requirements of Railway authorities. The construction plans shall be prepared in consultation with the concerned railway authority.
- XI) The ROB shall be constructed and maintained by the concessionaire under supervision of the Railways.
- XII) All expenditure related to construction, maintenance and supervision of ROB (except P&E charges) shall be borne by the Concessionaire

4.17. Slope protection

The side slope shall be protected by using suitable slope protection measures wherever required along project highway.

4.18 Utilities

Various utilities like electric and telephone poles, OFC lines, water pipe lines/sewage pipes and Hand pumps are located close to the Project Highway. With the proposal of widening of the existing road from 2-lane to 4-lane with paved shoulders with divided carriageway, it will be necessary to shift the utilities falling in the widening alignment, in consultation with IE/Authority.

4.19 Rainwater Harvesting

As per Ministry of Environment and Forests Notification, New Delhi dated 14.01.1997 (as amended on 13.01.1998, 05.01.1999 & 6.11.2000), the construction of Rain water, harvesting structure is mandatory in and around Water Crisis area, notified by the Central Ground Water Board.

Deleted

4.18 Type and Width of Median

Deleted.

4.20 Location of Footpath and drains

Drain cum footpath shall be provided in urban stretches as Appendix – BXVII. The dimensions of the footpath and drain shall be approved by Independent engineer.

4.21 Provision for extra widening at sharp curves

Extra widening to the carriageway shall be provided at sharp curve locations. The details of extra widening locations are as given in Appendix BXVIII.


Executive Engineer
Public Works Division, Nanded.



Appendix B I

Typical Cross Sections

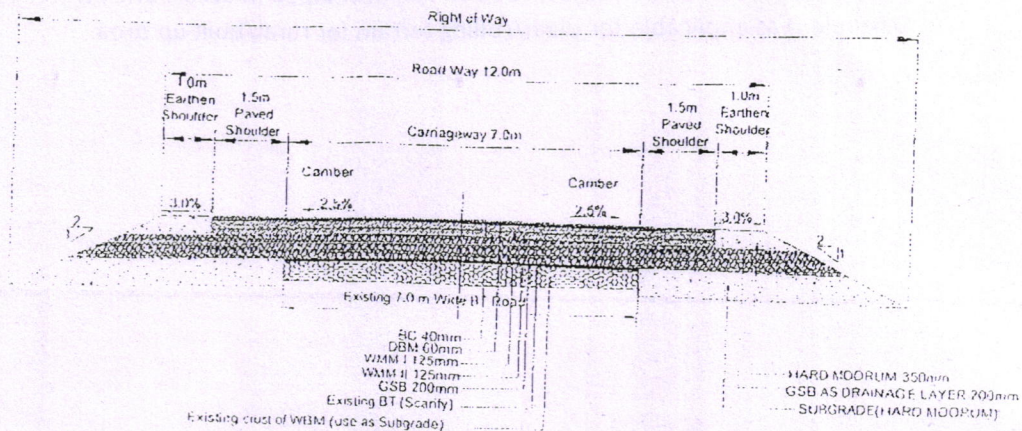
The cross sections of the project road will be developed in accordance with the manual indicated in the Schedule D as applicable for plain/rolling terrain for rural/built up area


Executive Engineer
Public Works Division, Nanded.

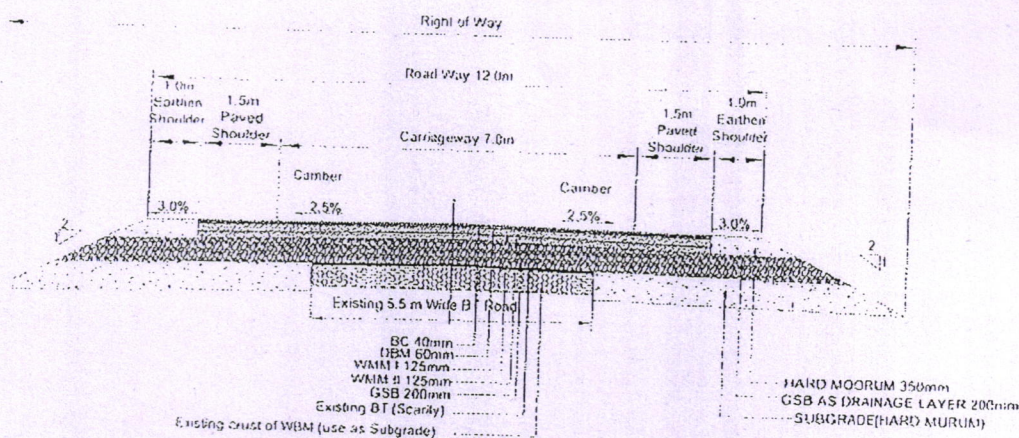


Appendix B-I: Figure of Typical Cross Section

- 1) AU-110 Road I: The section of State Highway SH-235 commencing from Km 51/100 to Km 97/606 i.e. From Sonpeth to Parbhani (Umri Phata).



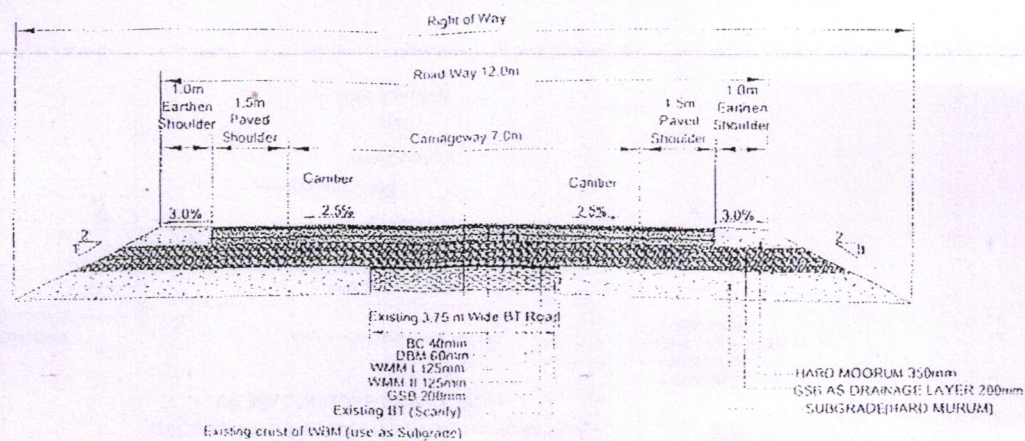
TYPICAL CROSS SECTION-1A
2-LANE WITH PAVED SHOULDERS ON EXISTING 7.0m BT ROAD



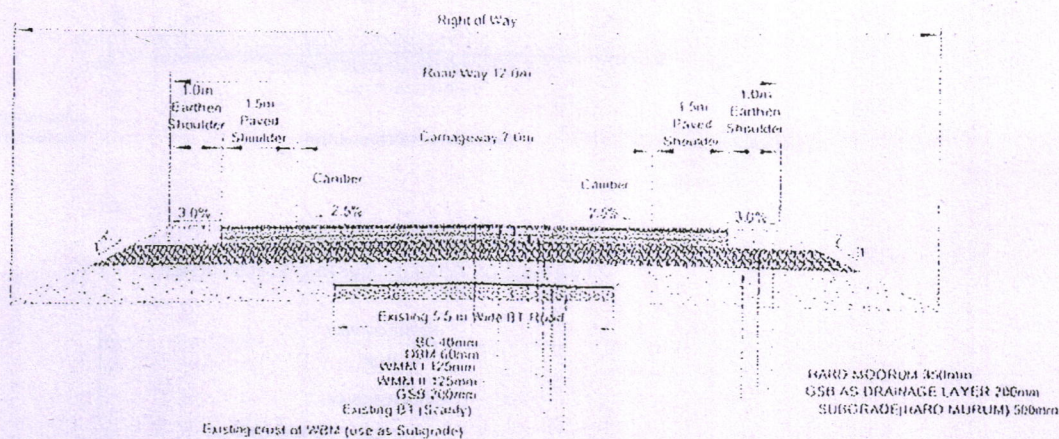
TYPICAL CROSS SECTION-1B
2-LANE WITH PAVED SHOULDERS ON EXISTING 5.5m BT ROAD

Executive Engineer
Public Works Division, Nanded.

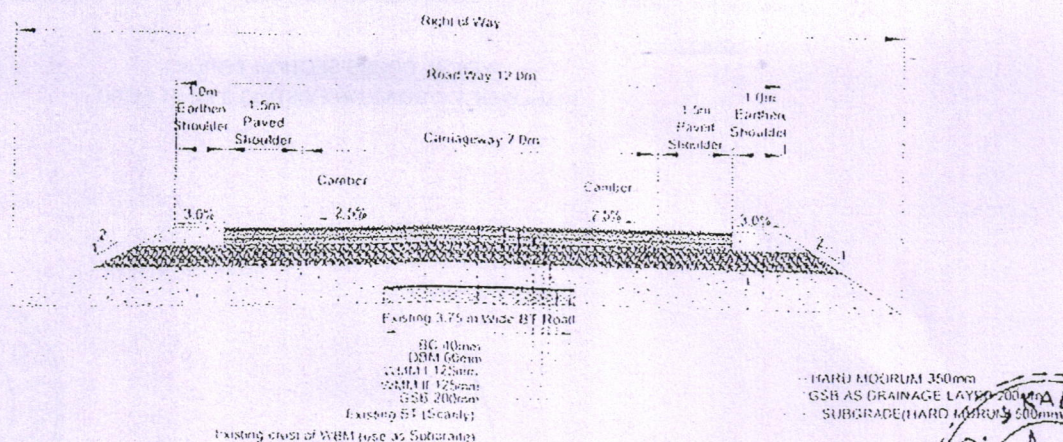




TYPICAL CROSS SECTION 1C
2-LANE WITH PAVED SHOULDERS ON EXISTING 3.75m BT ROAD

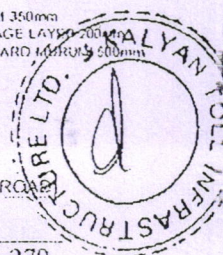


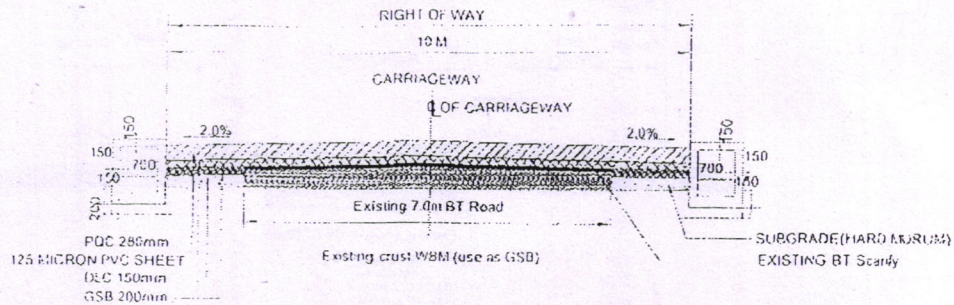
TYPICAL CROSS SECTION TYPE R2 2B
2-LANE WITH PAVED SHOULDERS (WIDENING & STRENGTHENING OF EXISTING 5.5M BT ROAD)



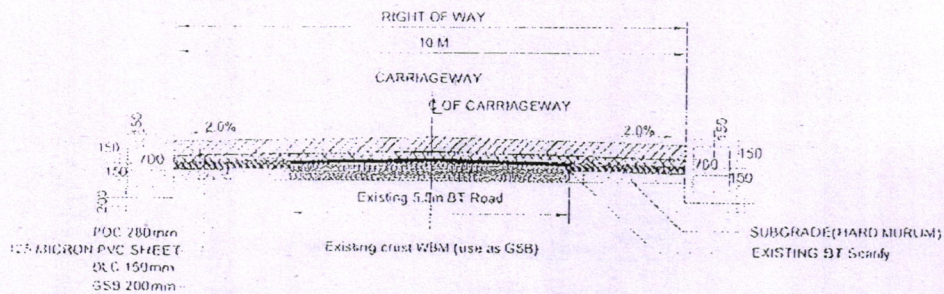
TYPICAL CROSS SECTION TYPE R2 2C
2-LANE WITH PAVED SHOULDERS (WIDENING & STRENGTHENING OF EXISTING 3.75M BT ROAD)

Executive Engineer
Public Works Division, Nanded.

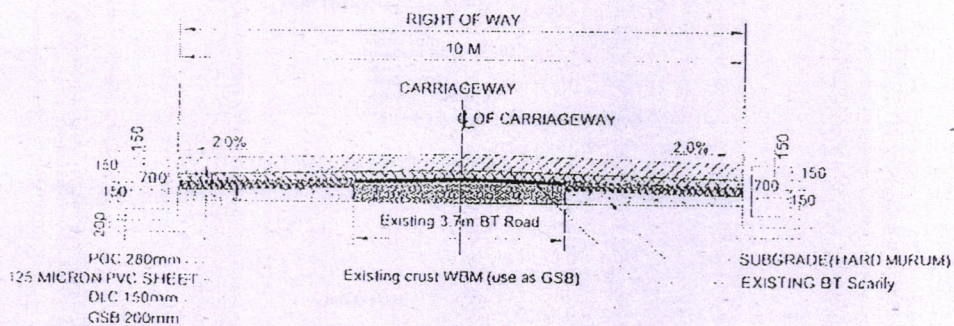




TYPICAL CROSS SECTION TYPE 3A
10.0m WIDE CC ROAD ON EXISTING 7.0m BT ROAD



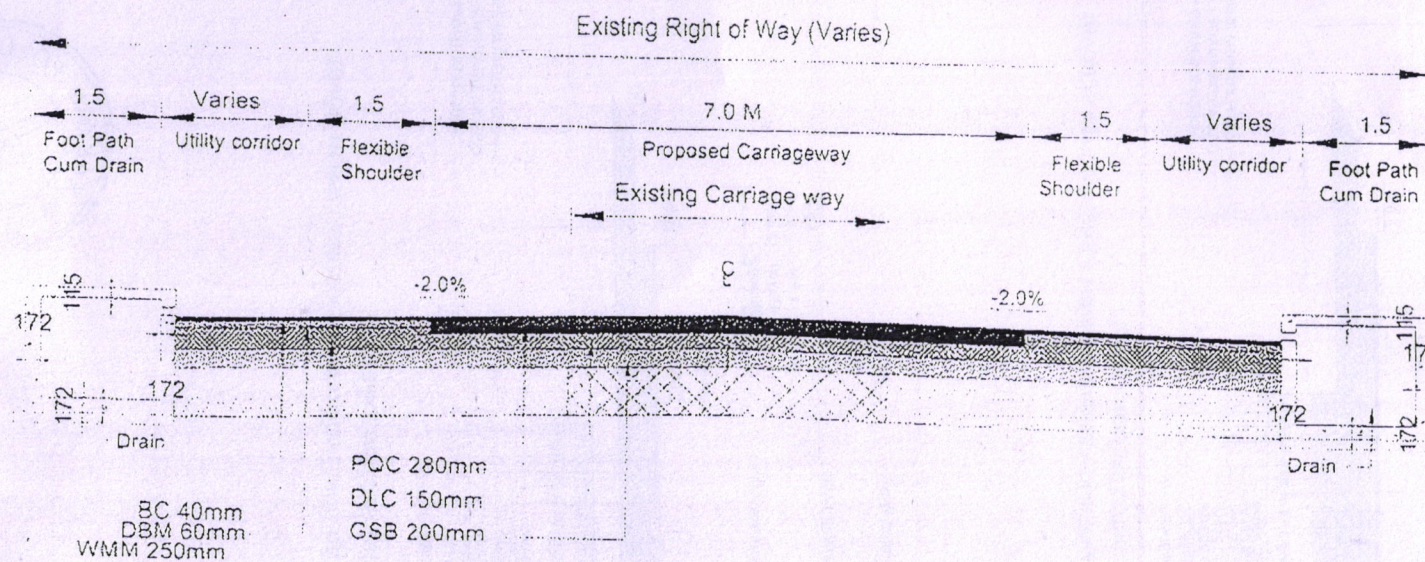
TYPICAL CROSS SECTION TYPE 3B
10.0m WIDE CC ROAD ON EXISTING 5.5m BT ROAD



TYPICAL CROSS SECTION TYPE 3C
10.0m WIDE CC ROAD ON EXISTING 3.7m BT ROAD

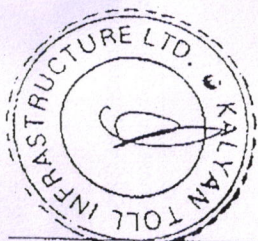
Executive Engineer
Public Works Division, Nanded.



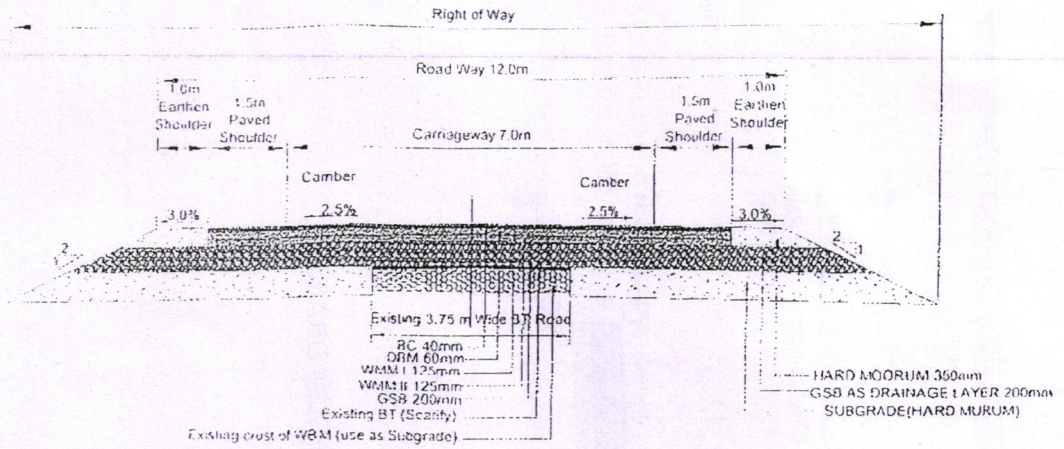


TCS 4C: CONCENTRIC WIDENING WITH CC SHOULDER WITH FOOTPATH CUM DRAIN

Executive Engineer
Public Works Division, Nanded.

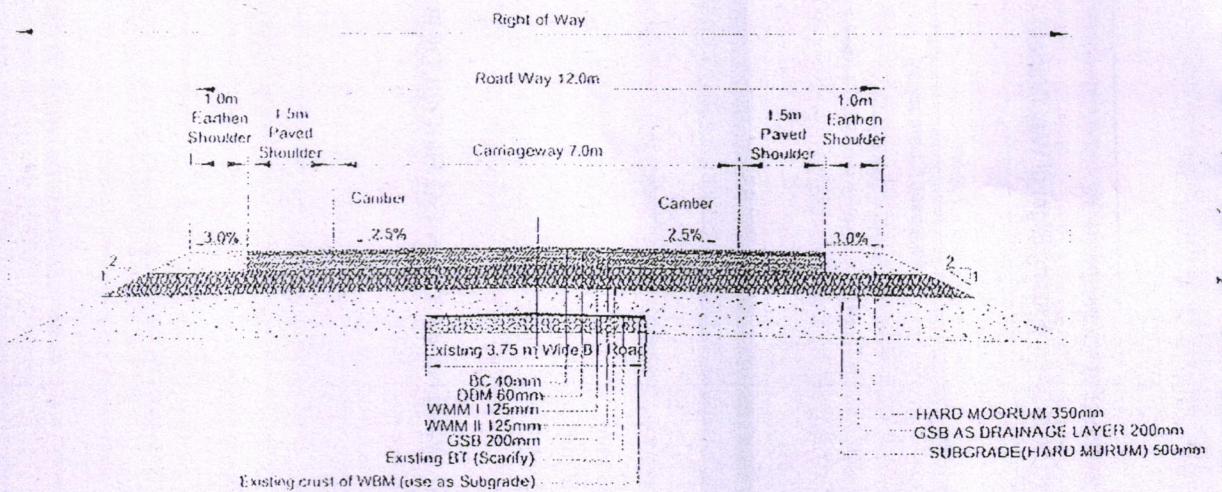


- II) AU-110 Road II : The section of Major District Road MDR-30 commencing from Km 0/000 to Km 33/074 i.e. From Jintur to Selu through Pachalegaon, Niwali Kh, Walur, and Rajewadi.



TYPICAL CROSS SECTION TYPE R2 1

2-LANE WITH PAVED SHOULDERS (WIDENING & STRENGTHENING OF EXISTING 3.75M BT ROAD)

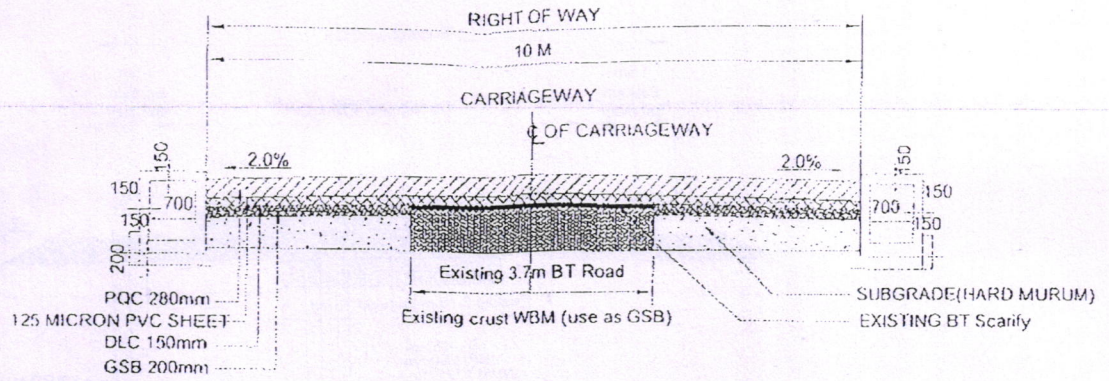


TYPICAL CROSS SECTION TYPE R2 2

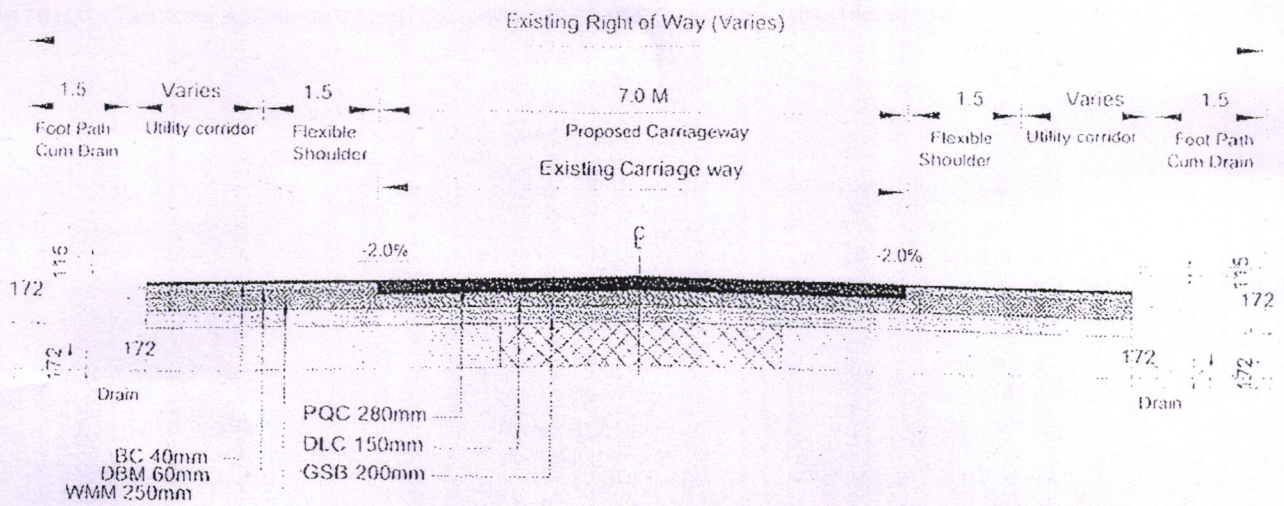
2-LANE WITH PAVED SHOULDERS (RECONSTRUCTION OF EXISTING 3.75M BT ROAD)

Executive Engineer
Public Works Division, Nanded.

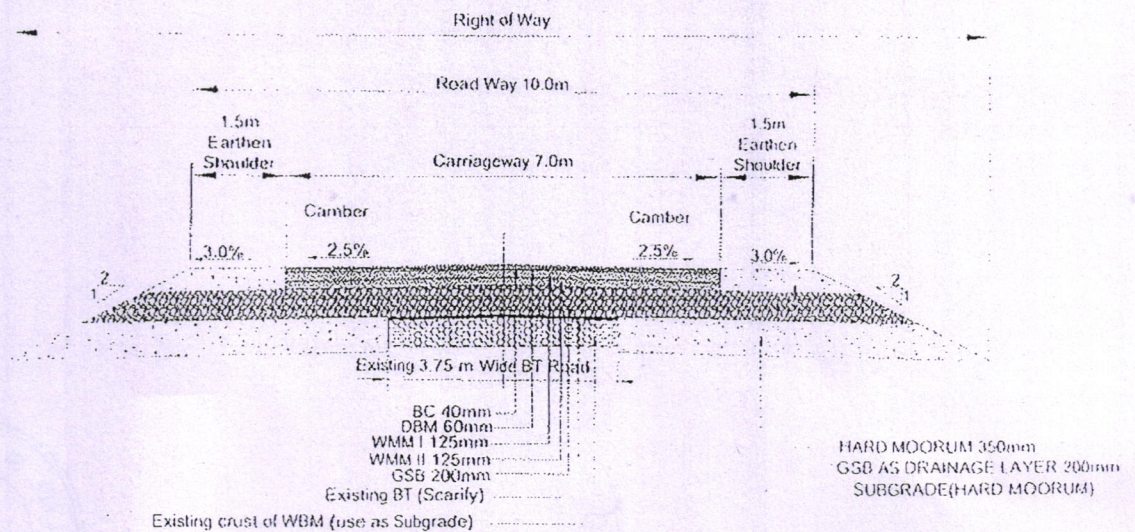




TYPICAL CROSS SECTION TYPE 3
1.0m WIDE CC ROAD ON EXISTING 3.7m BT ROAD



TCS 4: CONCENTRIC WIDENING WITH CC SHOULDER WITH FOOTPATH CUM DRAIN



TYPICAL CROSS SECTION TYPE 5

2-LANE WITHOUT PAVED SHOULDERS (WIDENING & STRENGTHENING OF EXISTING 3.75M BT ROAD)

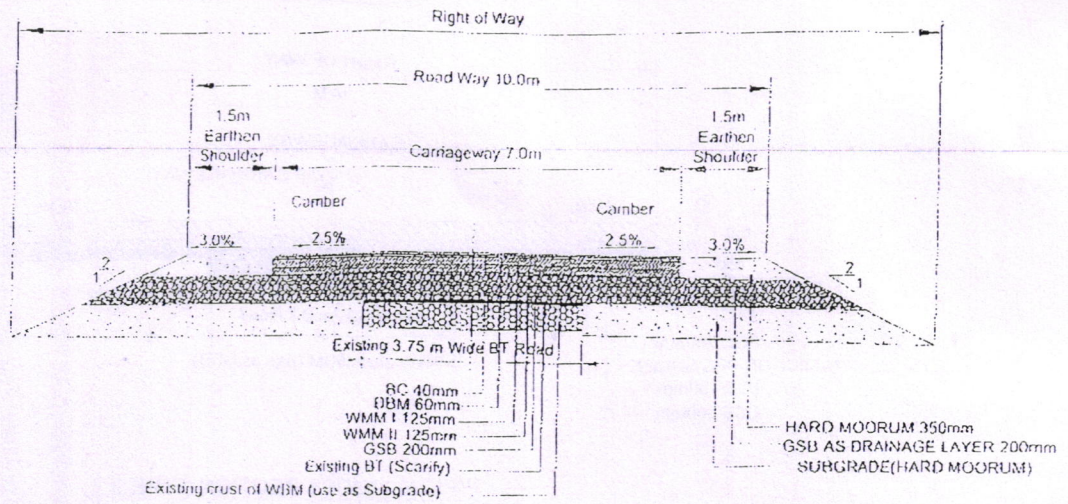
Executive Engineer

Public Works Division, Nanded

Construction of Two-laning Road with paved shoulders, under Package HAM-AU-108 in the State of Maharashtra, under MRIP on Hybrid Annuity Mode

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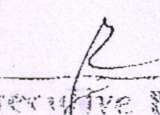
TYPICAL CROSS SECTION TYPE 6

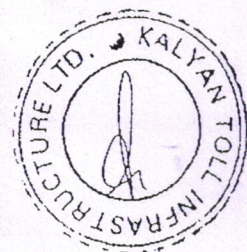
2-LANE WITHOUT PAVED SHOULDERS (WIDENING & STRENGTHENING OF EXISTING 3.75M BT ROAD)

Engineer
Public Works Division, Nanded.



Alignment Plan and Longitudinal Profile is enclosed in digital form in CD marked as Appendix-B II.


Executive Engineer
Public Works Division, Nagpur.



Details of Bypass / Realignment

1 Bypasses

Sr. No	Existing Chainage (km)		Design Chainage (km)		Design Length
	From	To	From	To	
Nil					

2 Realignments

- i) AU-110 Road I : The section of State Highway SH-235 commencing from Km 51/100 to Km 97/606 i.e. From Sonpeth to Parbhani (Umri Phata).

Sr. No	Existing Chainage (km)		Design Chainage (km)		Design Length
	From	To	From	To	
Nil					

- ii) AU-110 Road II : The section of Major District Road MDR-30 commencing from Km 0/000 to Km 33/074 i.e. From Jintur to Selu through Pachalegaon, Niwali Kh, Walur, and Rajewadi.

Sr. No	Existing Chainage (km)		Design Chainage (km)		Design Length (Km)
	From	To	From	To	
1	10.500	10.660	10.500	10.700	0.200
2	14.000	14.300	15.400	15.700	0.300

Executive Engineer
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शासकीय विमा निधी महाराष्ट्र राज्य

(विमा अधिनियम, १९३८ नुसार नोंदणीकृत)

सार : विमा निधी

विमा संचालनालय

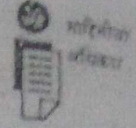
महाराष्ट्र राज्य

गृहनिर्माण भवन (महाडा)

२६४, पहिला मजला

कलानगरस्मॉर, वांद्रे (पूर्व)

मुंबई ४०० ०५१



फोन : २५१ २४ २२/२६५९ २४ ६९ • कार्यालय : २६५९ ०६ ९०/२६५९ ०७ ४६ • फॅक्स नं. ०२२-२६५९ ०४ ०३/२६५९ २४ ६९

E-mail: vimg3.doi@mgif.maharashtra.gov.in

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31 MAR 2015

/देमके कपात रकम/संकीर्ण/अप्रि-३

विश्व- कंत्राटी कामाचा व ते काम पूर्ण करण्यासाठी नियुक्त करण्यात येणा-या कामगारांचा विमा शासकीय विमानिधीकडे उत्तरविण्याकरिता कार्यपद्धत निश्चित करणेबाबत.

हदर्भ- १. महाराष्ट्र शासन, वित्त विभाग, शासन निर्णय क्र.विमास-१०९८/प्र.क्र. २८/ शासन हमी दि. १९.०८.१९९८.

२. महाराष्ट्र शासन, नगर विकास विभाग, पत्र क्र. जीईएन १०९८/१३५७/ प्र. क्र. १६६/९८/ नवि-२४ दि.३.११.२००३.

संदर्भ,

तदर्भाधीन १ मधील शासन निर्णयानुसार सर्व शासकीय विभाग, तसेच, त्यांच्या प्रशासकीय नियंत्रणाखालील सर्व महानडळे, मंडळे, सार्वजनिक उपक्रम, नगरपालिका, महानगरपालिका, जिल्हा परिषदा यांना त्यांचे विविध कामगारांच्या कंत्राटी कामाचा विमा शासकीय विमानिधीकडे उत्तरविणे बंधनकारक केलेले आहे. कंत्राटी कामाचा विमा शासकीय विमानिधीकडे उत्तरविणे संदर्भात शासकीय विमानिधीच्या स्तरावरून आपणास यापूर्वी पत्रव्यवहार करण्यात आलेला आहे. तथापि, कंत्राटी कामाचा विमा व्यवहार हाताळतांना सुसुत्रता व समानता आणण्यासाठी सोबत सुचित कार्यपद्धतीचे प्रारूप जोडण्यात येत आहे.

आपणास या पत्राद्वारे विनंती- करण्यात येते की, आपल्या अखत्यारितील विविध संबंधित विभागां/कार्यालयांना सोबत जोडलेल्या कंत्राटी कामाचा विमा उत्तरविण्याबाबतची कार्यपद्धतीचे प्रारूपानुसार अनुक्रम दि. १.०४.२०१५ पासून काटेकोरपणे करण्याचे आदेश निर्गमित करून त्या पत्राची प्रत या कार्यालयाच्या अभिलेखासाठी पाठविण्यात यावी.

आपला विश्वासू,

(वि. ज. सुरळकर)

विमा संचालक,

महाराष्ट्र राज्य, मुंबई

हदर्भ- १. कंत्राटी कामाचा विमा उत्तरविण्याबाबतची कार्यपद्धतीचे प्रारूप

२. दि. ३.११.२००३ नुसार शासकीय विमानिधीच्या मुंबई शाखा

कंत्राटी कामाचा विमा उत्तरविण्याबाबतच्या कार्यपद्धतीचे प्रारूप

विषय - रु. २५ लाखापेक्षा कमी कंत्राटी कामाचा व ते काम पूर्ण करण्याकरिता नियुक्त करण्यात येणाऱ्या कामगारांचा विमा शासकीय विमानिधीकडे उत्तरविण्याकरिता सुधारित कार्यपद्धत निश्चित करणेबाबत.

संदर्भ - १) महाराष्ट्र शासन, वित्त विभाग, शासन निर्णय क्र.विमासं-१०९८/प्र.क्र.२८/शासन हमी दि. १९.०८.१९९८.

२) महाराष्ट्र शासन, नगर विकास विभाग, पत्र क्र. जीईएन १०९८/१३५७/प्र. क्र. १६६/९८/नवि-२४ दि.३.११.२००३.

शासकीय विमानिधी या आस्थापनेचे मुंबई वगळता महाराष्ट्रात अन्य ठिकाणी शाखा कार्यालय नसत नाही. तसेच शासकीय विमानिधी ही शासनाची स्वयंविमा योजना असल्यामुळे सार्वजनिक क्षेत्रील विमा कंपन्याप्रमाणे एजंट/ब्रोकर यांची सेवा शासकीय विमानिधीकडे उतलव्य नाही. अस्तित् शासन निर्णयानुसार संबंधित प्रकर्ता (Principal) व कंत्राटदार यांना विषयांकित विमा शासकीय विमानिधीकडे उत्तरविणे अनिवार्य आहे. शासकीय विमानिधीकडे शासनाची कंत्राटी कामाची विमा योजना यशस्वीपणे राबविण्यासाठी प्रकर्ता (Principal) या नात्याने कंत्राटीकाम कंत्राटदारांना येवानंतर खालील नमूद केलेली कार्यपद्धती अनुसरून कंत्राटी कामाचा विमा उत्तरविणे आवश्यक आहे.

२.५ लाखापेक्षा कमी कंत्राटी कामाच्या विमाबाबतची कार्यपद्धती

१. कंत्राटी कामाचा कार्यादेश निर्गमित झाल्यावर कंत्राटदाराने विनाविलंब शासकीय विमानिधीकडे तपक साधून विमापत्रक/विमास्विकारपत्र घेतल्याचा पुरावा संबंधित प्रकर्ता यांना सादर करणे बंधनकारक आहे.

२. जर कंत्राटदाराने शासकीय विमानिधीने निर्गमित केलेले विमापत्रक/विमास्विकारपत्र सादर न केल्यास संबंधित कंत्राटदाराच्या प्रथम देयकानून एकूण कंत्राटी कामाच्या मुल्याच्या रु. ०.५०% या दराने विमाहप्त्याची रक्कम कपात करून कार्यादेशाच्या प्रतीसह शासकीय विमानिधीकडे "विमा संचालक, महाराष्ट्र राज्य, मुंबई" यांच्या नावे धनाकर्ष अथवा ग्रास संगणक आज्ञावलीत (GRAS-Government Receipt Accounting System) जमा करणे आवश्यक आहे. विमाहप्त्यापोटी कपात करण्यात आलेल्या रकमेचा तपशील २ प्रतीमध्ये खालील विवरणपत्रामध्ये शासकीय विमानिधीला पाठविणे आवश्यक आहे. त्यानुसार, विवरणपत्रनिहाय एकच सामाईक विमापत्रक (schedule policy) निर्गमित करण्यात येईल.

क्र.सं.	कंत्राटदाराचे नाव	कंत्राटी कामाचे नाव	कार्यादेश क्र. व दिनांक	कंत्राट कामाचा कालावधी	कंत्राटी कामाचे मूल्य	५.०/५.०% प्रमाणाचे विमाहप्त्याची रक्कम
१	२	३	४	५	६	७

जर नमूद करण्यात आलेल्या विवरणपत्रात संबंधित प्रकर्ता यांचेकडून विमाहप्ता प्रस्तावितची माहिती शासकीय विमानिधीला प्राप्त न झाल्यास सामाईक विमापत्रक (schedule policy) निर्गमित करण्यात येणार नाही याची कृपया नोंद घेण्यात यावी.

सामाईक विमापत्रक (schedule policy) विमापत्रका अंतर्गत कंत्राटदाराच्या सर्वंकष जोखीम/हानी/साठवण-उभारणी विमापत्रकाखाली कंत्राटी कामाचा विमा उतरविला जाणार असल्याने या विमापत्रकाच्या अटी व शर्तीनुसार विमाजोखीम आग, पूर, भूकंप, चोरी इ. विमाछत्राचा लाभ प्रकर्ता/कंत्राटदार यांना मिळणार आहे. तसेच, श्रमिक नुकसान भरपाई दायित्वही श्रमिक नुकसान भरपाई अधिनियम १९२३ तरतूदीनुसार स्विकारले जाईल.

प्रकर्ता यांनी विमाहप्त्याची रक्कम कंत्राटदाराच्या देयकातून कपात केल्यानंतर कंत्राटी कामाच्या वेळोवेळी वित्तीय अथवा जिवित हानी उद्भवल्यास त्याची सूचना शासकीय विमानिधीस विनाविलंब रूपाची दक्षता प्रकर्ता/कंत्राटदार यांनी घेणे आवश्यक राहिल.

२.२ लाखापेक्षा अधिक कंत्राटी कामाच्या विमाबाबतची कार्यपद्धती

१. जेव्हा कंत्राटदारास रु. २५ लाखापेक्षा अधिक रकमेचे कंत्राटी काम सुपूर्त केले असल्यास, कंत्राटदाराने शासकीय विमानिधीच्या कार्यालयाकडे प्रत्यक्ष संपर्क साधून विहित नमुन्यातील विमाप्रस्तावपत्र सादर करणे अनिवार्य आहे. शासकीय विमानिधीकडे विमाहप्ता रकमेचा भरणे केल्यावर संबंधित कंत्राटदारास विमास्विकारपत्र/विमापत्र निर्गमित करण्यात येईल.

२. जर कंत्राटदाराने कंत्राटी कामाचा विमा शासकीय विमानिधीकडे उतरविल्याचा पुरावा म्हणून शासकीय विमानिधीने निर्गमित केलेले विमास्विकारपत्र/विमापत्रक संबंधित प्रकर्ता (Principal) यांना सादर केले नाही तर संबंधित प्रकर्ता यांनी नगर विकास विभाग याच्या दि. ३.११.२००३ च्या परिपत्रकात नमूद करण्यात आलेल्या कार्यपद्धतीनुसार एकूण कंत्राटी कामाच्या मूल्याच्या ५% या दराने कंत्राटदाराच्या प्रथम देयकातून रक्कम वळती करून शासकीय विमानिधीकडे पत्राकर्षाद्वारे अथवा ग्रास संगणक आज्ञावलीत (GRAS Government Receipt Accounting

IRC: 37-2012

GUIDELINES FOR THE DESIGN OF FLEXIBLE PAVEMENTS

(Third Revision)



INDIAN ROADS CONGRESS

JULY 2012

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(Third Revision)

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ABBREVIATIONS

All symbols are explained where they occur first. Some of the symbols are,

AAAT	- Average Annual Air Temperature
AAPT	- Average Annual Pavement Temperature
AMAT	- Average Monthly Air Temperature
AMPT	- Average Monthly Pavement Temperature
AASHTO	- American Association of State Highway and Transportation Officials
ASTM	- American Society of Testing and Materials
AUSTROADS	- Association of Australian and New Zealand Road Transport and Traffic Authorities.
BC	- Bituminous Concrete
BIS	- Bureau of Indian Standards
BM	- Bituminous Macadam
C_s	- Spacing of Transverse Cracks
CBR	- California Bearing Ratio
CFD	- Cumulative Fatigue Damage
CTB/CT	- Cement Treated Base - includes all type of Cement/ Chemical stabilized bases
DBM	- Dense Bituminous Macadam
E	- Elastic Modulus of Cementitious Layer
GB	- Granular Base
GDP	- Gross Domestic Product
GSB	- Granular Sub-base
I_c	- Crack Infiltration Rate per Unit Length
IRC	- Indian Roads Congress
K_p	- Infiltration Rate Per Unit Area of Un-Cracked Pavement Surface
M_R	- Resilient Modulus
M_{RUP}	- Modulus of Rupture
MEPDG	- Mechanistic Empirical Pavement Design Guide

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msa	- Million Standard Axles
MORTH	- Ministry of Road Transport & Highways
MSS	- Mixed Seal Surfacing
N_c	- No. of Longitudinal Cracks
N_f	- Cumulative No. of Repetitions for Fatigue Failure
N_R	- Cumulative No. of Repetitions for Rutting Failure
PC	- Premix Carpet
q_i	- Water Infiltration Rate Per Unit Area
SAMI	- Stress Absorbing Membrane Interlayer
RAP	- Reclaimed Asphalt Pavement
RF	- Reliability Factor
SDBC	- Semi-Dense Bituminous Concrete
SD	- Surface Dressing
SDP	- State Domestic Product
UCS	- Unconfined Compressive Strength
V_a	- Volume of Air Voids
V_b	- Volume of Bitumen
VDF	- Vehicle Damage Factor
VG	- Viscosity Grade
W_p	- Width of Pavement Subjected to Infiltration
W_c	- Length of Transverse Cracks
WBM	- Water Bound Macadam
WMM	- Wet Mix Macadam
ϵ_t	- Horizontal Tensile Strain
ϵ_v	- Vertical Subgrade Strain
μ	- Poisson's Ratio
$\mu\epsilon$	- Micro Strain

GUIDELINES FOR THE DESIGN OF FLEXIBLE PAVEMENTS

1 INTRODUCTION

1.1 The guidelines on design of flexible pavement were first brought out in 1970, which were based on California Bearing Ratio (CBR) of subgrade and traffic in terms of number of commercial vehicles (more than 3 tonnes laden weight). These guidelines were revised in 1984 in which design traffic was considered in terms of cumulative number of equivalent standard axle load of 80 kN in millions of standard axles (msa) and design charts were provided for traffic up to 30 msa using an empirical approach.

1.2 The guidelines were revised again in 2001 when pavements were required to be designed for traffic as high as 150 msa. The revised guidelines used a semi-mechanistic approach based on the results of the MORTH's research scheme R-56 implemented at IIT Kharagpur. The software, FPAVE was developed for the analysis and design of flexible pavements. Multilayer elastic theory was adopted for stress analysis of the layered elastic system. A large number of data collected from different parts of India under various research schemes of MORTH were used for the development of fatigue and rutting criteria from field performance data.

1.3 The traffic pattern has changed since then and so has the technology. The volume of tandem, tridem and multi-axle vehicles has increased manifold and heavier axle loads are common. Experience has been gained on the use of new form of construction and materials such as stone matrix asphalt, modified bitumen, foamed bitumen, bitumen emulsion, warm asphalt, cementitious bases and sub-bases, since the publication of the last revision of the guidelines. Conventional as well as commercially available chemical soil stabilizers are being successfully used in trial sections. Attention is focused on fatigue resistant bituminous mixes with high viscosity binders for heavy traffic with a view to construct high performance long life bituminous pavements. The guidelines contained in this document reflect the current knowledge in the subject.

1.4 Conventional construction material like aggregates is becoming progressively scarce on account of environmental concerns as well as legal restrictions on quarrying while the construction activity has expanded phenomenally. This has shifted focus from large scale use of conventional aggregates to use of local, recycled and engineered marginal aggregates in construction.

1.5 It is recognized that research as well as performance trials have not been very extensive in India for some of the new materials but these have been included in the guidelines in the light of extensive performance reports and current practice in Australia, South Africa and other countries with due safeguards in design for heavy axle loads. Some trials in India have performed well (**Annex XI**).

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Accordingly, this revision of IRC 37 incorporates some of the new and alternate materials in the current design practices. A designer can use his sound engineering judgment consistent with local environment using a semi-mechanistic approach for design of pavements.

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1.6 The initial draft was prepared by Prof. B.B. Pandey of IIT Kharagpur and presented before the Flexible Pavement Committee (H-2) of IRC during its meeting held on 4.6.2011. There after the draft, after further revision, was presented at the joint meeting of Flexible Pavement Committee and Composite Pavement Committee (H-9) under the joint convenorship of Shri A.V. Sinha and Shri P.L. Bongirwar held on 12.9.2011 and the draft was finally approved in the joint meeting.

1.7 The finalized document was submitted to the Highways Specifications and Standards Committee (HSS) of IRC for their consideration. The document was approved by the Highways Specifications and Standards Committee (HSS) in its meeting held on 23.9.2011. The Executive Committee in its meeting held on 7.10.2011 approved the document for

placing before Council. The document was approved by the IRC Council in its meeting held on 3.11.2011 at Lucknow. The DG (RD) & SS authorized the Convenor of the Flexible Pavement Committee (H-2) to incorporate the comments offered by the Council members. The comments have been incorporated and the document has been finalized for printing as one of the revised Publications of IRC.

2 SCOPE OF THE GUIDELINES

2.1 The Guidelines shall apply to the design of new flexible pavements for Expressways, National Highways, State Highways, Major District Roads and other categories of roads predominantly carrying motorized vehicles. These guidelines do not form a rigid standard and sound engineering judgment considering the local environment and past pavement performance in the respective regions should be given due consideration while selecting a pavement composition.

2.2 For the purpose of the guidelines, flexible pavements include pavements with Bituminous surfacing over:

- (i) Granular base and sub-base
- (ii) Cementitious bases and sub-bases with a crack relief layer of aggregate interlayer below the bituminous surfacing
- (iii) Cementitious bases and sub-bases with SAMI in-between bituminous surfacing and the cementitious base layer for retarding the reflection cracks into the bituminous layer
- (iv) Reclaimed Asphalt Pavement (RAP) with or without addition of fresh aggregates treated with foamed bitumen/bitumen emulsion
- (v) Use of deep strength long life bituminous pavement

2.3 These guidelines shall not be straightway applied to overlay design for which IRC 81-997 or a more suitable procedure based on evaluation of in situ properties of pavement layers by Falling Weight Deflectometer (FWD) should be used (25,56).

2.4 The guidelines may require revision from time to time in the light of future developments and experience in the field. Towards this end, it is suggested that all the organizations intending to use the guidelines should keep a detailed record of the year of construction, subgrade CBR, soil characteristics including resilient modulus, pavement composition and specifications, traffic, pavement performance, overlay history, climatic conditions etc. and provide feedback to the Indian Roads Congress for further revision.

3 GENERAL

3.1 The IRC: 37-2001 was based on a Mechanistic Empirical approach, which considered the design life of pavement to last till the fatigue cracking in bituminous surface extended to 20 per cent of the pavement surface area or rutting in the pavement reached the terminal rutting of 20 mm, whichever happened earlier. The same approach and the criteria are followed in these revised guidelines as well, except that the cracking and rutting have been restricted to 10 per cent of the area for design traffic exceeding 30 million standard axles. The cracking and rutting models in IRC: 37-2001 were based on the findings of the research schemes of the Ministry of Road Transport & Highways, Government of India, under which pavement performance data were collected from all over India by academic institutions and Central Road Research Institute to evolve the fatigue and rutting criteria for pavement design using a semi-analytical approach. In the absence of any further research in the field to modify or refine these models, the same models are considered applicable in these guidelines as well. These revised guidelines, however, aim at expanding the scope of pavement design by including alternate materials like cementitious and reclaimed asphalt materials, and subjecting them to analysis using the software IITPAVE, a modified version of FPAVE developed under the Research Scheme R-56 for layered system analysis. The material properties of these alternate materials, such as Resilient/Elastic Modulus, were extensively tested in laboratories in the country, especially IIT, Kharagpur. Conservative values of material properties are suggested in these Guidelines because of variation in test results on materials from different sources and based on National Standards of Australia, South Africa and MEPDG of the USA as well as those adopted in some of the satisfactorily performing pavements constructed in the country using cementitious and RAP bases (Ref **Annex XI**). The material properties should be tested in laboratory as per test procedures recommended in **Annex IX** and **X**.

3.2 The experience on a number of high volume highways designed and constructed during the last decade using the guidelines of IRC: 37-2001 as reported in various literature shows that the most common mode of distress has been flushing and rutting in the bituminous layer (49, 51 and 61). Surface cracking of the bituminous layer (i.e. the top down cracking) within a year or two of traffic loading is also reported from different parts of India (39, 53 and 63). Heavy Vehicle Simulator at the Central Road Research Institute exhibited similar surface cracking. Published literatures on fatigue and rutting of different types of bituminous mixes have helped in better understanding of these problems (20, 24, 27, 38, 42, 43, 47 and 51). The present guidelines strongly recommend that these problems need serious consideration. Bituminous mix design needs to be considered an integral part of pavement design exercise with a view to provide (i) fatigue resistant mixes in the bottom bituminous layer to eliminate bottom-up cracking (ii) rut resistant bituminous layers of high tensile strength to eliminate rutting and surface cracking.

3.3 The revised guidelines also recommend cementitious sub-bases and bases. Such bound layers would display shrinkage and traffic induced cracks after the construction and the long term effective moduli would be much lower than those determined in the laboratory by

unconfined compression test. Elastic Moduli of such layers are to be judiciously selected, which can ensure long term performance as a structural layer in the pavement. Their fatigue fracture behaviour is analyzed on the same principles that are applied to concrete pavements. Only low strength cementitious bases are recommended for use since high strength rigid bases develop wide shrinkage cracks which reflect to the bituminous surface rapidly. Due to lower strength requirement of the cemented sub-bases and bases, the required compressive strength can be easily achieved even by stabilizing local and marginal materials. While their strength may be low, it is essential to ensure a reasonable level of durability by 'wetting' and 'drying' test.

3.4 The Guidelines recommend that the following aspects should be given consideration while designing to achieve better performing pavements:

- (i) Incorporation of design period of more than fifteen years.
- (ii) Computation of effective CBR of subgrade for pavement design.
- (iii) Use of rut resistant surface layer.
- (iv) Use of fatigue resistant bottom bituminous layer.
- (v) Selection of surface layer to prevent top down cracking.
- (vi) Use of bitumen emulsion/foamed bitumen treated Reclaimed Asphalt Pavements in base course.
- (vii) Consideration of stabilized sub-base and base with locally available soil and aggregates.
- (viii) Design of drainage layer.
- (ix) Computation of equivalent single axle load considering (a) single axle with single wheels (b) single axle with dual wheels (c) tandem axle and (d) tridem axles.
- (x) Design of perpetual pavements with deep strength bituminous layer.

Each of the items listed above has been discussed in these guidelines at appropriate places.

3.5 Load associated failure is considered as the mode of failure in these guidelines as environmental effects on bituminous layers are built-in in the calibration of rutting and fatigue equations from pavement performance.

4 TRAFFIC

4.1 General

4.1.1 The recommended method considers design traffic in terms of the cumulative number of standard axles (80 kN) to be carried by the pavement during the design life. Axle load spectrum data are required where cementitious bases are used for evaluating the fatigue damage of such bases for heavy traffic. Following information is needed for estimating design traffic:

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- (i) Initial traffic after construction in terms of number of Commercial Vehicles per day (CVPD).
- (ii) Traffic growth rate during the design life in percentage.
- (iii) Design life in number of years.
- (iv) Spectrum of axle loads.
- (v) Vehicle Damage Factor (VDF).
- (vi) Distribution of commercial traffic over the carriageway.

4.1.2 Only the number of commercial vehicles having gross vehicle weight of 30 kN or more and their axle-loading is considered for the purpose of design of pavement.

4.1.3 Assessment of the present day average traffic should be based on seven-day-24-hour count made in accordance with IRC: 9-1972 “Traffic Census on Non-Urban Roads”.

4.2 Traffic Growth Rate

4.2.1 The present day traffic has to be projected for the end of design life at growth rates (‘r’) estimated by studying and analyzing the following data:

- (i) The past trends of traffic growth; and
- (ii) Demand elasticity of traffic with respect to macro-economic parameters (like GDP or SDP) and expected demand due to specific developments and land use changes likely to take place during design life.

4.2.2 If the data for the annual growth rate of commercial vehicles is not available or if it is less than 5 per cent, a growth rate of 5 per cent should be used (IRC:SP:84-2009).

4.3 Design Life

4.3.1 The design life is defined in terms of the cumulative number of standard axles in msa that can be carried before a major strengthening, rehabilitation or capacity augmentation of the pavement is necessary.

4.3.2 It is recommended that pavements for National Highways and State Highways should be designed for a minimum life of 15 years. Expressways and Urban Roads may be designed for a longer life of 20 years or higher using innovative design adopting high fatigue bituminous mixes. In the light of experience in India and abroad, very high volume roads with design traffic greater than 200 msa and perpetual pavements can also be designed using the principles stated in the guidelines. For other categories of roads, a design life of 10 to 15 years may be adopted.

4.3.3 If stage construction is adopted, thickness of granular layer should be provided for the full design period. In case of cemented bases and sub-bases, stage construction may lead to early failure because of high flexural stresses in the cemented layer and therefore, not recommended.

4.4 Vehicle Damage Factor

4.4.1 The guidelines use Vehicle Damage Factor (VDF) in estimation of cumulative msa for thickness design of pavements. In case of cemented bases, cumulative damage principle is used for determining fatigue life of cementitious bases for heavy traffic and for that spectrum of axle loads is required.

4.4.2 The Vehicle Damage Factor (VDF) is a multiplier to convert the number of commercial vehicles of different axle loads and axle configuration into the number of repetitions of standard axle load of magnitude 80 kN. It is defined as equivalent number of standard axles per commercial vehicle. The VDF varies with the vehicle axle configuration and axle loading.

4.4.3 The equations for computing equivalency factors for single, tandem and tridem axles given below should be used for converting different axle load repetitions into equivalent standard axle load repetitions. Since the VDF values in AASHO Road Test for flexible and rigid pavement are not much different, for heavy duty pavements, the computed VDF values are assumed to be same for bituminous pavements with cemented and granular bases.

$$\text{Single axle with single wheel on either side} = \left(\frac{\text{axle load in kN}}{65} \right)^4 \quad \dots 4.1$$

$$\text{Single axle with dual wheels on either side} = \left(\frac{\text{axle load in kN}}{80} \right)^4 \quad \dots 4.2$$

$$\text{Tandem axle with dual wheels on either side} = \left(\frac{\text{axle load in kN}}{148} \right)^4 \quad \dots 4.3$$

$$\text{Tridem axles with dual wheels on either side} = \left(\frac{\text{axle load in kN}}{224} \right)^4 \quad \dots 4.4$$

4.4.4 VDF should be arrived at carefully by carrying out specific axle load surveys on the existing roads. Minimum sample size for survey is given in **Table 4.1**. Axle load survey should be carried out without any bias for loaded or unloaded vehicles. On some sections, there may be significant difference in axle loading in two directions of traffic. In such situations, the VDF should be evaluated direction wise. Each direction can have different pavement thickness for divided highways depending upon the loading pattern.

Table 4.1 Sample Size for Axle Load Survey

Total number of Commercial Vehicles per day	Minimum percentage of Commercial Traffic to be surveyed
<3000	20 per cent
3000 to 6000	15 per cent
>6000	10 per cent

4.4.5 Axle load spectrum

The spectrum of axle load in terms of axle weights of single, tandem, tridem and multi-axle should be determined and compiled under various classes with class intervals of 10 kN, such as 10 kN, 20 kN and 30 kN for single, tandem and tridem axles respectively.

4.4.6 Where sufficient information on axle loads is not available and the small size of the project does not warrant an axle load survey, the default values of vehicle damage factor as given in **Table 4.2** may be used.

Table 4.2 Indicative VDF Values

Initial traffic volume in terms of commercial vehicles per day	Terrain	
	Rolling/Plain	Hilly
0-150	1.5	0.5
150-1500	3.5	1.5
More than 1500	4.5	2.5

4.5 Distribution of Commercial Traffic over the Carriageway

4.5.1 Distribution of commercial traffic in each direction and in each lane is required for determining the total equivalent standard axle load applications to be considered in the design. In the absence of adequate and conclusive data, the following distribution may be assumed until more reliable data on placement of commercial vehicles on the carriageway lanes are available:

(i) Single-lane roads

Traffic tends to be more channelized on single-lane roads than two-lane roads and to allow for this concentration of wheel load repetitions, the design should be based on total number of commercial vehicles in both directions.

(ii) Two-lane single carriageway roads

The design should be based on 50 per cent of the total number of commercial vehicles in both directions. If vehicle damage factor in one direction is higher, the traffic in the direction of higher VDF is recommended for design.

(iii) Four-lane single carriageway roads

The design should be based on 40 per cent of the total number of commercial vehicles in both directions.

(iv) Dual carriageway roads

The design of dual two-lane carriageway roads should be based on 75 per cent

of the number of commercial vehicles in each direction. For dual three-lane carriageway and dual four-lane carriageway, the distribution factor will be 60 per cent and 45 per cent respectively.

4.5.2 Where there is no significant difference between traffic in each of the two directions, the design traffic for each direction may be assumed as half of the sum of traffic in both directions. Where significant difference between the two streams exists, pavement thickness in each direction can be different and designed accordingly.

For two way two lane roads, pavement thickness should be same for both the lanes even if VDF values are different in different directions and designed for higher VDF. For divided carriageways, each direction may have different thickness of pavements if the axle load patterns are significantly different.

4.6 Computation of Design Traffic

4.6.1 The design traffic in terms of the cumulative number of standard axles to be carried during the design life of the road should be computed using the following equation:

$$N = \frac{365 \times [(1 + r)^n - 1]}{r} \times A \times D \times F \quad 4.5$$

Where,

N = Cumulative number of standard axles to be catered for in the design in terms of msa.

A = Initial traffic in the year of completion of construction in terms of the number of Commercial Vehicles Per Day (CVPD).

D = Lane distribution factor (as explained in para 4.5.1).

F = Vehicle Damage Factor (VDF).

n = Design life in years.

r = Annual growth rate of commercial vehicles in decimal (e.g., for 5 per cent annual growth rate, $r = 0.05$).

The traffic in the year of completion is estimated using the following formula:

$$A = P (1 + r)^x \quad 4.6$$

Where,

P = Number of commercial vehicles as per last count.

x = Number of years between the last count and the year of completion of construction.

5 SUBGRADE

5.1 Requirements of CBR for Subgrade

The subgrade is the top 500 mm of the embankment immediately below the bottom of the pavement, and is made up of in-situ material, select soil, or stabilized soil that forms the foundation of a pavement. It should be well compacted to limit the scope of rutting in pavement due to additional densification during the service life of pavement. Subgrade shall be compacted to a minimum of 97 per cent of laboratory dry density achieved with heavy compaction as per IS: 2720 (Part 8) for Expressways, National Highways, State Highways, Major District Roads and other heavily trafficked roads. IRC: 36 “Recommended Practice for the Construction of Earth Embankments for Road Works” should be followed for guidance during planning and execution of work. The select soil forming the subgrade should have a minimum CBR of 8 per cent for roads having traffic of 450 commercial vehicles per day or higher. The guidelines for preparation of samples, testing and acceptance criteria are given in sub-paras given below. The in-situ CBR of the sub grade soil can also be determined from the Dynamic Cone Penetrometer (60° cone) from the following relation (ASTM-D6951-09) (11).

$$\text{Log}_{10} \text{ CBR} = 2.465 - 1.12 \log_{10} N \quad 5.1$$

Where N = mm/blow

5.1.1 Selection of dry density and moisture content for test specimen

5.1.1.1 The laboratory test conditions should represent the field conditions as closely as possible. Compaction in the field is done at a minimum of 97 per cent of laboratory density at moisture content corresponding to the optimum moisture content. In actual field condition, the subgrade undergoes moisture variations depending upon local environmental factors, such as, the water table, precipitation, soil permeability, drainage conditions and the extent to which the pavement is waterproof, which affect the strength of the subgrade in terms of CBR. In high rainfall areas, lateral infiltration through unpaved shoulder, through defects in wearing surfaces or through cracks may have significant effect on the subgrade moisture condition.

As a general practice, the worst field moisture is simulated by soaking the specimens in water for four days.

5.1.1.2 Number of tests, design value and tolerance limit

Where different types of soils are used in subgrade, a minimum of six to eight average CBR values (average of three tests) for each soil type along the alignment will be required for determination of design CBR. The 90th percentile of these values should be adopted as the design CBR (such that 90 per cent of the average CBR values are equal or greater than the design value) for high volume roads such as Expressways, National Highways and State Highways. For other categories of roads, design can be based on 80th percentile of laboratory CBR values. Method of computation of 90 percentile CBR is given in **Annex IV**. Pavement

thickness on new roads may be modified at intervals as dictated by the changes in soil profile but generally it will be found inexpedient to do so frequently from practical considerations.

The maximum permissible variation within the CBR values of the three specimens should be as indicated in **Table 5.1**.

Table 5.1 Permissible Variation in CBR Value

CBR (per cent)	Maximum variation in CBR value
5	± 1
5-10	± 2
11-30	± 3
31 and above	± 5

Where variation is more than the above, the average CBR should be the average of test results from at least six samples and not three.

5.2 Effective CBR

Where there is significant difference between the CBRs of the select subgrade and embankment soils, the design should be based on effective CBR. The effective CBR of the subgrade can be determined from **Fig. 5.1**. For other compacted thickness of subgrade, ref 4 may be consulted for guidance.

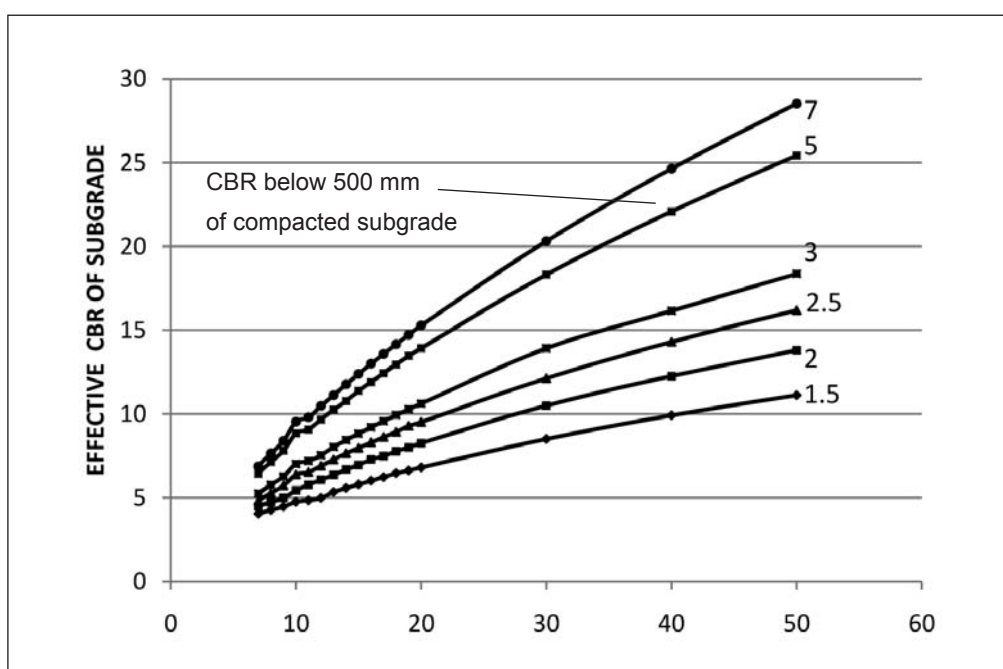


Fig. 5.1 CBR of Compacted Borrow Material 500 mm Thick

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In case the borrow material is placed over rocky foundation, the effective CBR may be larger than the CBR of the borrow material. Use of the CBR of the borrow material may be adopted for pavement design with proper safeguards against development of pore water pressure between the foundation and the borrow material.

5.3 Determination of Resilient Modulus

The behaviour of the subgrade is essentially elastic under the transient traffic loading with negligible permanent deformation in a single pass. Resilient modulus is the measure of its elastic behaviour determined from recoverable deformation in the laboratory tests. The modulus is an important parameter for design and the performance of a pavement. This can be determined in the laboratory by conducting tests as per procedure specified in AASHTO T 307-99(2003) (1). Since the repetitive triaxial testing facility is not widely available and is expensive, the default resilient modulus can be estimated from generally acceptable correlations which are as follows:

The relation between resilient modulus and the effective CBR is given as:

$$\left. \begin{aligned} M_R \text{ (MPa)} &= 10 * \text{CBR} && \text{for CBR } \leq 5 \\ &= 17.6 * (\text{CBR})^{0.64} && \text{for CBR} > 5 \end{aligned} \right\} \dots 5.2$$

M_R = Resilient modulus of subgrade soil.

The CBR of the subgrade should be determined as per IS: 2720 (Part 16) (36) at the most critical moisture conditions likely to occur at site. The test must always be performed on remoulded samples of soils in the laboratory. The pavement thickness should be based on 4-day soaked CBR value of the soil, remoulded at placement density and moisture content ascertained from the compaction curve. In areas with rainfall less than 1000 mm, four day soaking is too severe a condition for well protected subgrade with thick bituminous layer and the strength of the subgrade soil may be underestimated. If data is available for moisture variation in the existing in-service pavements of a region in different seasons, moulding moisture content for the CBR test can be based on field data. Wherever possible the test specimens should be prepared by static compaction. Alternatively dynamic compaction may also be used. Both procedures are described in brief in **Annex-IV**.

6 PRINCIPLES OF PAVEMENT DESIGN

(Users of these guidelines are advised to read this section in conjunction with Annexes I to XI for a better appreciation of the context and the requirements of pavement design)

6.1 Pavement Model: A flexible pavement is modeled as an elastic multilayer structure. Stresses and strains at critical locations (**Fig. 6.1**) are computed using a linear layered elastic model. The Stress analysis software IITPAVE has been used for the computation of stresses and strains in flexible pavements. Tensile strain, ϵ_t , at the bottom of the bituminous layer and

the vertical subgrade strain, ϵ_v , on the top of the subgrade are conventionally considered as critical parameters for pavement design to limit cracking and rutting in the bituminous layers and non-bituminous layers respectively. The computation also indicates that tensile strain near the surface close to the edge of a wheel can be sufficiently large to initiate longitudinal surface cracking followed by transverse cracking much before the flexural cracking of the bottom layer if the mix tensile strength is not adequate at higher temperatures.

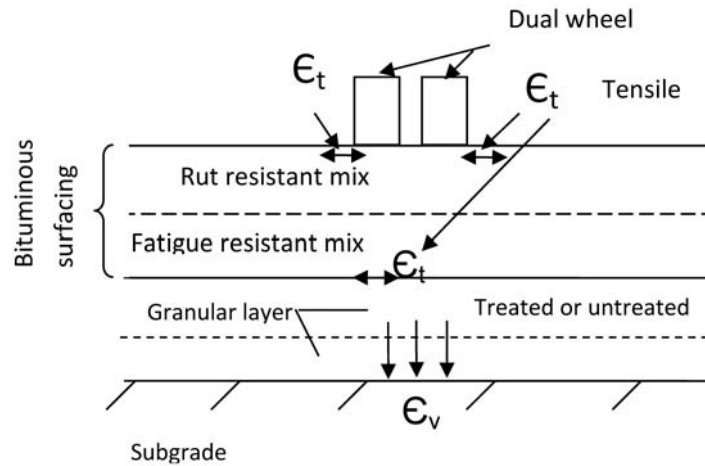


Fig. 6.1: Different Layers of a Flexible Pavement

6.2 Fatigue in Bottom Layer of Bituminous Pavement and Fatigue Life

6.2.1 With every load repetition, the tensile strain developed at the bottom of the bituminous layer develops micro cracks, which go on widening and expanding till the load repetitions are large enough for the cracks to propagate to the surface over an area of the surface that is unacceptable from the point of view of long term serviceability of the pavement. The phenomenon is called fatigue (or fracture) of the bituminous layer and the number of load repetitions in terms of standard axles that cause fatigue denotes the fatigue life of the pavement. In these guidelines, cracking in 20 per cent area has been considered for traffic up to 30 msa and 10 per cent for traffic beyond that.

6.2.2 Fatigue Model

Fatigue model has been calibrated in the R-56 (54) studies using the pavement performance data collected during the R-6 (57) and R-19 (58) studies sponsored by MORTH. Two fatigue equations were fitted, one in which the computed strains in 80 per cent of the actual data in the scatter plot were higher than the limiting strains predicted by the model (and termed as 80 per cent reliability level in these guidelines) and the other corresponding to 90 per cent reliability level. The two equations for the conventional bituminous mixes designed by Marshall method are given below:

$$N_f = 2.21 \times 10^{-04} \times [1/\epsilon_t]^{3.89} \times [1/M_R]^{0.854} \text{ (80 per cent reliability)} \quad 6.1$$

$$N_f = 0.711 \times 10^{-04} \times [1/\epsilon_t]^{3.89} \times [1/M_R]^{0.854} \text{ (90 per cent reliability)} \quad 6.2$$

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Where,

N_f = fatigue life in number of standard axles,

ϵ_t = Maximum Tensile strain at the bottom of the bituminous layer, and

M_R = resilient modulus of the bituminous layer.

As per the then prevailing practice, the mixes used in the pavements under study sections were generally designed for 4.5 per cent air voids and bitumen content of 4.5 per cent by weight of the mix (which in terms of volume would come to 11.5 per cent). Most literature recommend a factor 'C' to be introduced in fatigue models to take into account the effect of air voids (V_a) and volume of bitumen (V_b), which is given by the following relationships

$$C = 10^M, \text{ and } M = 4.84 \left(\frac{V_b}{V_a + V_b} - 0.69 \right)$$

Corresponding to the values of V_a and V_b as stated above, introduction of 'C' in Equation 6.2 leads to Equation 6.3 below.

$$N_f = 0.5161 * C * 10^{-04} \times [1/\epsilon_t]^{3.89} * [1/M_R]^{0.854} \quad 6.3$$

Many well known fatigue models also (3, 8 and 60) include the above approach to take into account the effect of volume of bitumen and air voids in the bituminous mix. Equation 6.3 would demonstrate that slight changes in volume air voids (V_a) and volume of bitumen (V_b) will have huge impact on the fatigue life. For example If bitumen content is increased by 0.5 per cent to 0.6 per cent above the optimum bitumen content given by Marshall test and air void is reduced to the minimum acceptable level of 3 per cent and volume of bitumen increased to the level of 13 per cent, the fatigue life would be increased by about three times. The recommendation in these guidelines is to target low air voids and higher bitumen constant for the lower layer to obtain fatigue resistant mix.

Equation 6.1 is recommended for use for traffic up to 30 msa where normal bituminous mixes with VG 30 bitumen can be used. Equation 6.3 is recommended for use for traffic greater than 30 msa where richer bituminous mixes with stiffer VG 40 binder should be used. Volume of stiffer grade bitumen is possible to be increased by slightly opening the grading. The guidelines recommend that the designer should consider these aspects with a view to achieving a high fatigue life of bituminous mixes. A discussion on effect of modulus of mixes, air voids and volume of bitumen on fatigue behaviour of bituminous mixes are given in **Annex I**.

6.3 Rutting in Pavement

6.3.1 Rutting is the permanent deformation in pavement usually occurring longitudinally along the wheel path. The rutting may partly be caused by deformation in the subgrade and other non-bituminous layers which would reflect to the overlying layers to take a deformed shape. The bituminous mixes also may undergo rutting due to secondary compaction and

shear deformation under heavy traffic load and higher temperature. Excessive rutting greatly reduces the serviceability of the pavement and therefore, it has to be limited to a certain reasonable value. In these guidelines the limiting rutting is recommended as 20 mm in 20 per cent of the length for design traffic up to 30 msa and 10 per cent of the length for the design traffic beyond.

6.3.2 Rutting model

Like the fatigue model, rutting model also has been calibrated in the R-56 studies using the pavement performance data collected during the R-6 (57) and R-19 (58) studies at 80 per cent and 90 per cent reliability levels. The two equations are given below:

$$N = 4.1656 \times 10^{-08} [1/\epsilon_v]^{4.5337} \quad \dots 6.4$$

$$N = 1.41 \times 10^{-8} \times [1/\epsilon_v]^{4.5337} \quad \dots 6.5$$

Where,

N = Number of cumulative standard axles, and

ϵ_v = Vertical strain in the subgrade

As can be seen, the model considers the vertical strain in subgrade as the only variable for rutting, which, is a measure of bearing capacity of the subgrade. Rutting in granular layer also is lower when the vertical subgrade elastic strains are given by Equations 6.4 and 6.5. A granular layer founded on a strong subgrade has a high resilient modulus and resists rutting when not highly stressed. Rutting in the bituminous layers also occurs due to the secondary compaction and shear deformation apart from that in the subgrade. This needs to be addressed. The recommendation in these guidelines is to provide rut resistant bituminous mixes using higher viscosity grade bitumen or modified bitumen.

6.4 Top Down Cracking in Bituminous Layer

While fatigue cracking is [conventionally considered as](#) a 'bottom-up cracking' phenomenon, 'top down cracking' has also been observed on high volume roads in the country, because of excessive tensile stresses developing at the top surface due to heavy axle loads. These guidelines recommend a high modulus rut as well as fatigue resistant mix to prevent top down cracking.

6.5 Cementitious Sub-base and Base

6.5.1 Cementitious materials normally crack due to shrinkage and temperature changes even without pavement being loaded. Slow setting cementitious materials having low cement content develop fine cracks and have to be preferred to high cement content mixes producing wider cracks. While making a judgment on the strength values for design, the reduction in strength due to the cracked condition of these layers need to be fully recognized. The Elastic Modulus (E) recommended for design is much lower than their respective laboratory value

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obtained from unconfined compression test. The extent of reductions proposed has been generally in agreement with practices followed in the national standards of other countries like Australia, South Africa, MEPDG of the USA etc. There are limited data in the country on the field performance of such type of construction to understand and model their performance in the field. Therefore, the new pavements constructed with these materials need to be closely monitored by Falling Weight Deflectometer (FWD) for the evaluation of material properties for future guidance. These guidelines strongly recommend construction with cementitious materials in the interest of saving the environment and using the local and marginal materials after stabilization. Validated results of cemented pavement layers from other countries and use of a sound analytical tool are likely to give good performing pavements at an affordable cost consistent with environmental requirement, and the availability of limited data of field performance in India need not be considered a handicap. Locations where the cemented layers were used in India are given in **Annex XI** and some of them were evaluated by FWD also.

6.5.2 Fatigue cracking in cementitious layers

In these guidelines, the treatment of fatigue cracking of cement treated layers is recommended at two levels. Thickness of the cemented layer is firstly evaluated from fatigue consideration in terms of cumulative standard axles. At the second level, the cumulative fatigue damage due to individual axles is calculated based on a model which uses 'stress ratio' (the ratio of actual stresses developed due to a class of wheel load and the flexural strength of the material) as the parameter. The computation of stresses due to the individual wheel load is done by the IITPAVE program. An excel sheet can be used to calculate the cumulative fatigue damage of each class of wheel loads and summed the entire axle load spectrum. The design requirement is that the cumulative damage of all wheel loads should be less than 1 during the design life of a pavement. If it is greater than 1, the section has to be changed and iteration done again. The first model is taken from the Australian experience, while the second one is suggested in MEPDG. The second level analysis is necessary only when very heavy traffic is operating on the highways. The two fatigue equations are given below:

A. Fatigue life in terms of standard axles

$$N = RF \left[\frac{(11300/E^{.0804} + 191)}{\epsilon_t} \right]^{12} \quad \dots 6.6$$

Where, RF = Reliability factor for cementitious materials for failure against fatigue.

= 1 for Expressways, National Highways and other heavy volume roads.

= 2 for others carrying less than 1500 trucks per day.

N = Fatigue life of the cementitious material.

E = Elastic modulus of cementitious material.

ϵ_t = tensile strain in the cementitious layer, microstrain.

B. Fatigue Equation for Cumulative Damage analysis

In fatigue analysis of cementitious bases, the spectrum of axle loads has to be compiled under various axle load classes. Axle weights of tandem and tridem axle may be taken as equivalent to two and three single axles respectively because axles located at distances more than 1.30 m apart are not considered as causing any significant overlapping of stresses. The fatigue life is given by the following equation:

$$\text{Log } N_{fi} = \frac{0.972 - (\sigma_t / M_{Rup})}{0.0825} \quad \dots 6.7$$

Where,

N_{fi} = Fatigue life in terms of cumulative number of axle load of class i

σ_t = tensile stress under cementitious base layer.

M_{Rup} = 28 day flexural strength of the cementitious base.

The fatigue criterion is considered satisfied if $\Sigma(N_i/N_{fi})$ is less than 1, where N_i is the actual number of axles of axle load of class i .

7 PAVEMENT COMPOSITION

7.1 General

A flexible pavement covered in these guidelines consists of different layers as shown in Fig. 7.1.

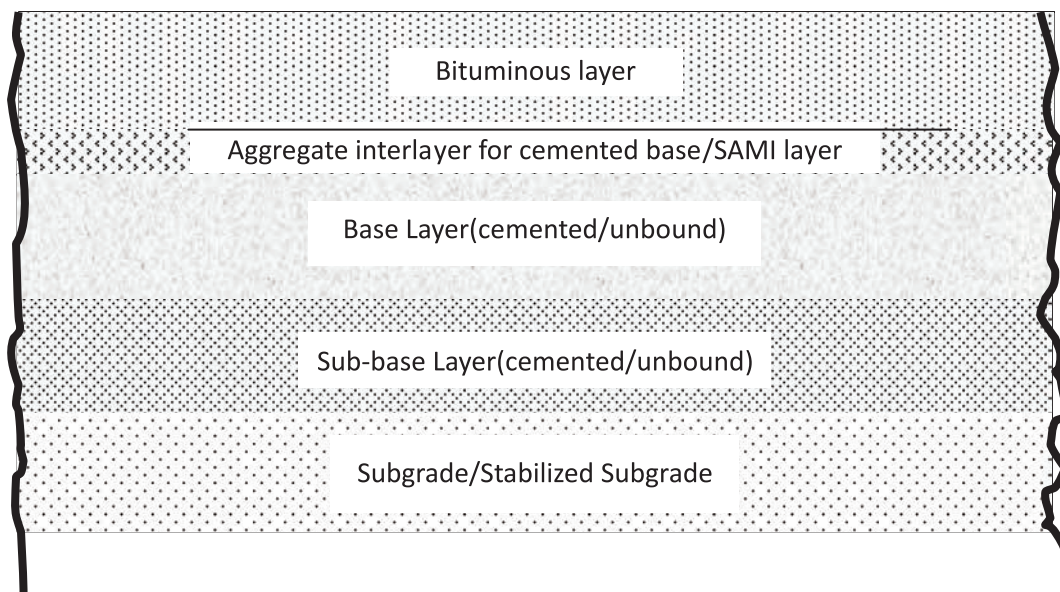


Fig. 7.1 Different Layers of Bituminous Pavement

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The sub-base and the base layer can be unbound (e.g. granular) or chemical stabilized with stabilizers such as cement, lime, flyash and other cementitious stabilizers. In case of pavements with cementitious base, a crack relief layer provided between the bituminous layer and the cementitious base delays considerably the reflection crack in the bituminous course. This may consist of crushed aggregates of thickness 100 mm of WMM conforming to IRC/MORTH specifications. Stress Absorbing Membrane Interlayer (SAMI) of elastomeric modified binder at the rate of about 2 litre/m² covered with light application of 10 mm aggregates to prevent picking up of the binder by construction traffic(AUSTROADS).

The unbound base layer may consist of granular layer such as wet mix macadam (MORTH Specification for Road & Bridge Works) and water bound macadam. The base layer may consist of granular materials treated with bitumen emulsion of SS2 grade or foamed bitumen. Fresh aggregates or aggregates obtained from reclaimed asphalt pavements when treated with foamed bitumen or bitumen emulsion should have the required indirect tensile strength to be considered as a base layer.

The sub-base layer serves three functions, viz., to protect the subgrade from overstressing, to provide a platform for the construction traffic and to serve as drainage and filter layer. The design of sub-base, whether bound or unbound, should meet these functional requirements.

7.2 Sub-base layer

7.2.1 Unbound sub-base layer

7.2.1.1 Sub-base materials may consist of natural sand, moorum, gravel, laterite, kankar, brick metal, crushed stone, crushed slag and reclaimed crushed concrete/reclaimed asphalt pavement or combinations thereof meeting the prescribed grading and physical requirements. When the sub-base material consists of combination of materials, mixing should be done mechanically either using a suitable mixer or adopting mix-in-place method. The sub-base should have sufficient strength and thickness to serve the construction traffic.

7.2.1.2 Specifications of granular sub-base (GSB) materials conforming to MORTH Specifications for Road and Bridge Works are recommended for use. These specifications suggest close and coarse graded granular sub-base materials and specify that the materials passing 425 micron sieve when tested in accordance with IS:2720 (Part 5) should have liquid limit and plasticity index of not more than 25 and 6 respectively. These specifications and the specified grain size distribution of the sub-base material should be strictly enforced in order to meet strength, filter and drainage requirements of the granular sub-base layer. When coarse graded sub-base is used as a drainage layer, Los Angeles abrasion value should be less than 40 so that there is no excessive crushing during the rolling and the required permeability is retained and fines passing 0.075 mm should be less than 2 per cent.

7.2.1.3 The sub-base should be composed of two layers, the lower layer forms the separation/filter layer to prevent intrusion of subgrade soil into the pavement and the upper GSB forms the drainage layer to drain away any water that may enter through surface cracks. The

drainage layer should be tested for permeability and gradation may be altered to ensure the required permeability. Filter and drainage layers can be designed as per IRC: SP: 42-1994 (33) and IRC: SP: 50-1999(34).

7.2.1.4 Strength parameter

The relevant design parameter for granular sub-base is resilient modulus (M_R), which is given by the following equation:

$$M_{R_{gsb}} = 0.2h^{0.45} * M_{R_{subgrade}} \quad \dots 7.1$$

Where h = thickness of sub-base layer in mm

M_R value of the sub-base is dependent upon the M_R value of the subgrade since weaker subgrade does not permit higher modulus of the upper layer because of deformation under loads.

7.2.2 Bound sub-base layer

7.2.2.1 The material for bound sub-base may consist of soil, aggregate or soil aggregate mixture modified with chemical stabilizers such as cement, lime-flyash, commercially available stabilizers¹ etc. The drainage layer of the sub-base may consist of coarse graded aggregates bound with about 2 per cent to 3 per cent cement while retaining the permeability. In case soil modified with cementitious material is used as a sub-base and granular material is not easily available, commercially available geo-composites possessing the necessary permeability can be used to serve both as a drainage and filter/separation layer. Drainage and separation layers are essential when water is likely to enter into pavements from the shoulder, median or through the cracks in surface layer.

7.2.2.2 Strength Parameter

The relevant design parameter for bound sub-bases is the Elastic Modulus E , which can be determined from the unconfined compressive strength of the material. In case of cementitious granular sub-base having a 7-day UCS of 1.5 to 3 MPa, the laboratory based E value (AUSTROADS) is given by the following equations:

$$E_{cgsb} = 1000 * UCS \quad \dots 7.2$$

Where UCS = 28 day strength of the cementitious granular material

Equation 7.2 gives a value in the range of 2000 to 4000 MPa. Since the sub-base acts as a platform for the heavy construction traffic, low strength cemented sub-base is expected to crack during the construction and a design value of 600 MPa is recommended for the stress analysis. Poisson's ratio may be taken as 0.25.

If the stabilized soil sub-bases have 7-day UCS values in the range 0.75 to 1.5 MPa, the recommended E value for design is 400 MPa with Poisson's ratio of 0.25.

1 Where commercially available stabilizers are used, the stabilized material should meet additional requirements of leachability and concentration of heavy metals apart from the usual requirements of strength and durability.

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7.3 Base Layer

7.3.1 Unbound base layer

The base layer may consist of wet mix macadam, water bound macadam, crusher run macadam, reclaimed concrete etc. Relevant specifications of IRC/MORTH are to be adopted for the construction.

When both sub-base and the base layers are made up of unbound granular layers, the composite resilient modulus of the granular sub-base and the base is given as:

$$M_{R_granular} = 0.2 * h^{0.45} M_{R_subgrade} \quad \dots 7.3$$

Where h = thickness of granular sub-base and base, mm

Poisson's ratio of granular bases and sub-bases is recommended as 0.35.

7.3.2 Cementitious bases

7.3.2.1 Cemented base layers may consist of aggregates or soils or both stabilized with chemical stabilizers such as cement, lime, lime-flyash or other stabilizers which are required to give a minimum strength of 4.5 to 7 MPa in 7/28 days. While the conventional cement should attain the above strength in seven days (IRC: SP-89-2010(30)), lime or lime-flyash stabilized granular materials and soils should meet the above strength requirement in 28 days since strength gain in such materials is a slow process. Though the initial modulus of the cementitious bases may be in the range 10000 to 15000 MPa, the long term modulus of the cemented layer may be taken as fifty per cent of the initial modulus due to shrinkage cracks and construction traffic (65, 66). Australian guidelines recommend use of Equation 7.2 for the cemented layer. Curing of cemented bases after construction is very important for achieving the required strength as described in IRC: SP-89 and curing should start immediately by spraying bitumen emulsion or periodical mist spray of water without flooding or other methods.

7.3.2.2 Strength parameter

Flexural strength is required for carrying out the fatigue analysis as per fatigue equation. MEPDG suggests that the modulus of rupture for chemically stabilized bases can be taken as 20 per cent of the 28 day unconfined compressive strength. The same is recommended in these guidelines. The following default values of modulus of rupture are recommended for cementitious bases (MEPDG).

Cementitious stabilized aggregates – 1.40 MPa

Lime—flyash-soil – 1.05 MPa

Soil cement – 0.70 MPa

Poisson's ratio of the cemented layers may be taken as 0.25.

7.3.2.3 Durability criteria

The minimum cementitious material in the cementitious base layer should be such that in a wetting and drying test (BIS: 4332 (Part IV) - 1968) (17), the loss of weight of the stabilized material does not exceed 14 per cent after 12 cycles of wetting and drying. In cold and snow bound regions like Arunachal Pradesh, Jammu & Kashmir, Ladakh, Himachal Pradesh etc., durability should be determined by freezing and thawing test and the loss of weight should be less than 14 per cent after 12 cycles (BIS: 4332 (Part IV) – 1968) (17). The cementitious layer meeting the strength requirements of IRC:SP:89-2010 is found to meet the criteria of durability requirement (14).

7.3.2.4 Strength gain with time

The cementitious materials keep on gaining strength over a long time period and a 28 day strength gives a conservative design. It should be recognized that the cemented materials may possibly degrade also with time depending upon the loads, temperature and moisture conditions, freeze-thaw cycles and quantity of chemical stabilizers.

7.3.2.5 Crack relief layer

A SAMI layer using elastomeric modified bitumen provided over the cementitious layer delays the cracks propagating into the bituminous layer. A crack relief layer of wet mix macadam of thickness 100 mm sandwiched between the bituminous layer and treated layer is much more effective in arresting the propagation of cracks from the Cementitious base to the bituminous layer (14, 22, 65 and 66). The aggregate layer becomes stiffer under heavier loads because of high confining pressure. If there is shoving and deformation in the unbound layer caused by the construction traffic, the granular layer may be treated with 1 to 2 per cent bitumen emulsion of grade RS to avoid reshaping.

7.3.2.6 Modulus of crack relief layer: The resilient modulus of a good quality granular layer provided between the cementitious and bituminous layers is dependent upon the confinement pressure under wheel load (3, 14, 26, 65 and 66). The modulus may vary from 250 to 1000 MPa and a typical value of 450 MPa (14, 65 and 66) may be used for the sandwiched aggregate layer for the analysis of pavements. Strong support from the cementitious base, results in higher modulus than what is given by Eq. 7.3. Poisson's ratio of the aggregate relief layer may be taken as 0.35. A brief description on strength and resilient modulus of cementitious materials is given in **Annex VIII**.

7.3.3 Bitumen emulsion/foamed bitumen treated aggregates/reclaimed asphalt base.

If the base is made up of fresh aggregates or milled material from reclaimed asphalt pavements treated with foamed bitumen or bitumen emulsion, the value of resilient modulus of the material may be taken as 600 MPa while the laboratory values may range from 600 to 1200 MPa (50, 59). The above mentioned resilient modulus value can be ensured if the Indirect Tensile Strength (ASTM: D7369-09) (12) of the 100 mm diameter Marshall specimen of the Emulsion/

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Foamed Bitumen treated material has a minimum value of 100 kPa in wet condition and 225 kPa in dry condition under a rate of loading of 50 mm/minute (59) at 25°C. Poisson's ratio is recommended as 0.35. Mix design and test methods are given in **Annex IX**.

7.4 Bituminous layers

7.4.1 The recommended resilient modulus values of the bituminous materials with different binders are given in Table 7.1. These are based on extensive laboratory testing modern testing equipments following ASTM Test procedures. The tests carried out were "Indirect Tensile Tests" (ASTM: D7369-09) (12) and "Standard Test Method for Determining Fatigue Failure of Compacted Asphalt Concrete Subjected to Repeated Flexural Bending" (ASTM: D7460-10) (13), a 'Four Point Bending Test' at 10 Hz frequency in constant strain mode. A loading pulse of 0.1 second followed by a rest period of 0.9 second were adopted for Indirect Tensile Test. It can be seen that modulus of mixes with modified binders do not necessarily give a higher resilient modulus at 35°C despite their apparent advantages in terms of higher viscosity at higher temperatures, higher softening point and lower penetration. Some modified binders tested give almost the same M_R as that with VG 30 bitumen. These findings are in agreement with those given in some other literature as well, e.g., Monismith et al (20), AUSTROADS and others. The guidelines, therefore recommend that the modulus values of mixes with modified binder should be determined from Indirect Tensile Strength or four point bending tests and used in design because the modulus values of these will vary greatly depending upon the base bitumen, modifiers and their dosage. Notwithstanding occasional lower modulus values, the modified mixes are known to give improved fatigue lives.

7.4.2 Higher viscosity of bituminous binders, which can be achieved either by using higher viscosity grade bitumen or modified bitumen will improve both fatigue and rutting behavior of mixes as compared to mixes with normal bitumen (20, 38, 42 and 69). Fatigue life can be further improved by reducing the air voids and increasing the volume of binder (both modified and unmodified). Low air voids and higher bitumen content may, however, induce bleeding and rutting, the chances of which are minimized if higher viscosity binder is used in the mix. These guidelines, therefore, recommend that these factors should be taken into account while designing bituminous mixes.

The Poisson's ratio of bituminous layer depend upon the pavement temperature and a value of 0.35 is recommended for temperature up to 35°C and value of 0.50 for higher temperatures. Stress computation is not very sensitive to minor changes in Poisson's ratio. Fatigue equation at any pavement temperature from 20°C to 40°C can be evaluated by substituting the appropriate value of the resilient modulus of the bituminous mix, air void and volume of bitumen. Catalogue of designs has been worked out for a temperature of 35°C. It is noted that the bituminous mixes harden with time and modulus may increase to higher values in upper layers due to ageing than what is given in the **Table 7.1**. Deterioration also occurs due to heavily loaded vehicles. Hence field performance is to be periodically recorded for future guidance. **Annex VII** gives various considerations for the selection of binders and mixes in the light of Indian and international experience.

Table 7.1 Resilient Modulus of Bituminous Mixes, MPa

Mix type	Temperature °C				
	20	25	30	35	40
BC and DBM for VG10 bitumen	2300	2000	1450	1000	800
BC and DBM for VG30 bitumen	3500	3000	2500	1700	1250
BC and DBM for VG40 bitumen	6000	5000	4000	3000	2000
BC and DBM for Modified Bitumen (IRC: SP: 53-2010)	5700	3800	2400	1650	1300
BM with VG 10 bitumen	500 MPa at 35°C				
BM with VG 30 bitumen	700 MPa at 35°C				
WMM/RAP treated with 3 per cent bitumen emulsion/ foamed bitumen (2 per cent residual bitumen and 1 per cent cementitious material).	600 MPa at 35°C (laboratory values vary from 700 to 1200 MPa for water saturated samples).				

8 PERPETUAL PAVEMENT

The pavement having a life of 50 years or longer is termed as a perpetual pavement. If the tensile strain caused by the traffic in the bituminous layer is less than 70 micro strains, the endurance limit of the material, the bituminous layer never cracks (Asphalt Institute, MS-4, 7th edition 2007). Similarly if vertical subgrade strain is less than 200 micro strains, there will be little rutting in subgrade. Design of such a pavement is illustrated in the guideline. Different layers are so designed and constructed that only the surface layer is the sacrificial layer which is to be scrapped and replaced with a new layer from time to time. There is now enough evidence worldwide that deep strength bituminous pavements suffer damage only at the top and nowhere else.

9 PAVEMENT DESIGN PROCEDURE

9.1 Using IITPAVE

Any combination of traffic and pavement layer composition can be tried using IITPAVE. The designer will have full freedom in the choice of pavement materials and layer thickness. The traffic volume, number of layers, the layer thickness of individual layers and the layer properties are the user specified inputs in the Program, which gives strains at critical locations as outputs. The adequacy of design is checked by the Program by comparing these strains with the allowable strains as predicted by the fatigue and rutting models, in-built in the Program. A satisfactory pavement design is achieved through iterative process by varying

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layer thicknesses or, if necessary, by changing the pavement layer materials. (See Section 13 for outline of procedures for using IITPAVE and Annex II for worked-out examples)

9.2 Using Design catalogues

These Guidelines provide a Design catalogue giving pavement compositions for various combinations of traffic, layer configuration and assumed material properties. If the designer chooses to use any of these combinations and is satisfied that the layer properties assumed in the design catalogue can be achieved in the field, the design can be straightway adopted from the relevant design charts given in the catalogue. (See Section 10 for details)

9.3 Material Properties

Regardless of the design procedure, it is essential that the material properties are adopted only after conducting relevant tests on the materials. Where all test facilities are not available, at least those tests must be carried out, which can validate the assumed design properties. In Annex XI the type of tests required as well as the range of values for material properties are given based on typical testing and experience in other countries. The values as suggested may be adopted for pavement design as default but not without validation by subjecting the materials to such tests which can be easily carried out in any laboratory (e.g. Unconfined Compressive Strength) to validate the assumed design values.

10 PAVEMENT DESIGN CATALOGUES

Five different combinations of traffic and material properties have been considered for which pavement composition has been suggested in the form of design charts presented in Plates 1 to 24. Each combination has been supported with illustration to compare the proposed design thickness in the design catalogue with that given by IITPAVE (Clauses 10.1 to 10.5). The five combinations are as under:

1. Granular Base and Granular Subbase. (CI 10.1) (Plate 1 to 8)
2. Cementitious Base and Cementitious Subbase of aggregate interlayer for crack relief. Upper 100 mm of the cementitious subbase is the drainage layer. (CI 10.2) (Plate 9 to 12)
3. Cementitious base and subbase with SAMI at the interface of base and the bituminous layer. (CI 10.3) (Plate 13 to 16)
4. Foamed bitumen/bitumen emulsion treated RAP or fresh aggregates over 250 mm Cementitious subbase (CI 10.4) (Plate 17 to 20)
5. Cementitious base and granular subbase with crack relief layer of aggregate layer above the cementitious base. (CI 10.5) (Plate 21 to 24)

Note:

- These charts are to be used for traffic above 2 msa. For traffic below 2 msa IRC SP 72-2007 should be referred to. City roads should be designed for minimum 2 msa traffic.
- Thickness design for traffic between 2 and 30 msa is exactly as per IRC 37-2001.
- In all cases of cementitious sub-bases (i.e. cases 2,3 and 4 above) the top 100 mm thickness of sub-base is to be porous and act as drainage layer

Where designer chooses to use his own combinations instead of design catalogues, this has been discussed with illustration in Clause 10.6

10.1 Granular Base and Granular Subbase

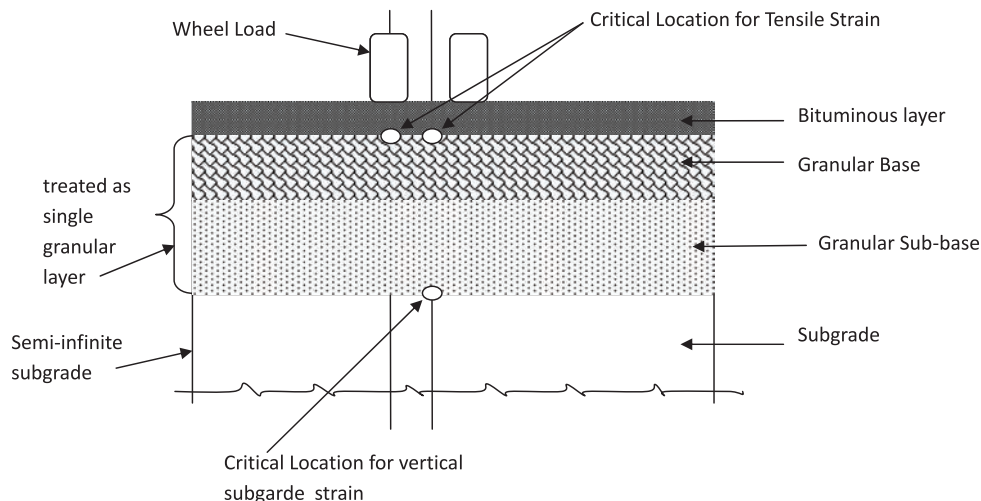
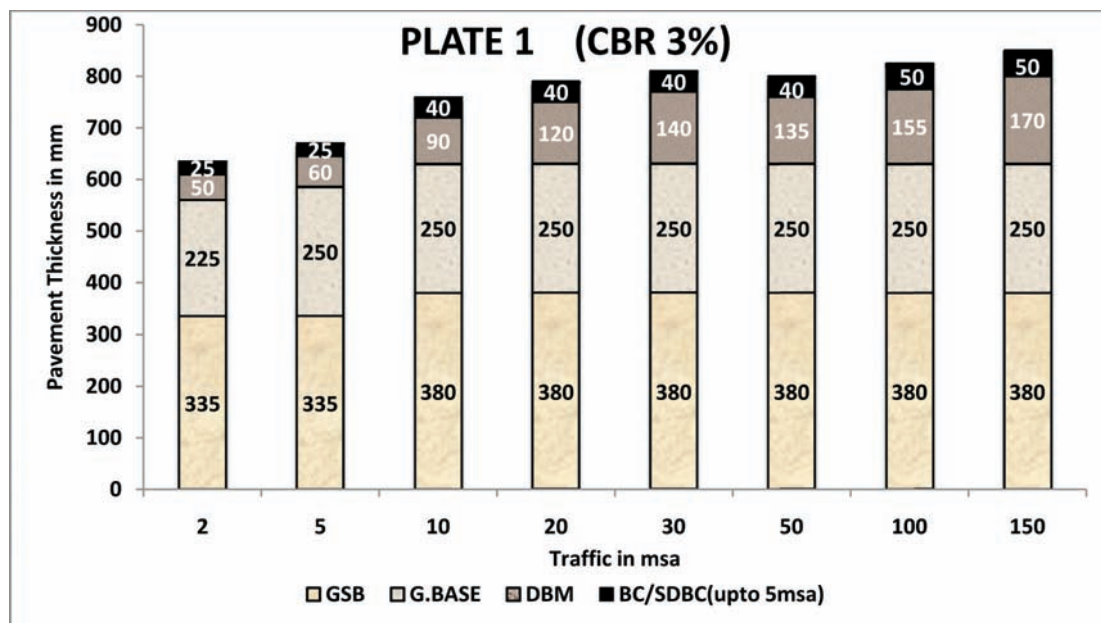
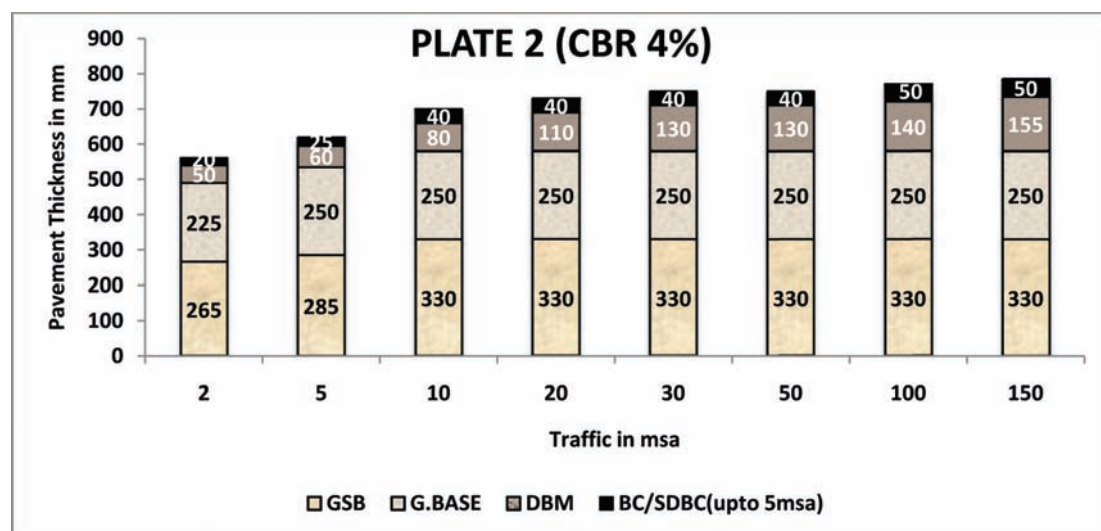
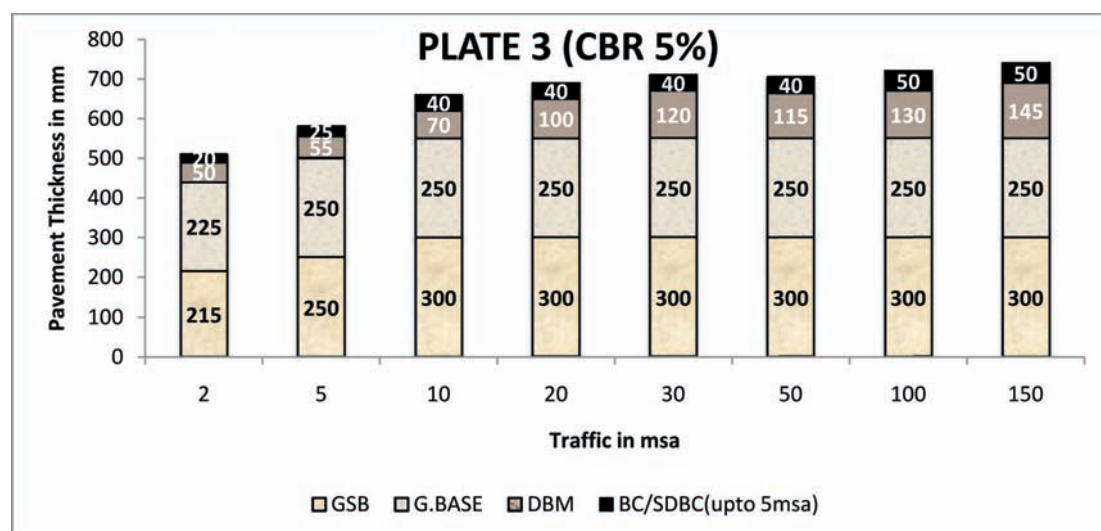
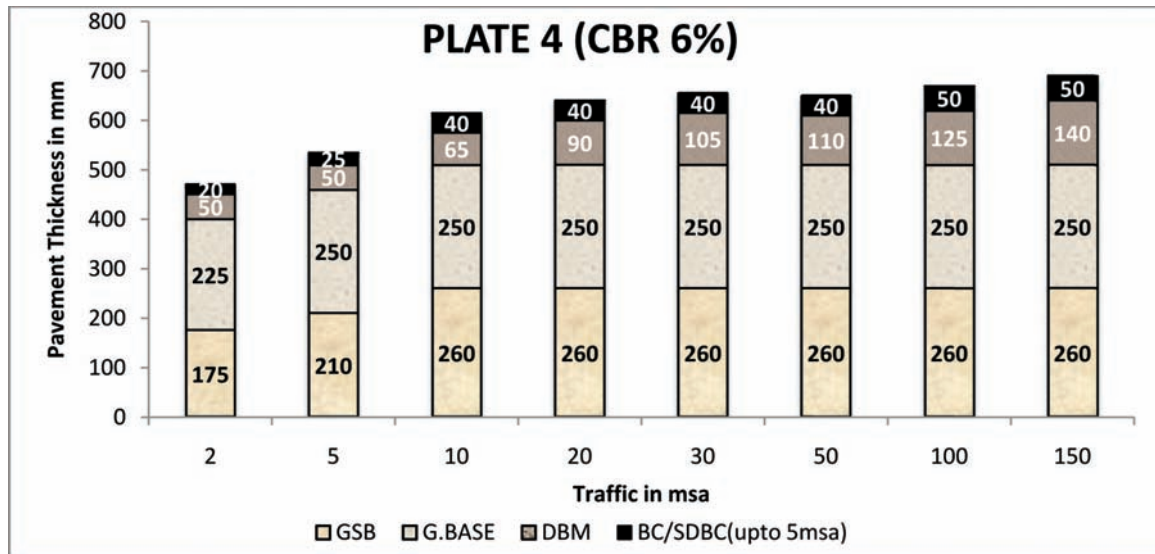
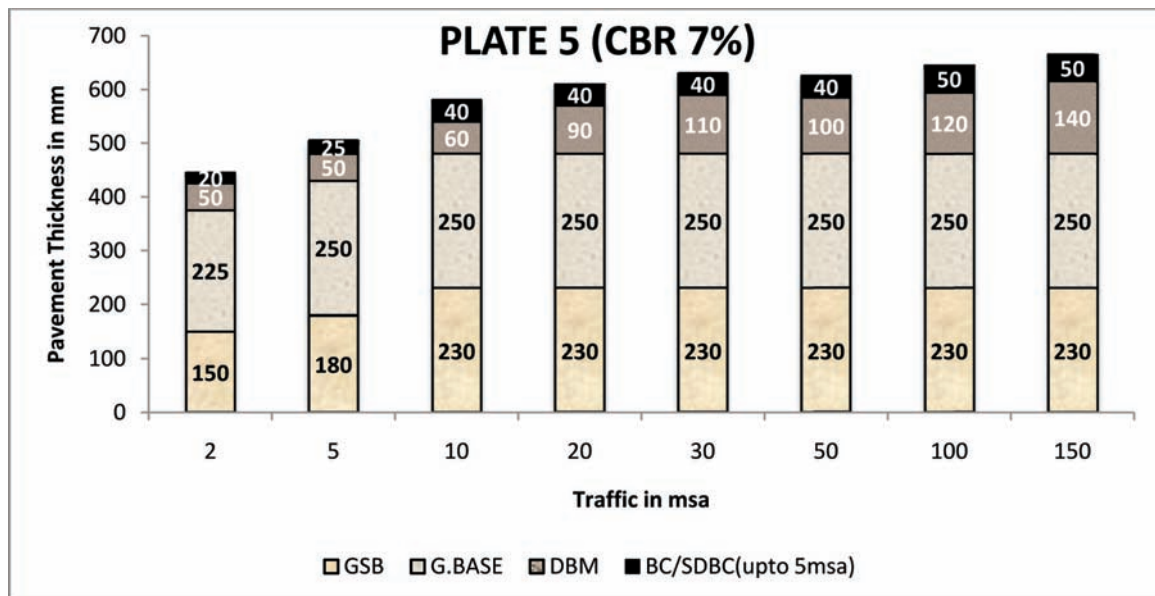
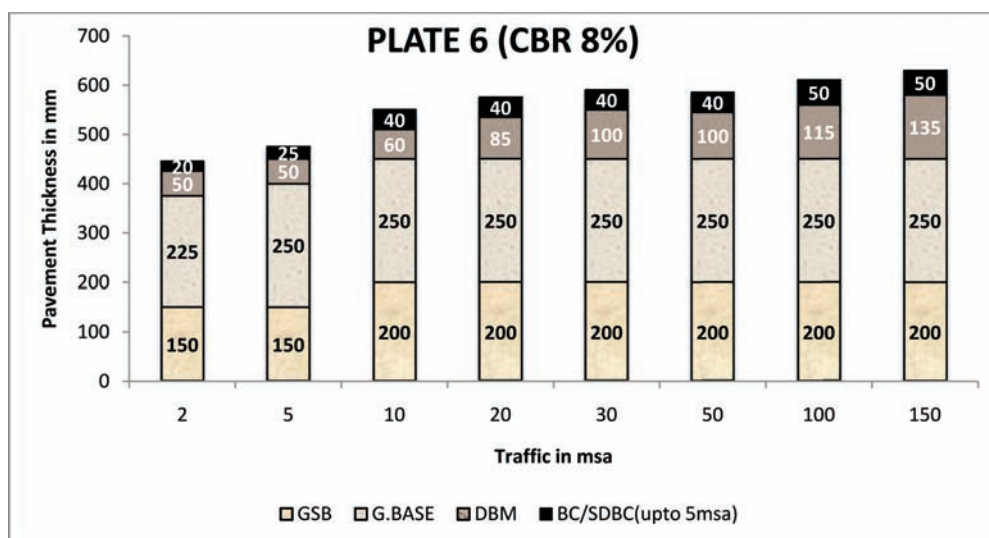
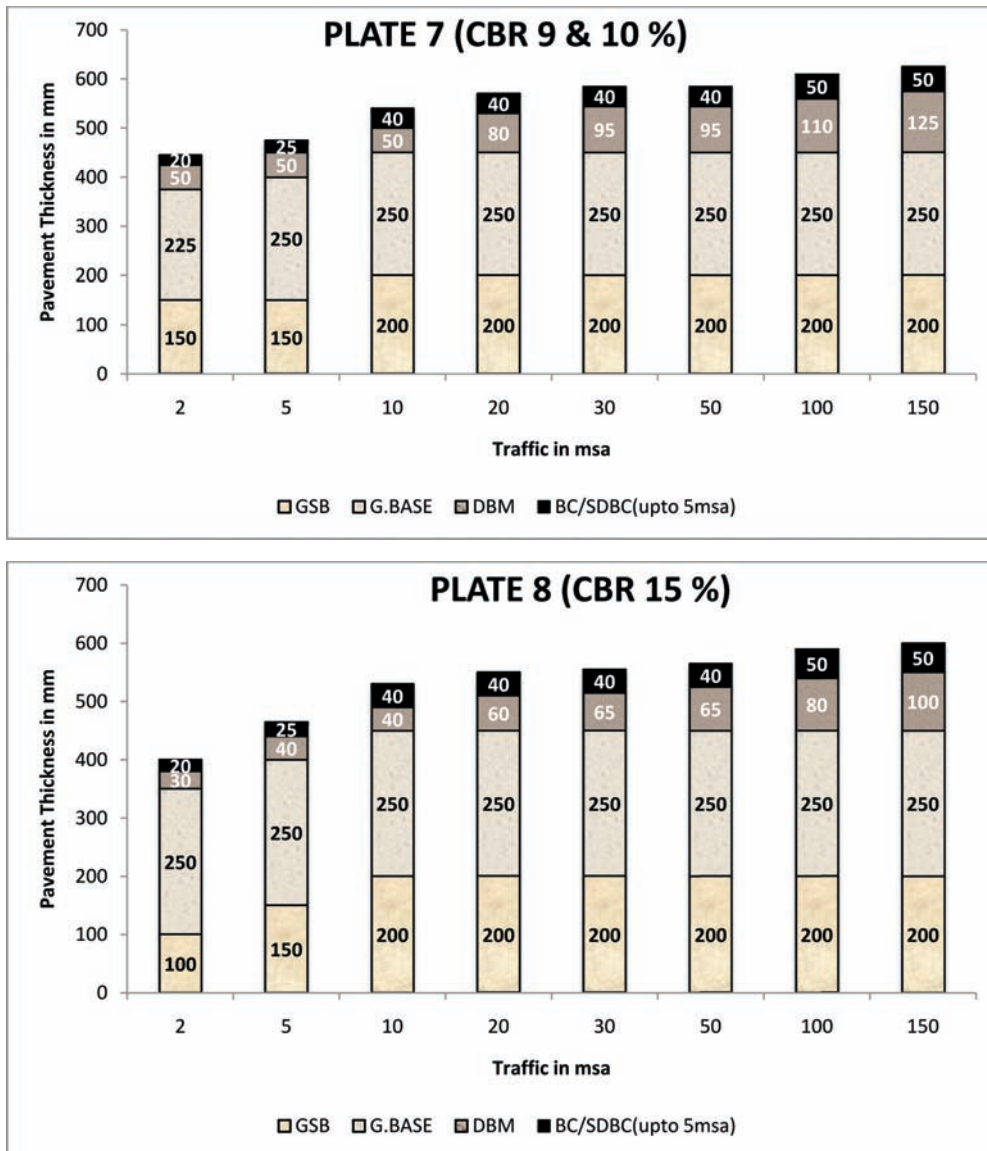


Fig. 10.1 Bituminous Surfacing with Granular Base and Granular Sub-base.

Fig. 10.1 shows the cross section of a bituminous pavement with granular base and subbase. It is considered as a three layer elastic structure consisting of bituminous surfacing, granular base and subbase and the subgrade. The granular layers are treated as a single layer. Strain and stresses are required only for three layer elastic system. The critical strains locations are shown in the figure. For traffic > 30 msa, VG 40 bitumen is recommended for BC as well as DBM for plains in India. Thickness of DBM for 50 msa is lower than that for 30msa for a few cases due to stiffer bitumen. Lower DBM is compacted to an air void of 3% after rolling with volume of bitumen close to 13 % (Bitumen content may be 0.5% to 0.6% higher than the optimum). Thickness combinations up to 30 msa are the same as those adopted in IRC: 37-2001. GSB consists of a separation/filter (F) in the bottom and a drainage layer (D) having the gradation 4 of **Table V-1** in Annexure V above that. Coarse graded GSB of MORTH with fines less than 2% may also be used.







Illustration

Traffic: 150 msa

Subgrade CBR = 10%, $E_{\text{subgrade}} = 17.6 \times \text{CBR}^{0.64} = 75 \text{ MPa}$

$M_{R_{\text{granular}}} = 0.2 \times E_{\text{subgrade}} \times h^{0.45}$, h = thickness of granular layer (GSB + WMM)

$M_{R_{\text{granular}}} = 0.2 \times 75 \times 450^{0.45} = 234 \text{ MPa}$. $M_{R_{\text{bituminous layer}}} = 3000 \text{ MPa}$

For the given composition of Pavement thicknesses, 90% Reliability is adopted i.e., Eq. 6.3 and Eq. 6.5 are used (Equations 6.1 and 6.4 with 80% reliability are used for design traffic up to 30 msa).

- I. Allowable Horizontal Tensile Strain in Bituminous Layer is 153×10^{-6} for VG 40 mixes (Allowable value is 178×10^{-6} from Eq. 6.1 for a mix with VG 30 used in IRC: 37-2001).
- II. Allowable Vertical Compressive Strain on Subgrade is 291×10^{-6} (Allowable value is 370×10^{-6} from Eq. 6.4 used in IRC: 37-2001).

From PLATE 7, BC = 50 mm, DBM = 125 mm, WMM = 250 mm, GSB-200 mm. The computed strains From IITPAVE Software are

- I. Horizontal Tensile Strain in Bituminous Layer is $149 \times 10^{-6} < 153 \times 10^{-6}$
- II. Vertical Compressive Strain on Subgrade is $244 \times 10^{-6} < 291 \times 10^{-6}$

Hence the Pavement Composition is Safe.

10.2 Bituminous Pavements with Cemented Base and Cemented Subbase with Crack Relief Interlayer of Aggregate

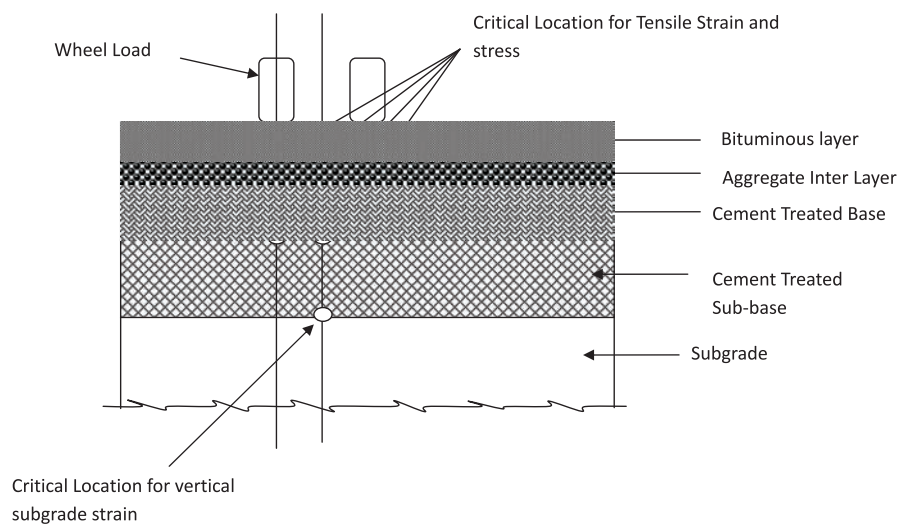
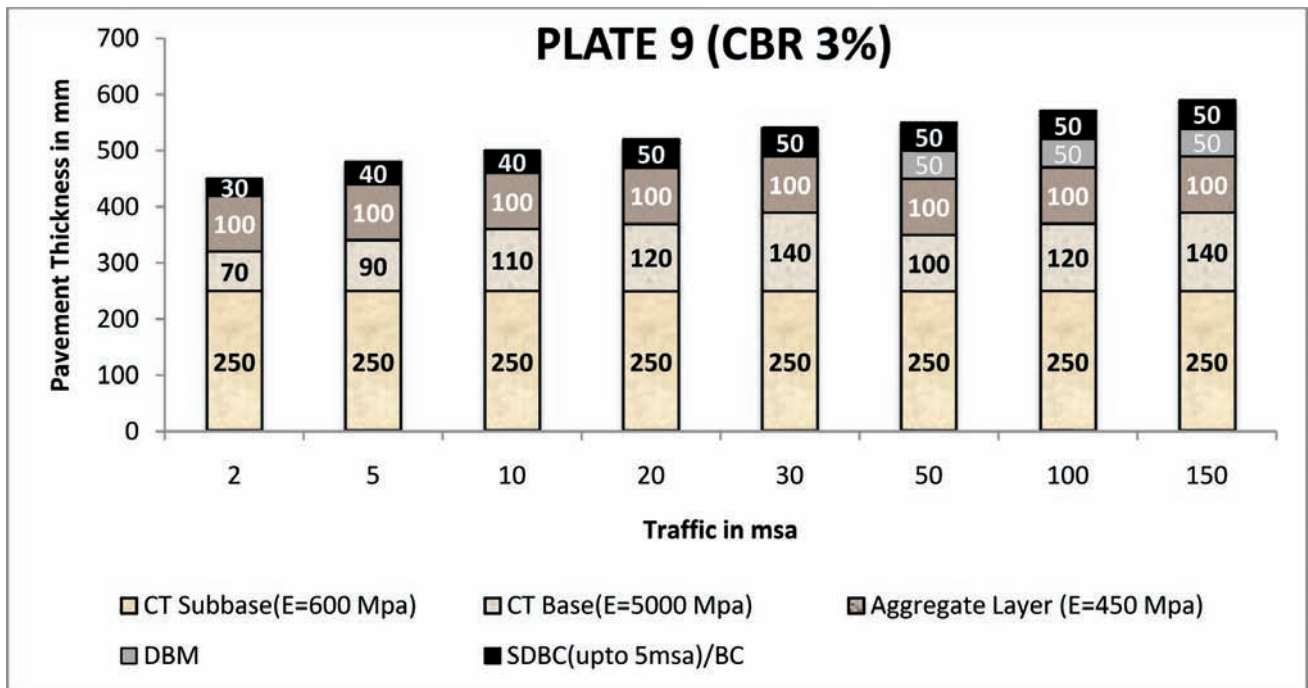
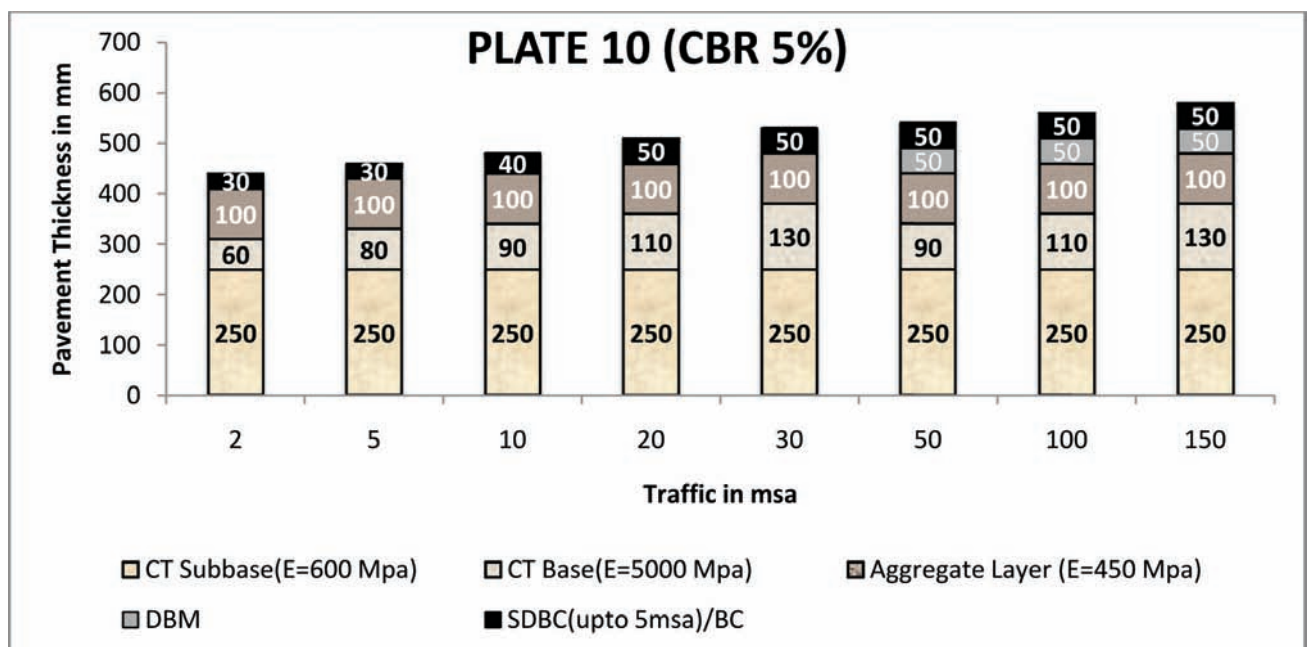


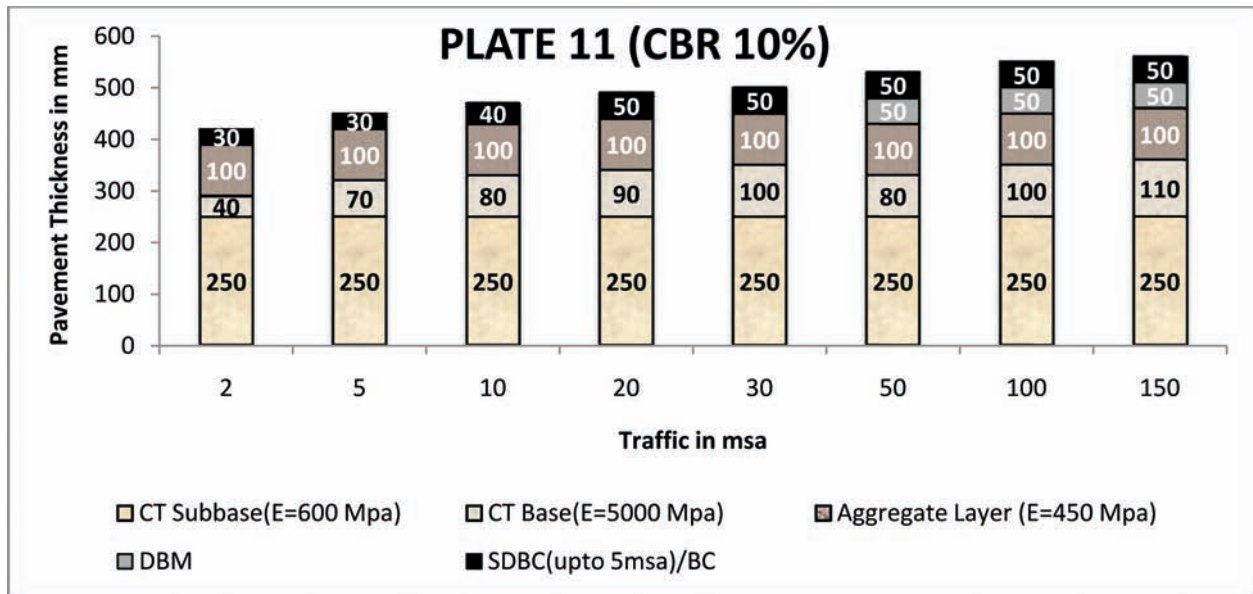
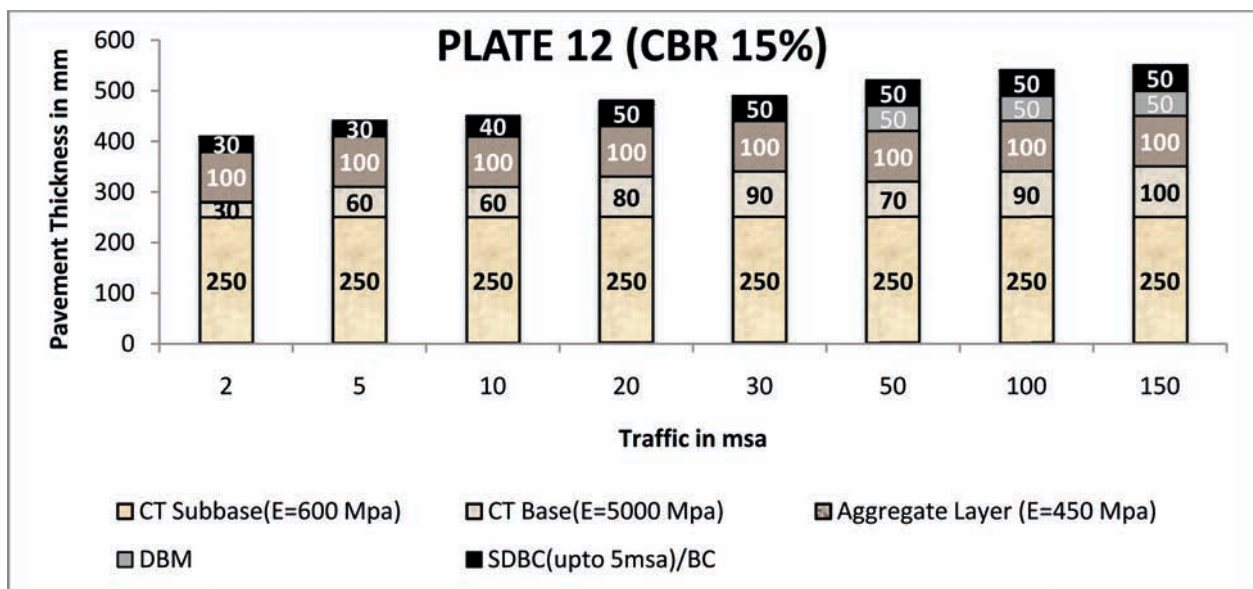
Fig. 10.2 Bituminous Surfacing, Cement Treated Base and Cement Treated Sub-Base with Aggregate Interlayer

Fig. 10.2 shows a five layer elastic structure consisting of bituminous surfacing, aggregate interlayer layer, cemented base, cemented subbase and the subgrade. Material properties such as modulus and poisson's ratio are the input parameters apart from loads and geometry of the pavement for the IITPAVE software. For traffic > 30 msa, VG 40 bitumen is used for preventing rutting. DBM has air void of 3% after rolling (Bitumen content is 0.5% to 0.6% higher than the optimum). Cracking of cemented base is taken as the design life of a pavement. For traffic greater than 30 msa, minimum thickness of bituminous layer consisting of DBM and BC layers is taken as 100 mm (AASHTO-1993) even though the thickness requirement may be less from structural consideration. Residual life of the bituminous layer against fatigue cracking is not considered since it cracks faster after the fracture of the cemented base. Upper

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100mm of the cemented subbase (D) having the gradation 4 of the Table V-1 of Annexure V is porous acting as the drainage layer over lower cemented subbase (F). Coarse graded GSB of MORTH with fines less than 2% containing about 2-3% cement can also be used.





Illustration

Traffic 150 msa

Subgrade CBR = 10 per cent, $M_{R \text{ subgrade}} = 17.6 \cdot \text{CBR}^{0.64} = 75 \text{ MPa}$, $M_{R \text{ bituminous layer}} = 3000 \text{ MPa}$

Pavement composition for 90 per cent Reliability is BC + DBM = 100 mm, Aggregate interlayer = 100 mm

(MR = 450 MPa), Cemented base = 110 mm (E = 5000 MPa), cemented subbase = 250 mm (600 MPa)

Equations 6.3, 6.5 and 6.6 are used as design criteria.

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- I. Allowable Horizontal Tensile Strain in Bituminous Layer is 153×10^{-6} .
- II. Allowable Vertical Compressive Strain on Subgrade is 291×10^{-6} .
- III. Allowable Tensile Strain in Cementitious Layer is 64.77×10^{-6} . From IITPAVE Software the computed strains are
- III. Horizontal Tensile Strain in Bituminous Layer is 131×10^{-6} .
- IV. Vertical Compressive Strain on Subgrade is 213×10^{-6} .
- V. Tensile Strain in Cementitious Layer is 52×10^{-6}

Hence the Pavement Composition is Safe.

Minimum thickness bituminous layer for major highways is recommended as 100mm as per the AASHTO93 guidelines.

10.3 Cemented Base and Cemented Subbase with Sami at the Interface of Cemented Base and the Bituminous Layer

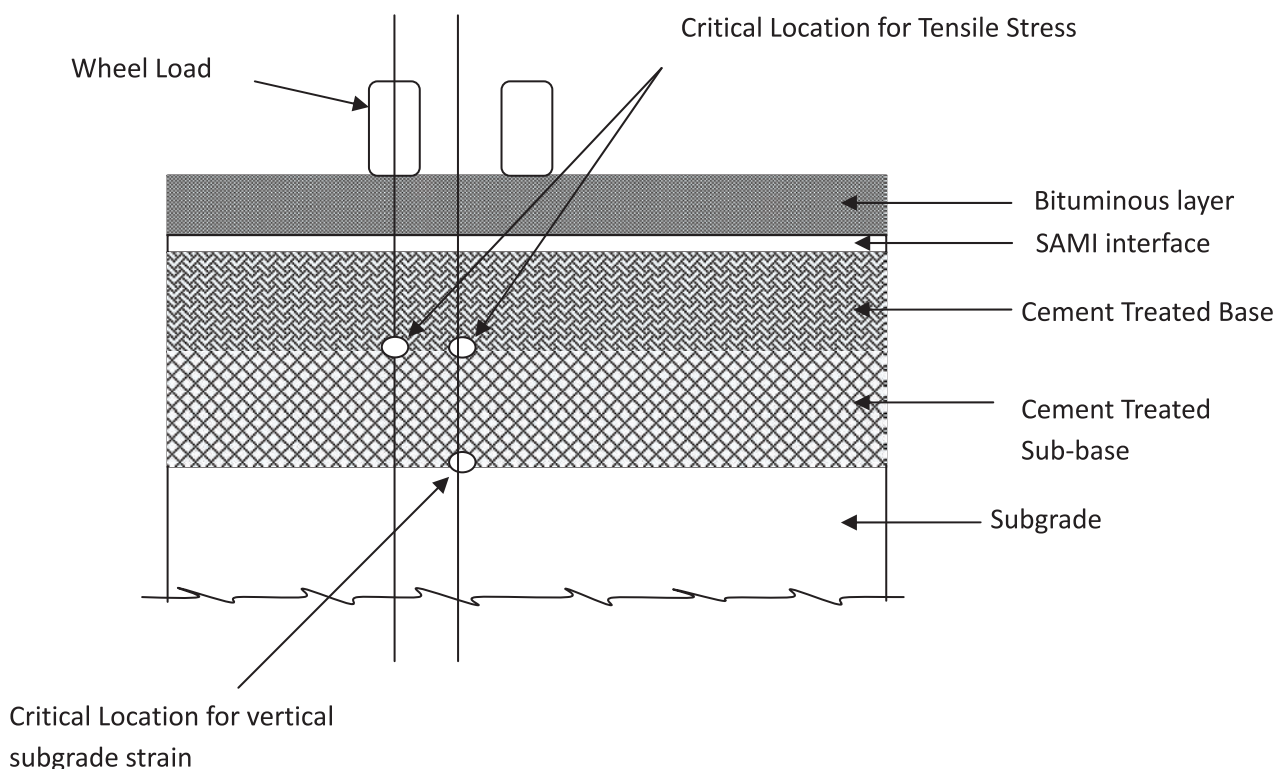
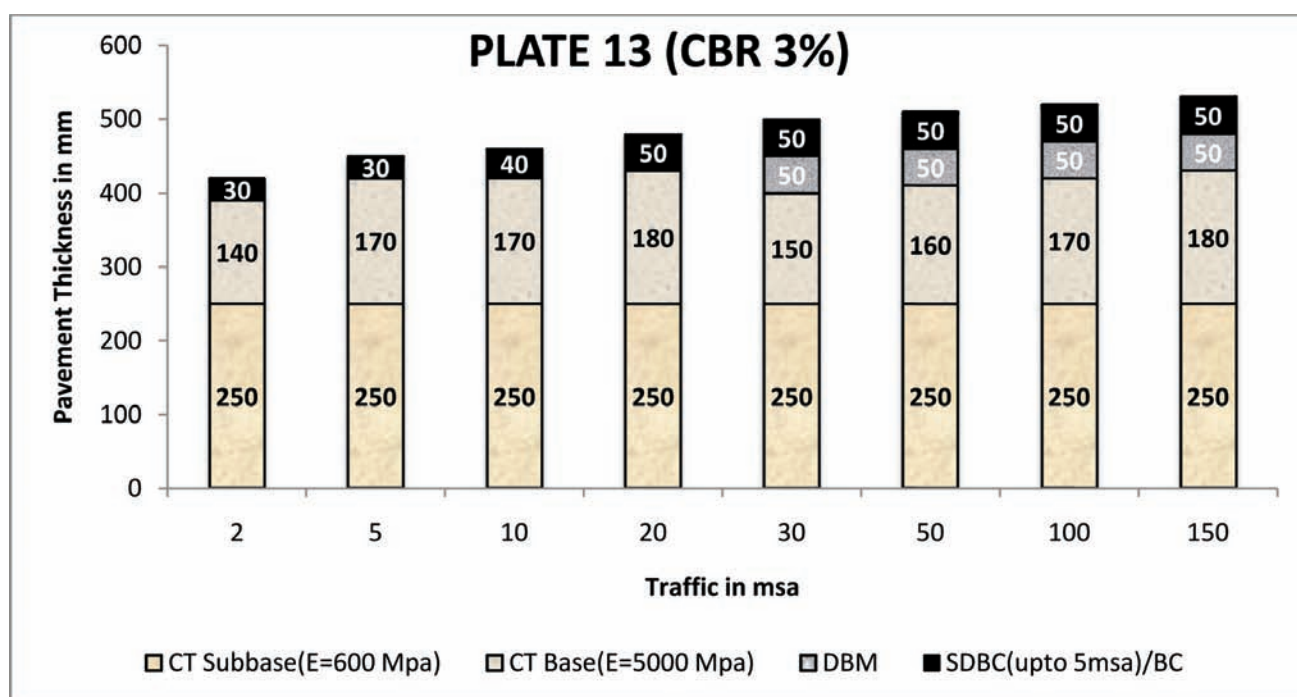
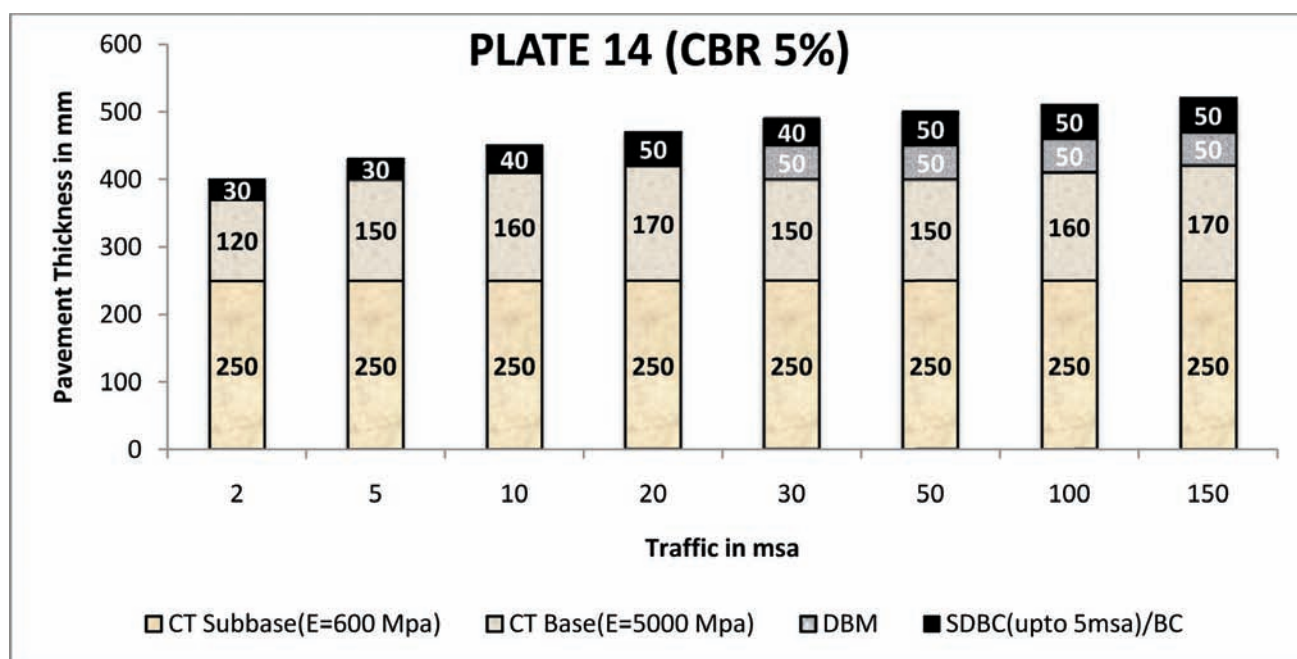


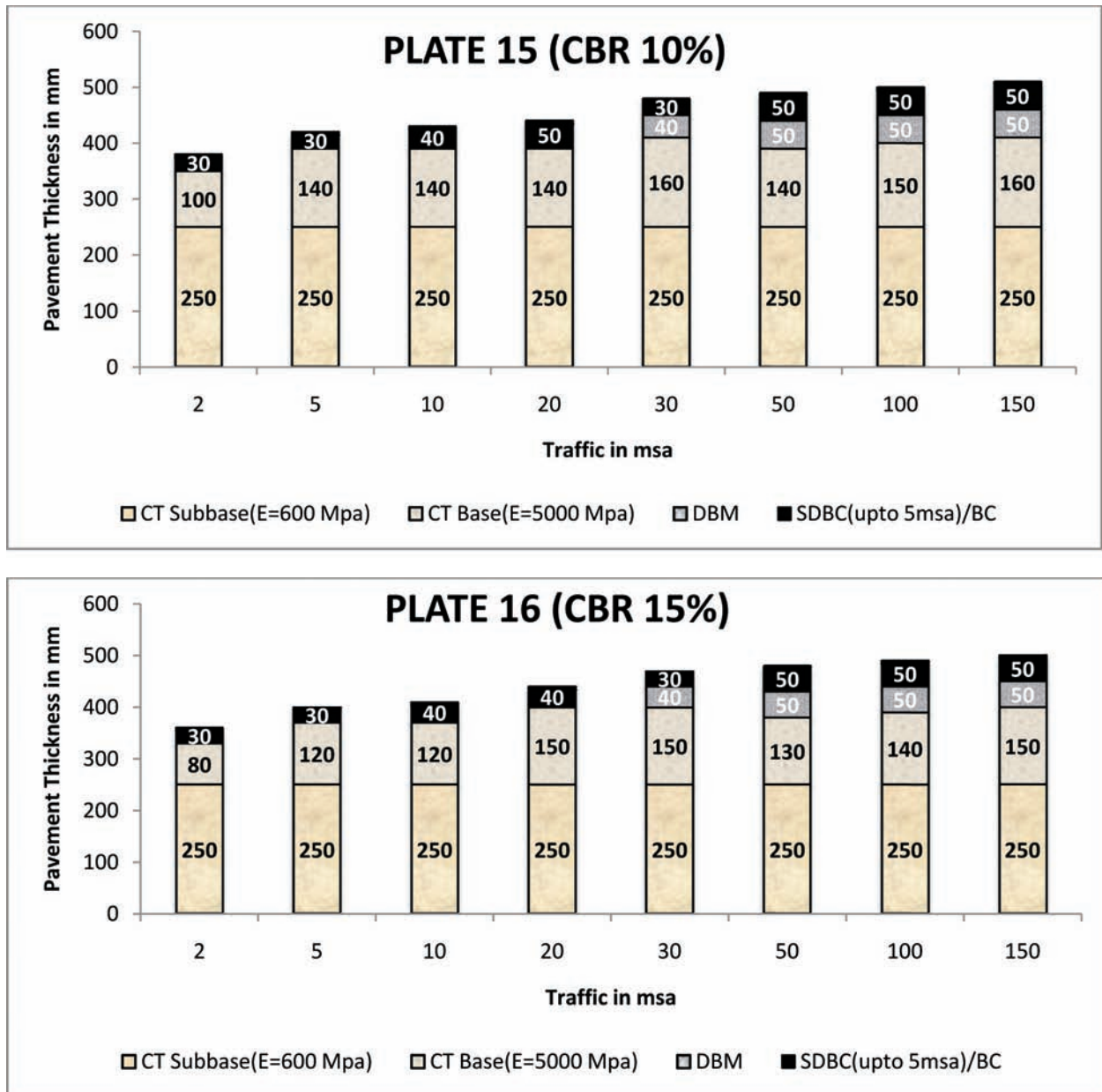
Fig. 9.3 Bituminous Surfacing with Cemented Granular Base and Cemented Granular Sub-base with Stress Absorbing Membrane Interlayer (SAMI)

Fig. 10.3 shows a four layer pavement consisting of bituminous surfacing, cemented base, cemented subbase and the subgrade. For traffic > 30 msa, VG 40 bituemen is used. DBM

has air void of 3 per cent after rolling (Bitumen content is 0.5 per cent to 0.6 per cent higher than the optimum). Cracking of cemented base is taken as the life of pavement. Minimum thickness of bituminous layer for major highways is recommended as 100mm as per the AASHTO93 guidelines. Stress on the underside of the bituminous layer over un-cracked cemented layer is compressive

Upper 100 mm of the cemented subbase having the gradation 4 of **Table V-1** of **Annex V** is porous and functions as drainage layer over the cemented lower subbase.





Illustration

Traffic 150 msa

Subgrade CBR = 10%, $M_{\text{Subgrade}} = 17.6 \times \text{CBR}^{0.64} = 75 \text{ MPa}$, $M_{\text{R bituminous layer}} = 3000 \text{ MPa}$

E of cemented base = 5000 MPa, E of cemented subbase = 600 MPa

From PLATE 15, BC + DBM = 100 mm, Cemented base = 160 mm, Cemented subbase = 250 mm

SAMI is provided on the top of cemented base.

For the given composition of Pavement thicknesses, 90% Reliability is adopted i.e., Equations 6.3, 6.5 and 6.6 are used.

- I. Allowable Horizontal Tensile Strain in Bituminous Layer is 153×10^{-6} .
- II. Allowable Vertical Compressive Strain on Subgrade is 291×10^{-6} .
- III. Allowable Tensile Strain in Cementitious Layer is 64.77×10^{-6} .

From IITPAVE Software the computed strains are

- I. Horizontal Tensile Strain in Bituminous Layer is -4.2×10^{-6} (Compressive).
- II. Vertical Compressive Strain on Subgrade is 193×10^{-6} .
- III. Tensile Strain in Cementitious Layer is 58×10^{-6} .

Minimum thickness of 100mm has been adopted even though there is no tensile stress at the bottom as per AAHSTO 93 Guidelines. The Pavement Composition is safe. The reduction in thickness of the cemented base increases the bending stresses considerably because it is inversely proportional to the square of the thickness.

10.4 Foamed Bitumen/Bitumen Emulsion Treated Rap/Aggregates Over Cemented Subbase

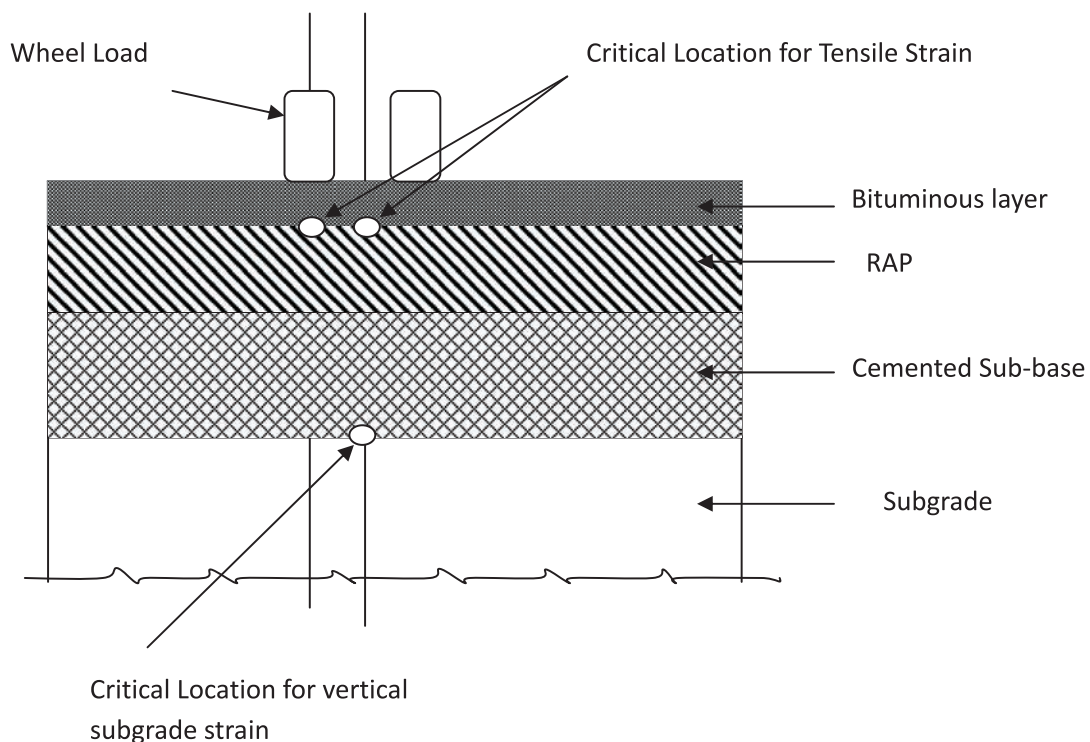
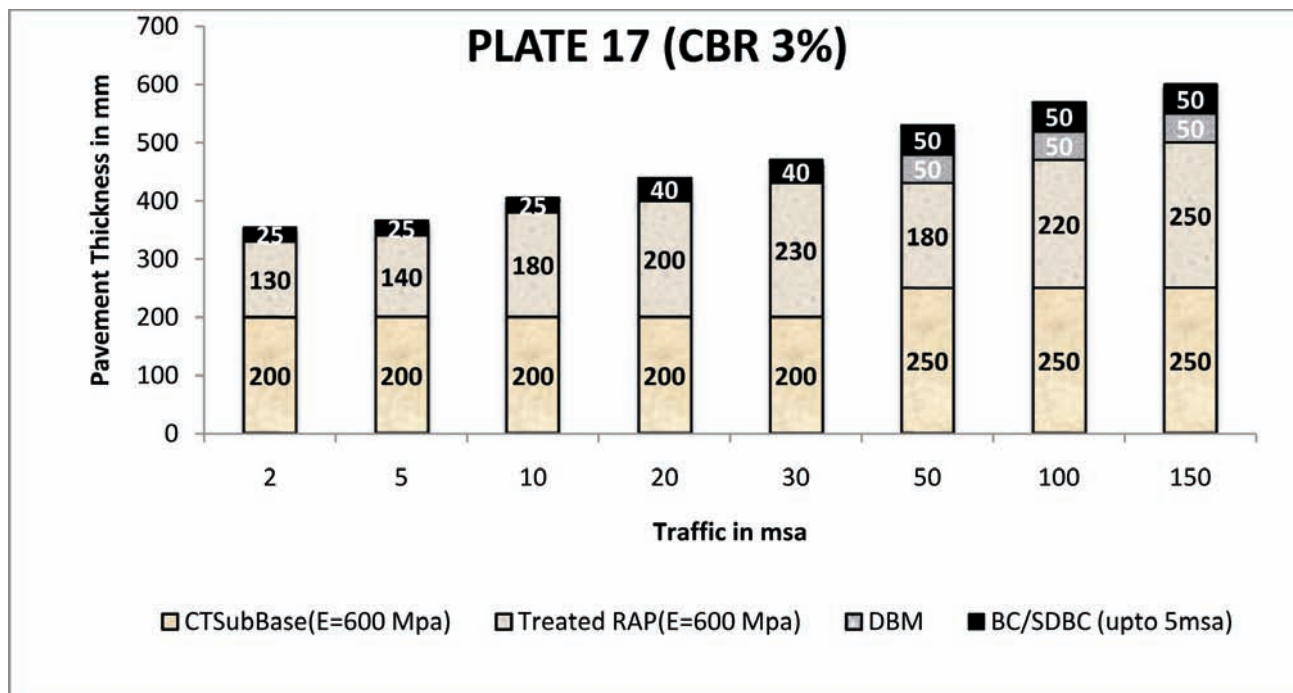
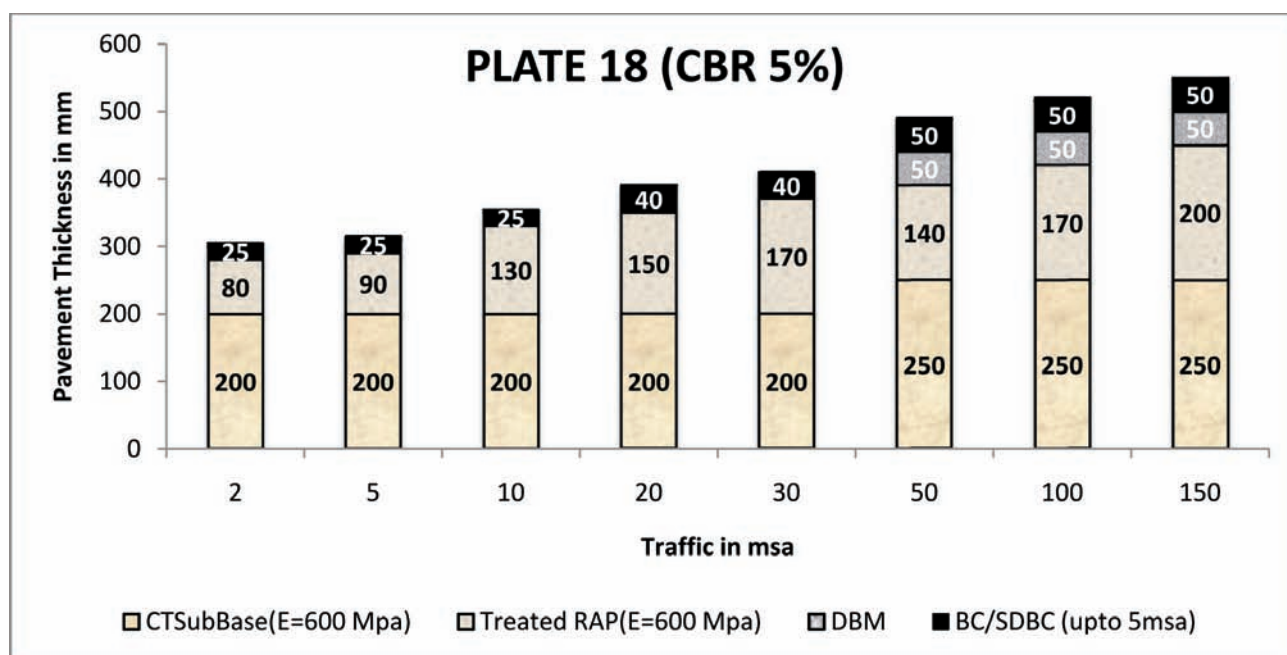
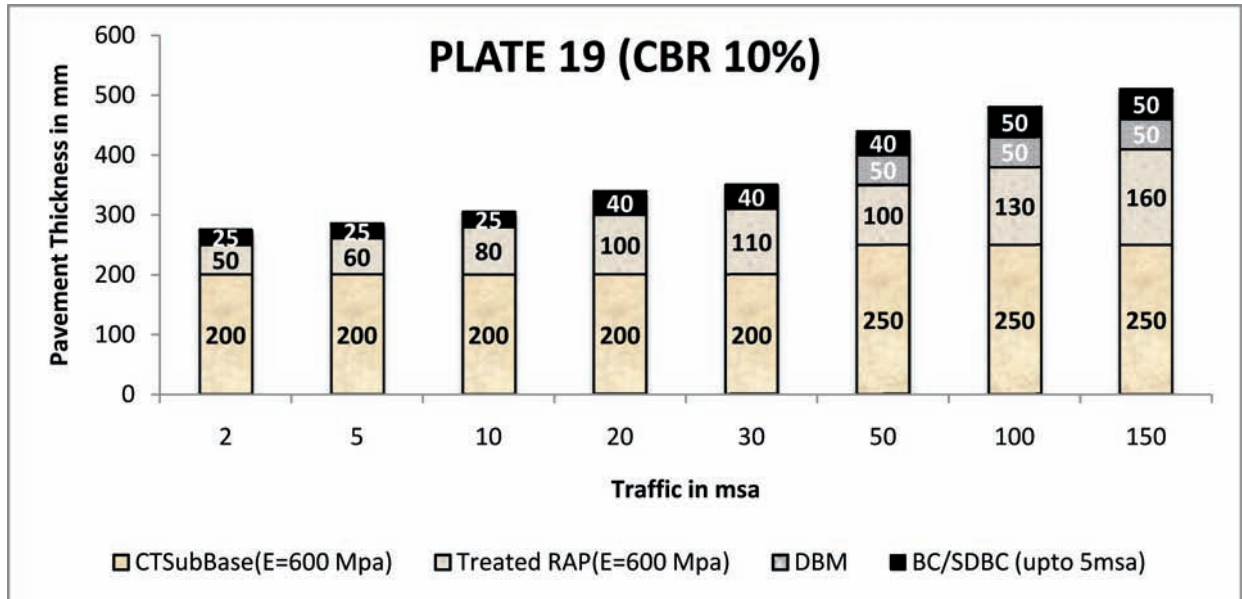
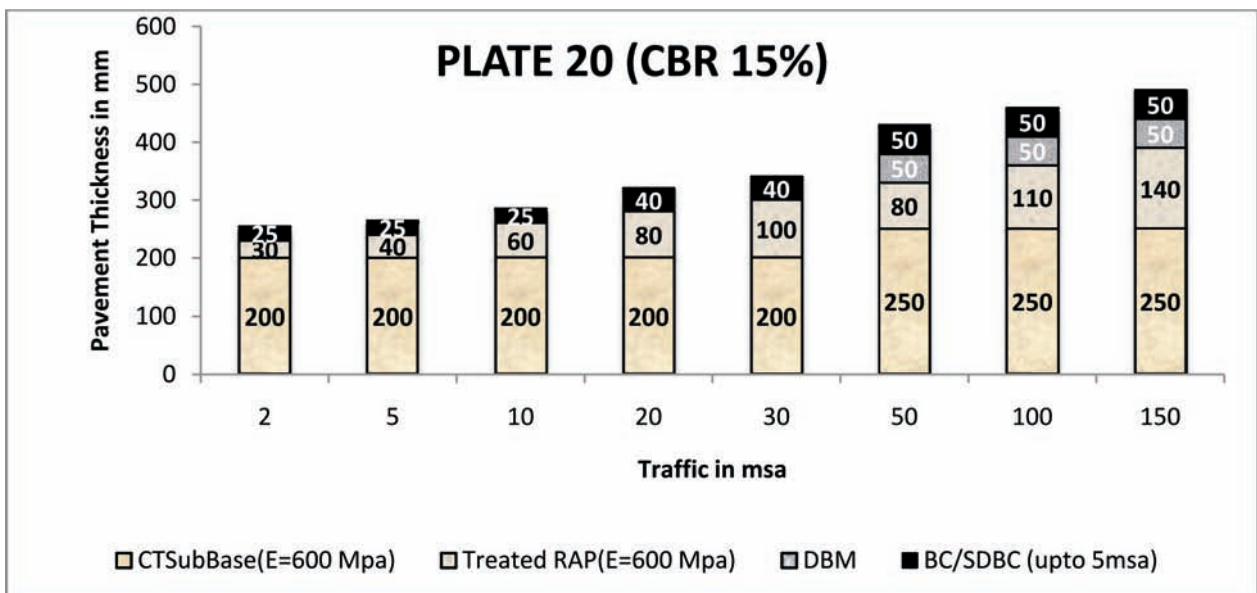


Fig. 10.4 Bituminous Surfacing with RAP and Cemented Sub-base

Fig. 10.4 shows a four layer pavement consisting of bituminous surfacing, recycled layer Reclaimed asphalt pavement, cemented subbase and the subgrade. VG 40 is used for traffic > 30 msa. Even bitumen emulsion/foamed bitumen treated fresh aggregates can be used to obtain stronger base of flexible pavements as per the international practice. DBM has air void of 3 per cent after rolling (Bitumen content is 0.5 per cent to 0.6 per cent higher than the optimum). Fatigue failure of the bituminous layer is the end of pavement life. Cemented subbase is similar to that in clause 9.3.





Illustration

Traffic 150 msa

Subgrade CBR = 10 per cent, $E_{\text{subgrade}} = 17.6 \times \text{CBR}^{0.64} = 75 \text{ MPa}$, M_R bituminous layer = 3000 MPa

M_R of RAP = 600 MPa, E of cemented subbase = 600 MPa

Pavement thicknesses for CBR 10 per cent (PLATE 19), BC + DBM = 100 mm, RAP = 160 mm, cemented subbase = 250 mm

Design traffic = 150 msa 90 per cent Reliability is adopted i.e., Equations 6.3 and Equation 6.5 are used.

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- I. Allowable Horizontal Tensile Strain in Bituminous Layer is 153×10^{-6} .
- II. Allowable Vertical Compressive Strain on Subgrade is 291×10^{-6} .

From IITPAVE Software the computed strains are

- I. Horizontal Tensile Strain in Bituminous Layer is 131×10^{-6} .
- II. Vertical Compressive Strain on Subgrade is 277×10^{-6} .

Minimum thickness of 100 mm has been adopted for traffic greater than 30 msa as per AAHSTO 93 Guidelines. Hence the Pavement Composition is Safe.

10.5 Cemented Base and Granular Subbase with Crack Relief Layer of Aggregate Interlayer Above the Cemented Base

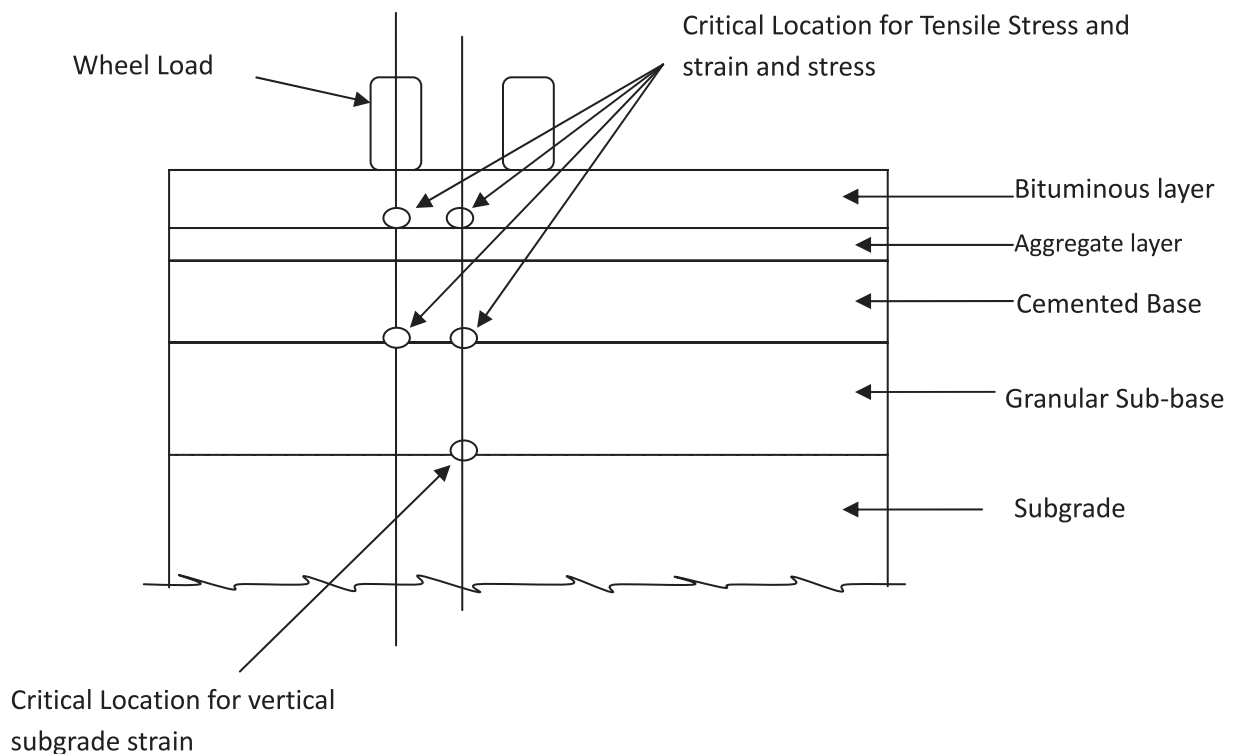
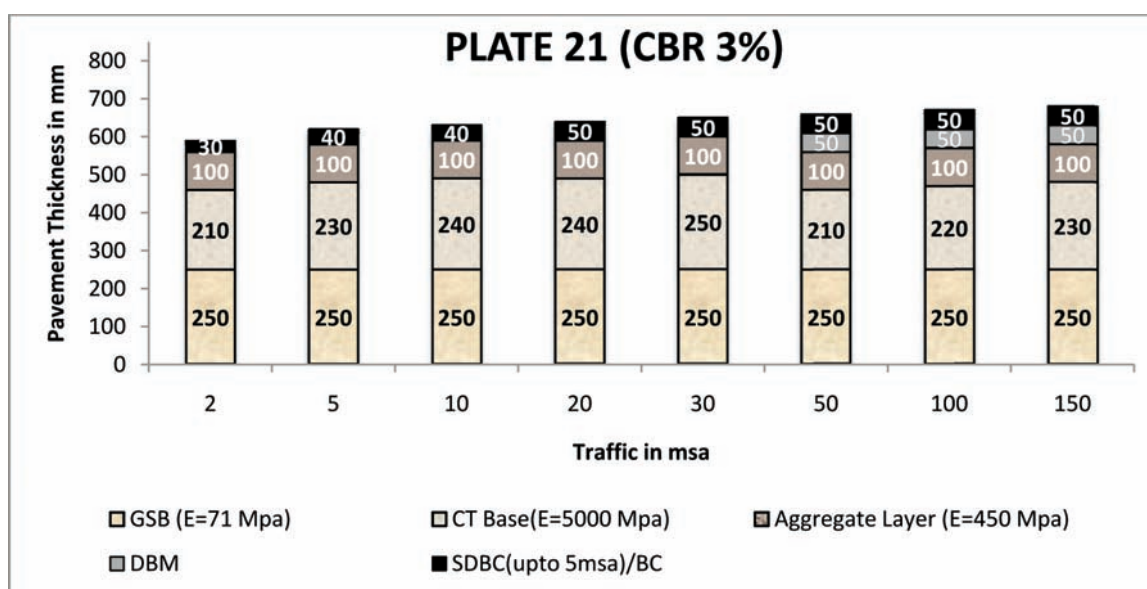
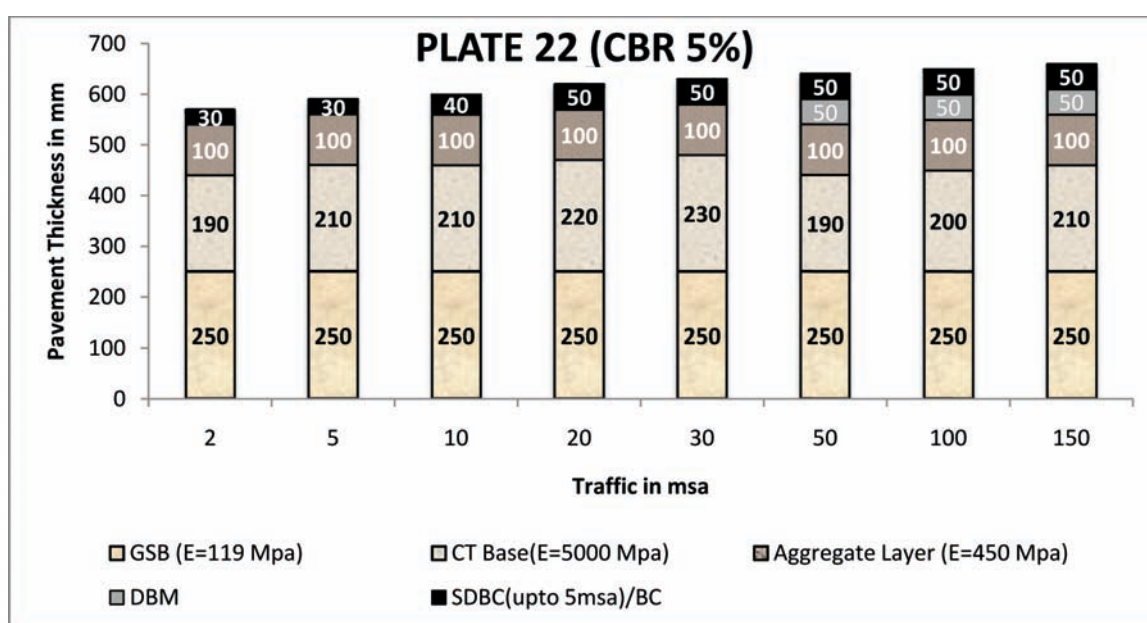
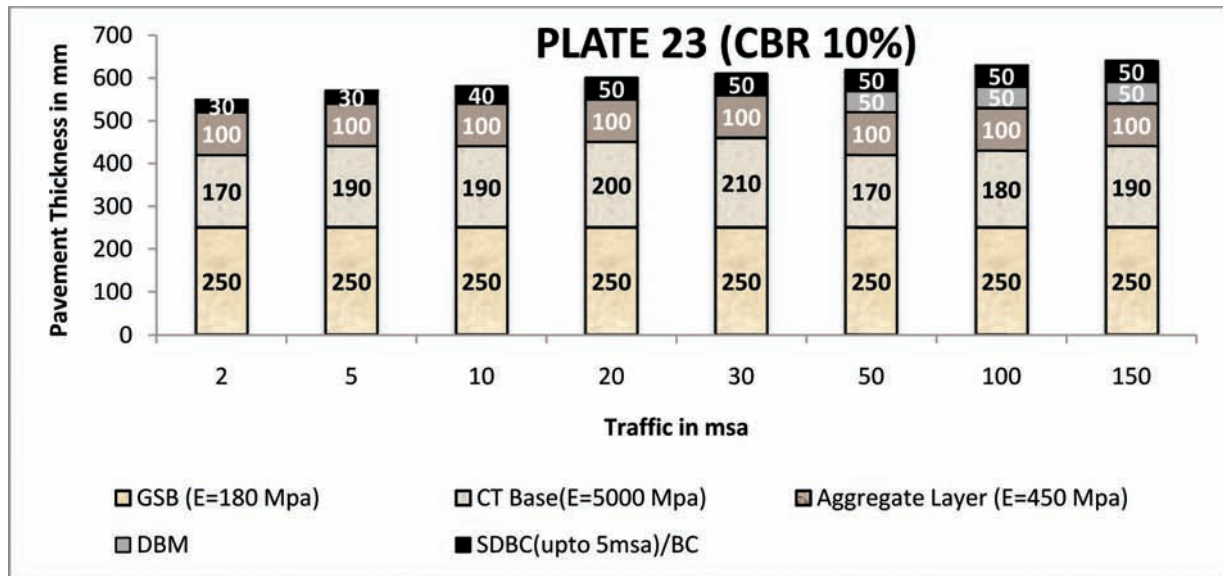
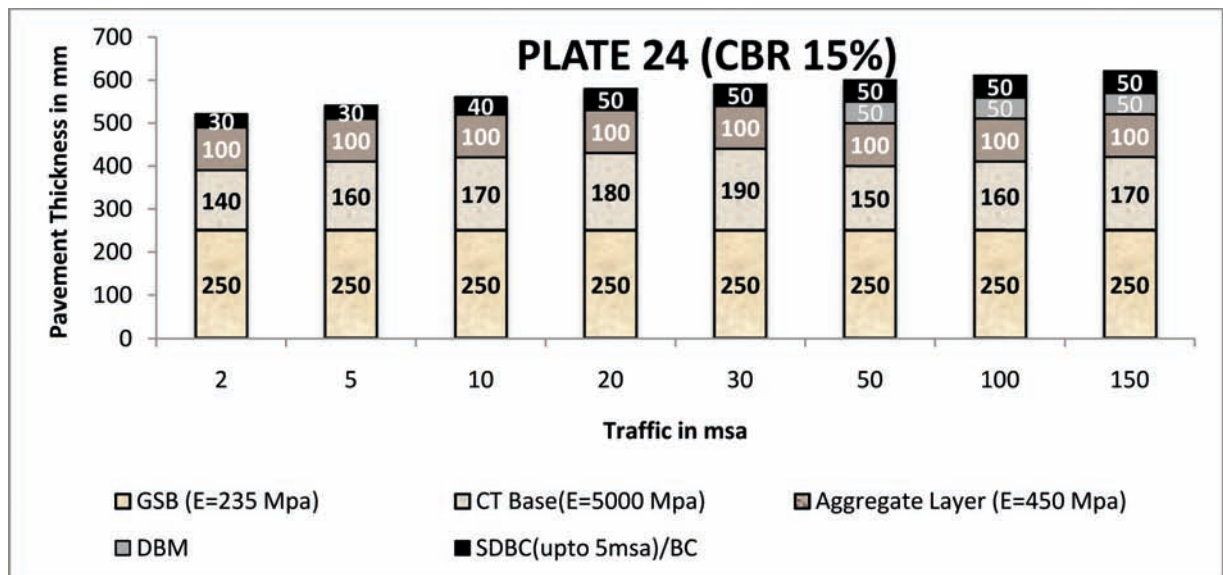


Fig. 9.5 Bituminous Surfacing, Cement Treated Base and Granular Sub-base with Aggregate Interlayer

For reconstruction of a highway, designers may have a choice of bituminous surface, aggregate interlayer, cemented base while retaining the existing granular subbase. The drainage layer in GSB is required to be restored in area where rainfall may damage the pavements. It is modeled as a five layer elastic structure in IITPAVE software. In a two layer construction of bituminous layer, the bottom layer should have an air void of 3 per cent after the compaction by incorporating additional bitumen of 0.5 to 0.6 per cent. This would also resist stripping due

to water percolating from the top to the bottom of the bituminous layer or rising from below. The aggregate interlayer acting as a crack relief layer should meet the specifications of Wet Mix Macadam and if required, it may contain about 1 to 2 per cent bitumen emulsion if the surface of the granular layer is likely to be disturbed by construction traffic. Emulsion can be mixed with water to make the fluid equal to optimum water content and added to the WMM during the processing. The granular subbase should consist of drainage (grading 4 of **Annex V, Table V-1**) as well as filter/separation layer. Upper 100mm of GSB is drainage layer having a permeability of 300 metre/day. A reliability of 80% is used for traffic up to 30msa and 90 per cent for traffic > 30 msa. VG 30 bitumen is recommended for traffic up to 30 msa and VG 40 for traffic > 30msa. For colder area, recommendation of IRC: 111-2009 shall be followed. The different catalogue of thicknesses is:





Illustration

Traffic 150 msa

Subgrade CBR = 10 per cent, $M_{\text{Rsubgrade}} = 17.6 \times \text{CBR}^{0.64} = 75 \text{ MPa}$, M_R of bituminous layer = 3000 MPa

M_R of Aggregate layer = 450 MPa, E of cemented base = 5000 MPa, E of granular subbase = $75 \times (0.2) \times (250)^{0.45} = 179.955 = 180 \text{ MPa}$

From PLATE 23, Pavement composition BC + DBM = 100 mm, Aggregate interlayer = 100 mm, cemented base = 190 mm, granular subbase = 250 mm

For the given composition of Pavement thicknesses, 90 per cent Reliability is adopted i.e., Equation 6.3, Equation 6.5 and Equation 6.6 are used.

- I. Allowable Horizontal Tensile Strain in Bituminous Layer is 153×10^{-6} .
- II. Allowable Vertical Compressive Strain on Subgrade is 291×10^{-6} .
- III. Allowable Tensile Strain in Cementitious Layer is 64.77×10^{-6} .

From IITPAVE Software the computed strains are

- I. Horizontal Tensile Strain in Bituminous Layer is 127×10^{-6} .
- II. Vertical Compressive Strain on Subgrade is 165.4×10^{-6} .
- III. Tensile Strain in Cementitious Layer is 63.6×10^{-6} .

Hence the Pavement Composition is Safe.

10.6 Other Pavement Compositions

There can be infinite number of combinations for a good pavement depending upon the availability of materials. A strong subgrade and a strong subbase which are non-erodible over a period of time due to pore water pressure are very important for a good performing pavement. Use of cemented subbase of lower strength having strength from 1.5 MPa to 3 MPa with thick bituminous layer is common in South Africa (66) in dry area. In wet regions, such low strength cemented subbases with granular layer and wearing course of bituminous concrete is used up to 30 msa. Though PLATES for thickness combinations are not provided, two examples are presented below illustrating how to work out thickness of such pavements with a cemented subbase, Wet Mix Macadam base and bituminous surfacing. NH-8 from Ahmedabad to Jodhpur has cemented layer below the Wet Mix Macadam. **Fig. 10.6** shows a combination of bituminous pavements with WMM base and cemented granular subbase with strength 1.5 MPa to 3.0 MPa. Cement bound granular subbase Grading IV of IRC:SP-89 having strength in the range 0.75-1.5 MPa is not recommended for major highways as per South African practice but it can be used for others if the design traffic less than 10 msa.

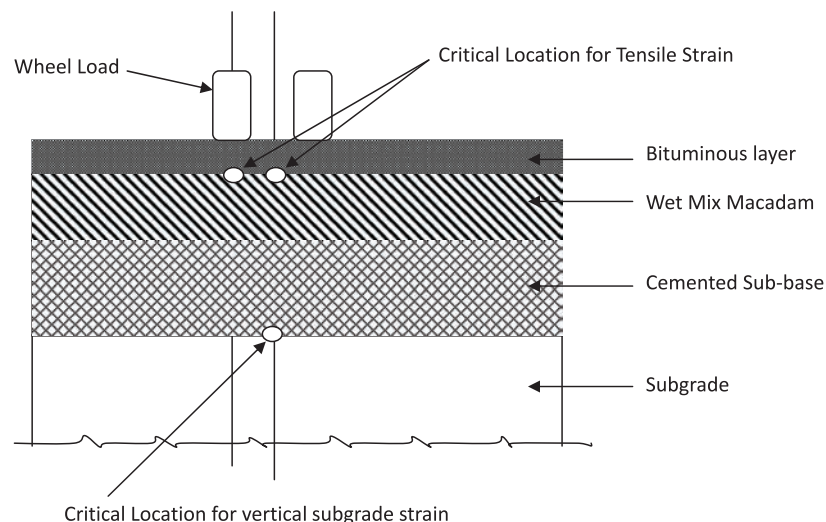


Fig. 10.6 Bituminous Surfacing with Wet Mix Macadam Base and Cemented Sub-base

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Illustration 1

Traffic = 100 msa, Subgrade CBR = 8 per cent, Pavement Composition: Trial Bituminous layer (BC + DBM) = 120 mm, WMM base = 150 mm, Cemented subbase (1.5-3.0 MPa strength) = 300 mm.

For 8 per cent CBR, modulus of subgrade = $17.6 \times 8^{0.64} = 66$ MPa, $MR_{\text{bituminous layer}} = 3000$ MPa, $MR_{\text{WMM}} = 350$ MPa since the support is weak, MR is taken as 450 MPa over stronger cemented layer of Modulus 5000 MPa in PLATE 9.

$$E_{\text{cemented sub-base}} = 600 \text{ Mpa.}$$

For 90 per cent reliability,

Allowable Tensile strain on the bottom of Bituminous layer (ϵ_t) = 169.96×10^{-6}

Allowable Compressive strain on the top of subgrade (ϵ_z) = 318.9×10^{-6}

For the above thickness, the strains at the critical locations calculated by IITPAVE software are:

Tensile strain at the bottom of Bituminous Layer (ϵ_t) = 139×10^{-6}

Compressive strain on the top of subgrade (ϵ_z) = 248×10^{-6}

Thickness can be optimized by different trials. Low strength cemented subbase without a strong cemented base is not suitable for Wet areas.

Illustration 2

Traffic = 5 msa, Subgrade CBR = 8 per cent, Pavement Composition: Bituminous layer (BC + DBM) = 75 mm, WMM base = 100 mm, Cemented sub-base = 150 mm.

For 8 per cent CBR, modulus of subgrade = $17.6 \times 8^{0.64} = 66$ MPa, E

$$MR_{\text{bituminous layer}} = 1700 \text{ MPa, } MR_{\text{WMM}} = 350 \text{ MPa,}$$

$$E_{\text{cemented sub-base}} = 600 \text{ Mpa.}$$

For 80 per cent reliability,

Allowable Tensile strain on the bottom of Bituminous layer (ϵ_t) = 425.5×10^{-6}

Allowable Compressive strain on the top of subgrade (ϵ_z) = 784.3×10^{-6}

For the above thickness, the strains at the critical locations calculated by IIT PAVE software are:

Tensile strain at the bottom of Bituminous Layer (ϵ_t) = 230×10^{-6}

Compressive strain on the top of subgrade (ϵ_z) = 665×10^{-6}

Thickness can be optimized by different trials.

11 INTERNAL DRAINAGE IN PAVEMENT

11.1 The performance of a pavement can be seriously affected if adequate drainage measures to prevent accumulation of moisture in the pavement structure are not taken. Some of the measures to guard against poor drainage conditions are maintenance of transverse section in good shape to reasonable crossfall so as to facilitate quick run-off of surface water and provision of appropriate surface and sub-surface drains where necessary. Drainage measures are especially important when the road is in cutting or built on low permeability soil or situated in heavy rainfall/snow fall area.

11.2 On new roads, the aim should be to construct the pavement as far above the water table as economically practicable. The difference between the bottom of subgrade level and the level of water table/high flood level should, generally, not be less than 1.0 m or 0.6 m in case of existing roads which have no history of being overtopped. In water logged areas, where the subgrade is within the zone of capillary saturation, consideration should be given to the installation of suitable capillary cut-off as per IRC:34 at appropriate level underneath the pavement.

11.3 When the traditional granular construction is provided on a relatively low permeability subgrade, the granular sub-base should be extended over the entire formation width in order to drain the pavement structural section. Care should be exercised to ensure that its exposed ends do not get covered by the embankment soil. The trench type section should not be adopted in any case as it would lead to the entrapment of water in the pavement structure.

11.4 If the granular sub-base is of softer variety which may undergo crushing during rolling leading to denser gradation and low permeability, the top 100 to 150 mm thickness should be substituted by an open graded crushed stone layer of Los Angeles abrasion value not exceeding 40 to ensure proper drainage.

The filter layer must have enough permeability to prevent development of undesirable pore water pressure and it should drain away any free water that enters into it albeit at much lower rate as compared to the drainage layer.

The filter/separation layer should satisfy the following criteria:

$$\frac{D_{15} \text{ of filter layer}}{D_{15} \text{ of subgrade}} \geq 5 \quad \dots 11.1$$

$$\frac{D_{15} \text{ of filter layer}}{D_{85} \text{ of subgrade}} \leq 5 \quad \dots 11.2$$

To prevent entry of soil particles into the drainage layer

And $\frac{D_{50} \text{ of filter layer}}{D_{50} \text{ of subgrade}} \leq 25 \quad \dots 11.3$

D_{85} means the size of sieve that allows 85 per cent by weight of the material to pass through it. Similar is the meaning of D_{50} and D_{15} .

The permeable sub-base when placed on the erodible subgrade soil should be underlain by a layer of filter material to prevent the intrusion of soil fines into the drainage layer (**Fig. 11.2**). Non-woven geosynthetic also can be provided to act as a filter/separation layer. Some typical drainage system is illustrated in **Figs. 11.1, 11.2 and 11.3**.

11.5 When large inflows are to be taken care of, an adequately designed sub-surface drainage system consisting of an open graded drainage layer with collection and outlet pipes should be provided. The system should be designed on a rational basis using seepage principles to estimate the inflow quantities and the outflow conductivity of the drainage system. It should be ensured that the outflow capabilities of the system are at least equal to the total inflow so that no free water accumulates in the pavement structural section. If granular sub-base is not required because of strong subgrade, commercially available geocomposite can be used for drainage and separation. A design example is given in **Appendix V**.

11.6 Very often, water enters the base, sub-base or the subgrade at the junction of the verges and the bituminous surfacing. To counteract the harmful effects of this water, it is recommended that the shoulders should be well-shaped and if possible, constructed of impermeable material. Major highways should have paved shoulder to keep away water from the subgrade and for other roads also with design traffic of 20 msa or less; the base should be constructed 300-450 mm wider than the required bituminous surfacing so that the run-off water disperses harmlessly well clear off the main carriageway.

11.7 Shoulders should be accorded special attention during subsequent maintenance operation too. They should be dressed periodically so that they always conform to the requisite cross-fall and are not higher than the level of carriageway at any time.

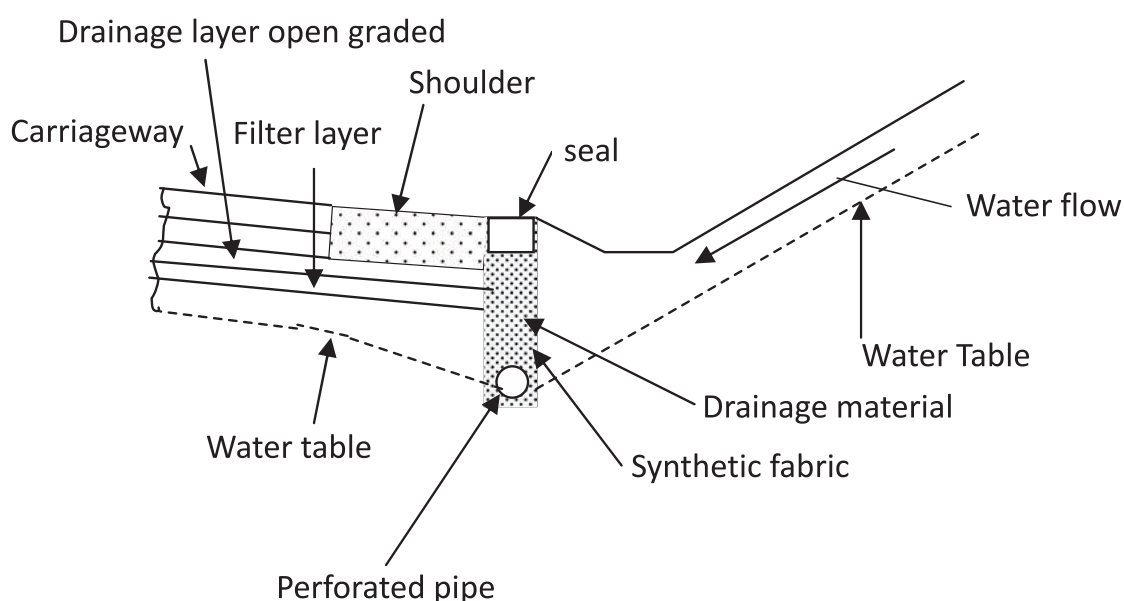


Fig. 11.1 Pavement along a Slope

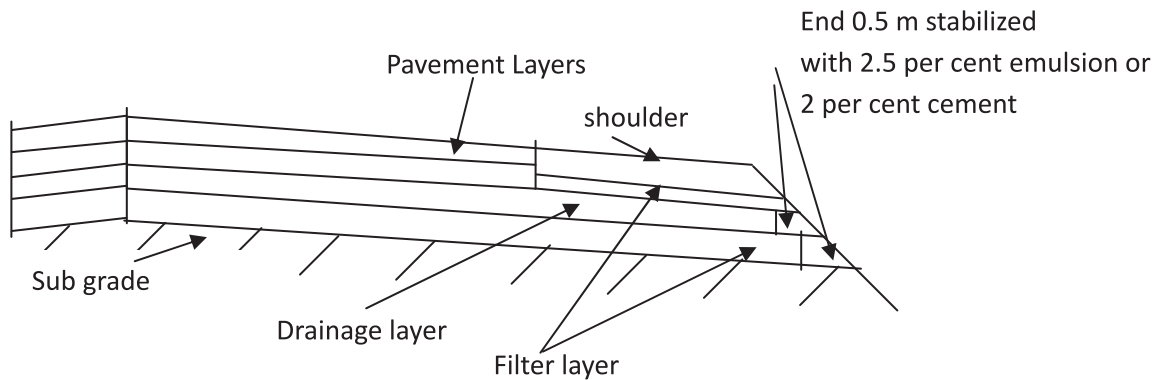


Fig. 11.2 Pavement with Filter and Drainage Layers

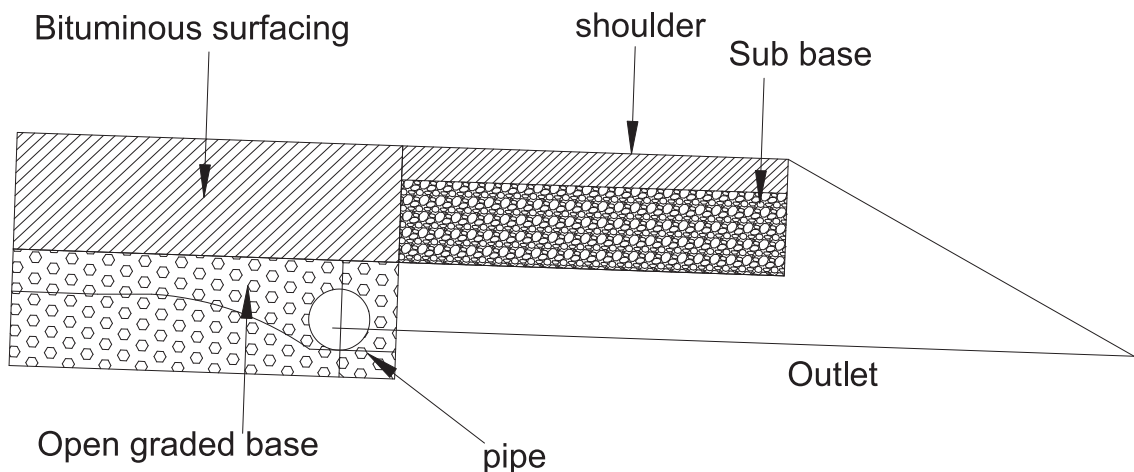


Fig. 11.3 Longitudinal Pipe at the Edge of the Drainage Layer with Outlet Pipe

11.8 Drainage Requirement

Heavy axle loads commonly ply on major roads in India and therefore, it should be ensured that the unbound layers do not undergo unacceptable permanent deformation under repeated loading. The subgrade and the granular layers with entrapped water would be subjected to large pore water pressure under heavy loads causing erosion of the unbound layer. It is necessary to provide a drainage layer to drain away the water entering into the pavement. The coarse graded granular sub-base (62) would have the necessary permeability of 300 m/day with per cent fines passing 0.075 mm sieve less than 2 per cent. Laboratory test should be conducted for the evaluation of the permeability of the drainage layer. If the surface of the open graded drainage layer is likely to be disturbed by the construction traffic the layer may be treated with 2 per cent cement/2-2.5 per cent of bituminous emulsion without any significant loss of permeability. Field test by Ridgeway in USA indicated that it is the duration of low intensity sustained rainfall rather than high intensity rainfall that is critical for infiltration

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of water into the pavement. It was found that the infiltration rate through the joints/cracks was 0.223 m³/day/m and this value can be used for design of drainage layer in the absence of field data. The infiltration rate per unit area q_i in m³/day/m² can be expressed as:

$$q_i = I_c \left(\frac{N_c}{W_p} + \frac{W_c}{C_s W_p} \right) + K_p \quad \dots 10.4$$

Where,

I_c = Crack infiltration rate (0.223 m³/day/m)

N_c = Number of longitudinal cracks (i.e., number of lanes plus one)

W_p = Width of pavement subjected to infiltration

W_c = Length of the transvers cracks or joints (equal to the width of the pavement)

C_s = Spacing of transverse cracks (taken as 12 m for bituminous pavement)

K_p = Rate of infiltration through uncracked area (assumed zero for thick bituminous pavements)

An example for the design of drainage layer is given in **Appendix V**.

12 DESIGN IN FROST AFFECTED AREAS

12.1 In areas susceptible to frost action, the design will have to be related to actual depth of penetration and severity of the frost. At the subgrade level, fine grained clayey and silty soils are more susceptible to ice formation, but freezing conditions could also develop within the pavement structure if water has a chance of ingress from above.

12.2 One remedy against frost attack is to increase the depth of construction to correspond to the depth of frost penetration, but this may not always be economically practicable. As a general rule, it would be inadvisable to provide total thickness less than 450 mm even when the CBR value of the subgrade warrants a smaller thickness. In addition, the materials used for building up the crust should be frost resistant.

12.3 Another precaution against frost attack is that water should not be allowed to collect at the subgrade level which may happen on account of infiltration through the pavement surface or verges or due to capillary rise from a high water table. Whereas capillary rise can be prevented by subsoil drainage measures and cut-offs, infiltrating water can be checked only by providing a suitable wearing surface.

13 SUMMARY OF PAVEMENT DESIGN PROCEDURE AND USE OF IITPAVE SOFTWARE

The analysis and design of pavement may be carried out by the following approach:

- A. For traffic lower than 2 msa, recommendation of IRC:SP:72-2007 may be used.
- B. In case of higher traffic, IITPAVE software may be used. It is a multilayer elastic layer analysis programme. This software is included along with the Pavement Design Guidelines in a CD. Details and method of data inputs are self explanatory CD. The necessary steps required to use this software are:
 - i. Open the folder IRC_37_IITPAVE.
 - ii. Double-click IITPAVE_EX file in the IRC_37_IITPAVE folder. This is an executable jar file. A home screen will appear.
 - iii. From the Home screen user can manually give input through input window by clicking on 'Design New Pavement Section'. User can also give input through properly formatted input file by clicking on 'Edit Existing File' option then browsing and opening the input file.
 - iv. Next an input window will come. All the inputs required have to be given through that input window.
 - v. First, number of layers to be selected from drop down menu to fix up input boxes for different layer inputs.
 - vi. Next, Elastic modulus (E) values of the various layers in MPa, Poisson's ratio and thickness of various layers in mm excluding the subgrade thickness are to be provided.
 - vii. Single wheel load and the tyre pressure are to be provided (tyre pressure of 0.56 MPa has been used for calibration of the fatigue equation and the same pressure can be used for stress analysis. Change of pressure even up to 0.80 MPa has a small effect upon stress values in lower layers.)
 - viii. Then the number of points for stress computations is to be given through the drop down menu for analysis points.
 - ix. Then corresponding to different points, the values of depth Z in mm and the corresponding value of radial distance from wheel centre (r) in mm are to be given.
 - x. Provide whether analysis is for single wheel load or double wheel load by selecting 1 or 2 from drop down menu beside "Wheel Set". Only dual wheel load may be needed in most cases.

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- xi. The output of the programme will provide stresses, strains and deflections at the desired points. Next check if the computed strains are less than the permissible strain. If not then run the program with a new thickness combinations till the permissible strain values are achieved. ep_T , ep_R and ep_Z will be the outputs that will be of interest. For cemented base tensile stress below the cemented layer σ_T/σ_R are needed for cumulative fatigue damage analysis.
- xii. In most cases the tensile strain at the bottom of the bituminous layer is higher in the longitudinal direction (ep_T) rather than in radial direction (ep_R). If tensile strain in the bituminous layer is high, increase the thickness of the bituminous layer.
- xiii. Tensile strains in the cementitious bases also are to be computed for design. If the tensile strain/stress in the cemented layer is higher, increase the thickness of the cemented layer.
- xiv. Vertical subgrade strain (ep_Z) should be less than the permissible value for the design traffic. If the vertical subgrade strain is higher, increase the thickness of sub-base layer.
- xv. Stress values can also be easily computed by changing directly the input file which is to be written in a format as illustrated in the manual and browse the input file by clicking 'Edit Existing File' on home screen of IITPAVE.

The above approach can be used to arrive at the pavement thickness satisfying the limiting strains.

- C. Design charts are provided in the text of the guidelines. The software can help in finding the thickness for any traffic other than that given in the design catalogue. The method of arriving at the design catalogue is illustrated in the plates for each type of pavement combination.

ANNEX-I

Considerations in Design of Bituminous Pavements

I-1 The IITPAVE software is capable of analyzing a multilayer layer elastic system with rough interfaces. Vertical subgrade strain, ϵ_v , is an index of bearing capacity of the subgrade and it needs to be kept below a certain value for a given traffic to limit rutting in the subgrade and granular layers of a well constructed pavement. Research findings indicate that the plastic vertical strain, ϵ_p , in pavement materials depends upon the magnitude of elastic vertical strain, ϵ_v , given as

$$\epsilon_p/\epsilon_v = K \times (N)^c \quad \dots (I-1)$$

Where ϵ_p and ϵ_v are plastic and elastic strains respectively, N = number of repetition of axle loads, K and c are constants

If the computed ϵ_v on the subgrade for a given wheel load is low, the vertical strain in the upper granular layers also is low. Hence limiting the subgrade strain controls the rutting in the subgrade as well as in the granular layers. Bituminous layer must have a rut resistant mix.

The elastic tensile strains, ϵ_t , at the bottom and at the top of the bituminous layer should not exceed a certain limit for a given design traffic to control development of cracks during the design period. Surface crack may develop on either side of the wheel path as shown in **Fig. I-1**. Tensile stains near the edge of the tyres can be higher than that at the bottom and surface cracks may develop much earlier than those at the bottom particularly at higher temperatures. Though a number of cases of Top Down Cracking within a year or two of opening to traffic has been found at many locations (39, 53 and 63) in the BC and the DBM layers in India, surface bleeding and rutting (49, 51 and 61) rather than surface cracking has been very common because of secondary compaction owing to the softer bitumen for the climate and traffic.

Surface transverse surface cracks may also develop due to horizontal shear stresses applied by wheels of heavy commercial vehicles during acceleration and braking if the mix does not have sufficient tensile strength. The surface cracks responsible for top down cracking shown in **Fig. I-1** can be delayed by using high viscosity binder such as VG 40 or polymer/Crumb rubber modified binder because of higher tensile strength in the top layer of the bituminous surfacing at higher temperatures. Low temperature transverse cracking associated with stiffer binders is not a problem in plains of India. Bitumen of lower viscosity controls transverse surface cracking in colder regions as per international experience. In the light of the above, the approach discussed in the following is recommended for design of bituminous pavements.

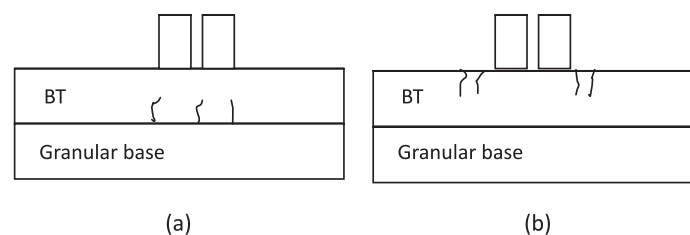


Fig. I-1 Cracks at Bottom (a) and Top (b)

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I-2 Rutting in Subgrade and Granular Layer

Large amount of field data for rutting in flexible pavements were collected and analyzed during several research projects of MORTH; and a relationship between limiting surface rutting of 20mm and the vertical elastic subgrade strain was developed for different repetitions of standard axle loads and it was subsequently adopted in IRC-37:2001. The bituminous layers were not very thick in India in eighties and nineties when rutting data was collected and most of the rutting took place in the subgrade and the granular layers only. The equations for rutting for 80 per cent and 90 per cent reliability respectively are given (46, 54) as

$$N = 4.1656 \times 10^{-08} [1/\epsilon_v]^{4.5337} \quad \dots (I-2)$$

$$N = 1.41 \times 10^{-88} \times [1/\epsilon_v]^{4.5337} \quad \dots (I-3)$$

Equation I-2 was used as the rutting criterion in IRC: 37-2001 for controlling rutting in the subgrade and granular layers, and the rutting in the bituminous layer was to be taken care of by selecting appropriate binder and mix design.

A more correct approach would be to estimate permanent deformation in different layers by spectrum of axle loads adopted in mechanistic-empirical pavement design method as recommended in MEPDG (3) but this would require massive coordinated research effort in the laboratory as well as in the field in different regions of the country so that laboratory equations can be calibrated and validated from field performance. Data from other countries can not directly be used due to different types of traffic and climate. Equation I-2 having a reliability of 80 per cent is based upon a good data base for limiting rutting in granular layers and the subgrade soils. Equation I-3 is recommended for 90 per cent reliability for high volume roads with traffic greater than 30 msa. Providing large thickness of granular layer does not cause any marked reduction in the thickness of bituminous layer from fatigue considerations. The thickness of the sub-base should be sufficient to stand the construction traffic and the granular base also should be thick enough so as not to cause the damage to GSB. These factors were considered in developing the design charts of IRC: 37-2001. Field performance data of pavements designed as per IRC: 37-2001 indicated unacceptable rutting in the bituminous layer rather than in the granular layer within a year or two of construction of highways (49, 51 and 61) because of use of softer bitumen for the climate, higher temperatures and heavy axle loads. This problem is now addressed by the selection of high viscosity binder for the bituminous mix in line with the European practice.

I-3 Rutting in the Bituminous Layer

Thickness of bituminous layers in India for flexible pavements with granular bases can be close to 200 mm or higher for heavy volume roads. The rutting in the bituminous layer is to be controlled by selecting a mix using binder of appropriate viscosity considering the traffic, climate and field experience. Rut resistant mixes for high volume traffic with air temperatures of 40°C and above can be obtained by using high viscosity binders Laboratory rut tests using IITKGP RUT tester on mixes with VG 40 bitumen, and some modified binders indicated

almost equal performance at 50°C. VG 30 bitumen gave much higher rutting in the rut tester, a phenomenon observed in the field also though it meets the superpave specification requirement (5, 38) of 1 kPa for $G^*/\sin \delta$ at 64°C using Dynamic Shear Rheometer. Analysis by MEPDG model (3) also predicted 50 per cent rut depth in mixes with VG 40 bitumen as compared to that with VG 30 (50). Even when modified bitumen is used in the wearing course, the rutting may occur in the DBM layer made with VG 30 just below the wearing course (51). Hence a higher grade of binder is recommended for the mix both for the BC and the DBM layer below the wearing course under heavy traffic conditions for the maximum air temperatures of 40°C and higher, very common on plains of India. Recommendation of IRC: 111-2009 (29) for use of VG 40 bitumen in BC as well as DBM layer may be adopted if the pavement carries over 2000 commercial vehicles per day. Stone Matrix Asphalt (IRC: SP: 79-2008) (32) is another wearing course that is known to be rut as well as fatigue resistant. Marshall Method of mix design is recommended for determination of optimum binder content.

I.4 Fatigue Resistant Bituminous Layer

Laboratory tests and field performance indicate (3, 20, 27, 38 and 40) that fatigue life of a bituminous layer depends to a great extent on the bitumen content for a given mix. A bituminous layer with higher modulus develops lower tensile strain by a wheel load at the bottom of the layer. To ensure that the bottom Dense Bituminous Macadam has a higher fatigue life, it should contain higher bitumen content. But softer grade bitumen such as VG 30 may give an unstable mix with higher bitumen content if exposed to construction traffic. For a bituminous layer thickness of 150 mm and higher, the temperature of the bottom DBM is lower than the top and there is little chance of rutting in the bottom layer if the air void is close to 3 percent. Higher bitumen content in the bottom layer makes the mix resistant to stripping and it also provides a strong barrier for entry of moisture into the upper bituminous layer (20). Computations further shows that the tensile strain in the wearing course near the edge of the tyre can be even higher (3, 50 and 63) than that at the bottom of bituminous layer particularly at higher temperatures and therefore, the wearing course also must be fatigue resistant in addition to being rut resistant. Surface longitudinal cracking was also noticed during Heavy Vehicle Simulator testing at the Central Road Research Institute also. In a two layer bituminous construction consisting of BC and DBM, VG 40 should be used for both the layers with DBM having 0.5 per cent to 0.6 per cent higher bitumen content so that the air void after the compaction is close to 3 per cent. Mixes with Polymer and Crumb Rubber Modified binders have fatigue lives which can be two to ten times higher than the normal mixes (38, 44 and 69) depending upon the binder content and designers can utilize this property in designing high fatigue life bituminous pavements after carrying out laboratory tests both on normal and modified bituminous mixes for the evaluation of their relative fatigue lives.

I.5 Fatigue equations

Fatigue lives of a bituminous mixture at a reliability level of 80 per cent and 90 per cent (46,

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54) respectively are given as

$$N_f = 2.21 * 10^{-04} \times [1/\epsilon_t]^{3.89} * [1/M_R]^{0.854} \quad \dots (I-4)$$

$$N_f = 0.711 * 10^{-04} \times [1/\epsilon_t]^{3.89} * [1/M_R]^{0.854} \quad \dots (I-5)$$

N_f = fatigue life, ϵ_t = Maximum Tensile strain at the bottom of the bituminous layer, M_R = resilient modulus of the bituminous layer.

Equation I-4 was used in IRC: 37-2001. Equation I-5 gives fatigue life which is about one third of that given by Equation I-4 for a given strain and modulus and the thickness of the bituminous layer would be much higher for a given traffic leading to very high cost. High volume highways demand a reliability level of 90 per cent and higher. This practice is followed in all international guidelines to avoid frequent maintenance. Mix design is the key factor to enhance the fatigue life without any marked increase in thickness

I-6 Mix Design and Fatigue Life

The bitumen content of the DBM mixes used in major highways in India varies generally from a minimum of 4 per cent to a maximum of about 5 per cent depending upon the gradation and the specific gravity of the aggregates; and the recommended air void content range is 3 to 6 per cent (62) with an average of air void content of about 4.5 per cent. In a two layer DBM, the fatigue life of bottom layer needs to be enhanced by increasing its bitumen contents so that the cracks do not propagate from the bottom during the design life of the pavement. Though softer bitumen can be used in lower layers since the temperature may not be too high below 100 mm depth, use of such bitumen would require thicker DBM layer because of its lower modulus. Asphalt Institute (6), Shell (60) and MEPDG (3) have given equations for determination of fatigue life of bituminous mixtures for different values of volume of bitumen (V_b) and the air voids (V_a) and same basic approach was used to modify the calibrated fatigue equations to obtain high fatigue mixes. The fatigue Equation I-5 having a reliability level of 90 per cent is modified to include the mix design variables such as air void and volume of bitumen as given below,

$$N_f = 0.5161 * C * 10^{-04} \times [1/\epsilon_t]^{3.89} * [1/M_R]^{0.854} \quad \dots (I-6)$$

$$\text{Where, } C = 10^M, M = 4.84 \left(\frac{V_b}{V_a + V_b} - 0.69 \right) \quad \dots (I-7)$$

V_a = per cent volume of air void and V_b = per cent volume of bitumen in a given volume of bituminous mix.

N_f = fatigue life, ϵ_t = maximum tensile strain at the bottom of DBM.

M_R = Resilient modulus of bituminous mix.

If $V_a = 4.5$ per cent and $V_b = 11.5$ per cent (corresponding to bitumen content of approximately 4.5 per cent by weight of total mix), Equation I-6 is reduced to Equation I-5 If the constant

0.5161 of Equation I-6 is replaced by 1.604 ($= 0.5161 \times 2.21/0.711$) the modified equation considering the mix design variable V_a and V_b will have a reliability of 80 per cent. Effect of bitumen content can thus be considered to determine the fatigue life of a bituminous mixture in colder areas at 80 per cent reliability using VG 30 bitumen or softer bitumen depending upon the climate as recommended in IRC:111-2009.(29)

Equations I-4 and I-5 give fatigue lives for 20 per cent cracked area of the bituminous layer at a reliability level of 80 and 90 per cent respectively at the end of the design period. In other words, only ten percent of the area may have 20 per cent cracks if 90 per cent reliability is used for high volume highways. To avoid frequent maintenance, a reliability level of 90 per cent is recommended for highways having a design traffic exceeding 30 msa. Since most places on plains of India have maximum air temperatures equal to 40°C or higher, VG 40 bitumen is recommended for higher traffic and hardly any additional thickness of bituminous layer other than what is specified as per IRC: 37-2001 will be required if the bottom bituminous layer is made fatigue resistant by increasing the binder content by 0.5 per cent to 0.6 per cent so that the air void is around 3 per cent. Mix design exercise is required to be done to get a durable mix. The thickness requirement is less when stiffer binder is used. Mix design and pavement design should be integrated to get an optimum design. Using the principle outlined above, a pavement can be designed so that the bottom rich bituminous layer has a very long fracture life and only the wearing course is subjected to distress such as surface cracks, rutting, raveling, pot holes etc due to traffic and ageing and it would need replacement from time to time. On a close examination of Equations I-6 and I-7, it is found the Equation I-6 with a reliability level of 90 per cent reduces very close to Equation I-4 if air void of the bottom DBM layer is 3 per cent and volume of bitumen is about 13 per cent.

The modified fatigue equation having a 90 per cent reliability with air void around 3 per cent and the volume of bitumen of about 13 per cent is given as

$$N_f = 2.021 \times 10^{-04} \times [1/\epsilon_t]^{3.89} \times [1/M_R]^{0.854} \quad \dots (I-8)$$

Constants of Equations I.4 and I.8 are almost same and hardly any additional thickness of the bituminous layer is needed for a better performing pavement using Equations I-8. The constant 2.021 of Equations I-8 can be increased further by increasing volume of bitumen by opening the grading and even 2 per cent air void in deep bituminous layer has been recommended (27) for long life pavements.

Fig. I-1 illustrates the effect of mix design variables on fatigue life. It can be seen that for a mix modulus of 3000 MPa, if V_a is decreased from 5 per cent, to 3 per cent and V_b is increased from 10 per cent to 13 per cent, the fatigue life at the tensile strain of $200E-04$ increases from $1.00E + 07$ to $5.00E + 07$. Similarly, the fatigue life of the mix with a modulus of 1700 MPa increases from $1.7 E + 07$ to $8.0E + 07$ for identical change of mix variable. Mix design thus plays a very important role in design of bituminous pavements. It can also be seen that the fatigue life of the softer mix ($M_r = 1700$ MPa) is higher than that of the stiffer mix ($M_r = 3000$ MPa) but thickness also will be greater for the less stiff mix. Designers can develop better thickness combinations

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than what are given in different PLATES using innovative design and life cycle cost be optimized considering the response of constructed pavements in different climate.

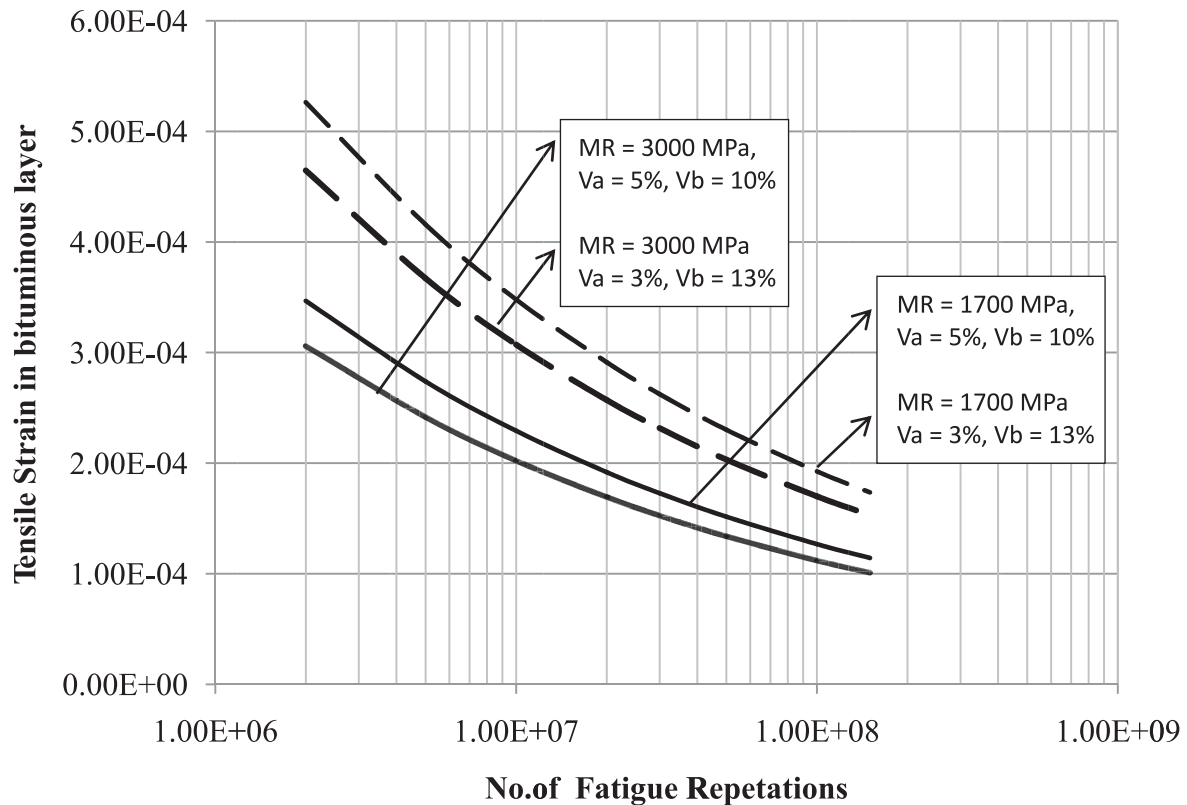


Fig. I-1 Effect of Air Void and Volume of Bitumen on Fatigue Life Bituminous Layer

I-7 Flexural Fatigue of Thin Wearing Course

When a thin wearing course of bituminous layer is provided over a granular layer, there is compressive bending strain due to a wheel load at the bottom of the bituminous layer which decreases with increasing thickness and becomes tensile with higher thickness as can be seen from **Fig. I-2**. Only when thickness reaches to about 50 mm, there is reduction in tensile strain with further increase in thickness of the bituminous layer.

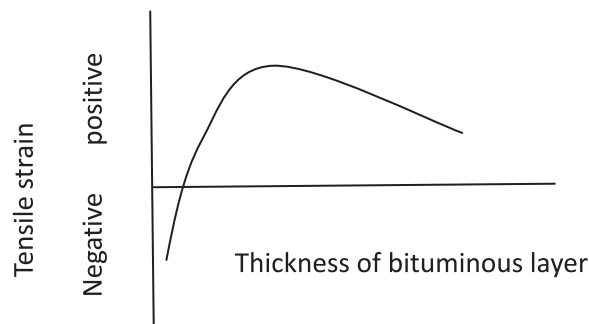


Fig. I-2 Tensile Strain in Thin Bituminous Wearing Course

I-8 Resilient Modulus and Poisson's Ratio of Bituminous Mixes

The Resilient modulus and Poisson's ratio values of bituminous mixes with different binders are given in cl. 7.4. Typical values shown in **Table 7.1** were obtained by repeated bending test as per ASTM D7460-10 (13) under constant strain mode at 10 Hz frequency. The elastic modulus values for bituminous mixes were also obtained by Indirect Tensile strength test method as per ASTM D7369-09 (12) with a loading time of 0.1 seconds and a rest period of 0.9 seconds and modulus values were comparable. These moduli were used in calibration of fatigue equation.

I-9 Temperature of Bituminous Surface for Pavement Design

Fatigue behaviour and resilient modulus of a bituminous material depend upon its temperature and its variation within it. Hourly temperature data for consecutive three years were collected from Indian Meteorological Department for Mumbai, Guwahati, Hyderabad, New Delhi, Chennai and Kharagpur and Average Annual Air Temperatures were computed (54) respectively as 27.10°C, 23.87°C, 26.16°C, 24.53°C, 27.97°C and 28.16°C. A number of correlations have been developed relating Average Monthly Pavement Temperature (AMPT) and Average Monthly Air Temperature (AMAT) (69, 19) as well as Average Annual Pavement Temperature (AAPT) and Average Annual Air Temperature (AAAT) (18).

Equations given by Witczak and Brunton et al. are given as

$$\text{AMPT}(^{\circ}\text{C}) = (1.05 \times \text{AMAT } (^{\circ}\text{C})) + 5.0 \text{ (Witczak)} \quad \dots \text{I-9}$$

$$\text{AMPT}(^{\circ}\text{C}) = (1.15 \times \text{AMAT } (^{\circ}\text{C})) + 3.17 \text{ (Brunton et al.)} \quad \dots \text{I-10}$$

In the absence of any co-ordinated study in India, the AAAT values for different locations in India as mentioned above are substituted in Equations I-9 and I-10 and Average Annual Pavement Temperature comes to about 35°C recognizing that the above equations may not be strictly valid for Indian conditions. Hence resilient modulus of bituminous layer at 35°C has been considered in the guidelines for pavement analysis. This needs updation through a well coordinated pavement performance study in India. High summer temperatures dictate selection of binder for the upper layers. Similar approach can be adopted for temperature of the bituminous layer for pavement design in regions such as Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Arunachal Pradesh.

I-10 Design charts

Based on the fatigue and rutting equations, bituminous pavements can be designed for different subgrade modulus (CBR values). Design is to be optimized considering different options such as availability of aggregates, use of foamed bitumen/bitumen emulsion modified reclaimed asphalt pavements, foamed bitumen/bitumen emulsion modified fresh aggregates, cementitious base and cementitious sub-base. Reclaimed Asphalt Pavements (RAP) contains best quality aggregates and their use in GSB amounts to its under-utilization. The top 40 mm

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to 50 mm of the bituminous layer would suffer damage due to traffic and weathering and it would require renewal from time to time. Hot recycling can be an alternative to conserve the materials. Since every region is unique from the consideration of traffic, cost and availability of materials, engineers have to develop pavement design to suit the region since the IRC-37 guidelines do not constitute a rigid standard, and sound engineering judgment based on local environment and pavement performance in the region is needed in developing a good design. In case of heavy rainfall area, proper internal drainage also should be provided to increase the pavement life. Local experience should be made use of while selecting the pavement layers. A few examples of pavement designs are illustrated for different subgrade modulus values corresponding to CBR of 3 per cent to 15 per cent and design traffic ranging from 2 msa to 150 msa. Examples are also given for (a) a pavement having a design life of 300 msa and (b) a perpetual pavement in the light of international experience. For design traffic less than 2 msa, IRC: SP: 72-2007 (35) would be applicable. City streets should be designed for the minimum design traffic of 2 msa because of frequent heavily loaded construction traffic. Beyond the subgrade CBR of 10 per cent, pavement thickness is affected only marginally. Temperature effect is taken care of by assigning appropriate value of resilient modulus to the bituminous layer depending upon the AAPT. 35°C is the most appropriate AAPT for plains of India (54).

ANNEX-II

Work-out Examples Illustrating the Design Method

(i) Bituminous pavements with untreated granular layer

Example - I: Design the pavement for construction of a new flexible pavement with the following data:

DATA

- (i) Four lane divided carriageway
- (ii) Initial traffic in the year of completion of construction = 5000 CV/day
(Sum of both directions)
- (iii) Percentage of Single, Tandem, and Tridem axles are 45 per cent, 45 per cent and 10 per cent respectively
- (iv) Traffic growth rate per annum = 6.0 per cent
- (v) Design life = 20 years
- (vi) Vehicle damage factor = 5.2
(Based on axle load survey)
- (vii) CBR of soil below the 500 mm of the subgrade = 3 per cent
- (viii) CBR of the 500 mm of the subgrade from borrow pits = 10 per cent

DESIGN CALCULATIONS

- (i) Lane Distribution factor = 0.75
- (ii) Initial traffic = 2500 CVPD assuming 50 per cent in each direction.
- (iii) Vehicle Damage Factor (VDF) computed for the traffic = 5.2.
- (iv) Cumulative number of standard axles to be catered for in the design

$$N = \frac{2500 \times 365 \times ((1 + 0.06)^{20} - 1)}{0.06} \times 0.75 \times 5.2 = 131 \text{ msa}$$

- (v) CBR of the embankment material = 3 per cent, CBR of 500 mm of subgrade = 10 per cent,
Effective CBR of the subgrade from Fig. 5.1 = 7 per cent
Design resilient modulus of the compacted subgrade = $17.6(7)^{0.64} = 62 \text{ MPa}$
- (vi) Thickness of granular layers: WMM = 250 mm, GSB = 230 mm
Resilient modulus of granular layer = $0.2 \times (480)^{0.45} \times 62 = 200 \text{ Mpa}$.

Thickness of proposed Bituminous layer with VG 40 bitumen with bottom DBM layer having air void of 3 per cent (0.5 per cent to 0.6 per cent additional bitumen over OBC) over WMM and GSB = 185 mm at reliability of 90 per cent.

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(The thickness of the bituminous layer as per IRC: 37-2001 = 210 mm at reliability of 80 per cent).

(ii) Bituminous pavement with cemented base and cemented sub-base with aggregate interlayer of 100 mm

Design traffic as above 131 msa.

Bituminous layer with VG 40 (BC + DBM) = 100 mm.

Aggregate interlayer = 100 mm.

Cemented base = 120 mm ((thickness of the cemented base for CBR 5 and 10 are 130 mm and 100 mm respectively).

Cemented sub-base layer for drainage and separation = 250 mm.

The upper 100 mm of the cemented sub-base should be open graded so that its permeability is about 300 mm/day or higher for quick removal of water entering from the surface.

Checking of the safety of cemented base due to spectrum of axle loads resulting in msa of 131.

Since there are plenty of single, tandem and tridem axle loads which are far higher than standard axle load used for pavement design, thickness of cement layer must be checked for sudden fracture of the brittle material like cemented base due to higher axle loads using cumulative damage principle. One tandem axle is taken as two single axles and one tridem axle is taken as three axles carrying equal weight since the interference of stresses at the cemented base are little due to axle loads being about 1.30 m to 1.40 m apart. All multiple axle vehicles are combination of single, tandem and tridem axles. The axle load data can be classified or grouped in such a manner that all tandem and tridem axles can be converted into single axle repetition for stress analysis The axle load spectrum of the traffic data is as follows.

Single Axle Loads		Tandem Axle Loads		Tridem Axle Loads	
Axle Load Class (kN)	Percentage of Axles	Axle Load Class (kN)	Percentage of Axles	Axle Load Class (kN)	Percentage of Axles
185-195	0.64	390-410	1.85	585-615	1.4
175-185	0.8	370-390	2.03	555-585	1.6
165-175	0.8	350-370	2.03	525-555	1.60
155-165	2.58	330-350	2.08	495-525	1.80
145-155	2.58	310-330	2.08	465-495	1.80
135-145	5.8	290-310	4.17	435-465	4.4
125-135	5.8	270-290	4.17	405-435	4.4

Single Axle Loads		Tandem Axle Loads		Tridem Axle Loads	
Axle Load Class (kN)	Percentage of Axles	Axle Load Class (kN)	Percentage of Axles	Axle Load Class (kN)	Percentage of Axles
115-125	11.82	250-270	12.67	375-405	13.10
105-115	11.82	230-250	12.67	345-375	13.10
95-105	12.9	210-230	10.45	315-345	10.90
85-95	12.16	190-210	10.45	285-315	10.4
<85	32.3	170-190	7.05	255-285	7.15
		<170	28.28	<255	28.33
Total	100	Total	100	Total	100

Cummulative fatigue damage analysis is computed as follows for Single, Tandem and Tridem Axle respectively considering flexural strength of cemented base as 1.4 MPa.

Cummulative fatigue damage analysis for Single Axle

Modulus of Rupture of the cementitious base = 1.4 MPa

Axle Load in kN	Expected Repitations	Stress in MPa	Stress Ratio	Fatigue Life	Fatigue life consumed
190	72504	0.70	0.50	5.37E + 05	0.14
180	90631	0.66	0.47	1.12E + 06	0.08
170	90631	0.63	0.45	2.33E + 06	0.04
160	292283	0.59	0.42	4.85E + 06	0.06
150	292283	0.55	0.39	1.01E + 07	0.03
140	657071	0.52	0.37	2.10E + 07	0.03
130	657071	0.48	0.34	4.38E + 07	0.02
120	1339066	0.44	0.32	9.11E + 07	0.01
110	1339066	0.40	0.29	1.90E + 08	0.01
100	1461417	0.37	0.26	3.95E + 08	0.00
90	1377584	0.33	0.24	8.22E + 08	0.00
85	3659206	0.31	0.22	1.19E + 09	0.00
		cumm. Damage			0.42

Cummulative fatigue damage analysis for Tandem Axle**Modulus of Rupture of the cementitious base = 1.4 MPa**

Axle Load in kN	Expected Repitations	Stress in MPa	Stress Ratio	Fatigue Life	Fatigue life consumed
400	419166	0.74	0.53	2.58E + 05	1.626
380	459950	0.70	0.50	5.37E + 05	0.857
360	459950	0.66	0.47	1.12E + 06	0.411
340	471279	0.63	0.45	2.33E + 06	0.202
320	471279	0.59	0.42	4.85E + 06	0.097
300	944823	0.55	0.39	1.01E + 07	0.094
280	944823	0.52	0.37	2.10E + 07	0.045
260	2870721	0.48	0.34	4.38E + 07	0.066
240	2870721	0.44	0.32	9.11E + 07	0.032
220	2367722	0.40	0.29	1.90E + 08	0.012
200	2367722	0.37	0.26	3.95E + 08	0.006
180	1597363	0.33	0.24	8.22E + 08	0.002
170	6407576	0.31	0.22	1.19E + 09	0.005
cumm. Damage					3.46

Cummulative fatigue damage analysis for Tridem Axle**Modulus of Rupture of the cementitious base = 1.4 MPa**

Axle Load in kN	Expected Repitations	Stress in MPa	Stress Ratio	Fatigue Life	Fatigue life consumed
600	105736	0.74	0.53	2.58E+05	0.410
570	120841	0.70	0.50	5.37E+05	0.225
540	120841	0.66	0.47	1.12E+06	0.108
510	135946	0.63	0.45	2.33E+06	0.058
480	135946	0.59	0.42	4.85E+06	0.028

Axle Load in kN	Expected Repitations	Stress in MPa	Stress Ratio	Fatigue Life	Fatigue life consumed
450	332312	0.55	0.39	1.01E+07	0.033
420	332312	0.52	0.37	2.10E+07	0.016
390	989383	0.48	0.34	4.38E+07	0.023
360	989383	0.44	0.32	9.11E+07	0.011
330	823227	0.40	0.29	1.90E+08	0.004
300	785464	0.37	0.26	3.95E+08	0.002
270	540007	0.33	0.24	8.22E+08	0.001
255	2139635	0.31	0.22	1.19E+09	0.002
		cumm. Damage			0.92

It can be seen that total fatigue damage is greater than 1. Hence the pavement is unsafe and cemented layer will crack prematurely. It can also be noticed that the Tandem axle weighing 400 kN causes maximum fatigue damage followed by Tandem axle of 380 kN. It can also be seen that stress variation is linear due to linear stress analysis. If the load is halved, stress also is halved.

One Tandem axle is considered as 2 Single axles and One Tridem axle as 3 Single axles sharing the total load equally since there is no superposition of stresses in cemented layer as per the computation.

If the heavy axle loads are not allowed, the pavement would be safe. If the cemented layer thickness is increased from 120 mm to 160 mm Cumulative Fatigue Damage (CFD) is computed as 0.92 and for 165 mm CFD is 0.89 cumulative fatigue damage is and hence the pavement is safe. If the modulus of rupture is 1.20 MPa, a thickness of 220 mm is needed. Such checks are to be made on cemented layer because of heavy loading over the highways in India.

(lii) Bituminous Pavement with Cemented Base and Cemented Sub-base with Sami Layer Over Cemented Base

Design traffic = 131 msa.

Bituminous layer with VG 40 (BC + DBM) = 100 mm.

Cemented base = 165 mm estimated from the plates 14 and 15 for cumulative fatigue damage analysis

Cemented sub-base layer for drainage and separation = 250 m.

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Checks must be done for cumulative fatigue damage as explained in the previous example.

The upper 100 mm of the cemented sub-base should be open graded so that its permeability is about 300 mm/day or higher for quick removal of water entering from the surface in high rainfall area.

(iv) Bituminous Pavement with Base of Fresh Aggregates or Reclaimed Asphalt Pavement (RAP) Treated with Foamed Bitumen/Bitumen Emulsion and Cemented Sub-base

Design traffic = 131 msa.

Bituminous layer with VG 40 (BC + DBM) = 100 mm.

Treated aggregates RAP = 180 mm estimated from plates 18 and 19 and design is found to be safe from strain consideration.

Cemented sub-base layer for drainage and separation = 250 mm.

(V) Bituminous Pavement with Cemented Base and Granular Sub-base with 100 mm WMM Layer Over Cemented Base

Design traffic = 131msa

BC (VG 40) = 50 mm, DBM (VG 40) = 50 mm, WMM = 100 mm, cemented base = 195 mm estimated from plates 22 and 23 for fatigue damage analysis, GSB = 250 mm.

The upper 100 mm of the cemented/granular sub-base should be open graded so that its permeability is about 300 mm/day or higher for quick removal of water entering from the surface.

Design of Flexible Pavement for 300 msa of Traffic

Many highways have heavy volume of traffic and the design traffic at the end of concession period can be as high as 300 msa. If the pavement design and mix design are integrated, only the top wearing course of 40 mm to 50 mm suffer damaged by the traffic and aging. Low life cycle cost may justify use of thicker bituminous layer in which only the top 40 mm to 50 mm is milled and replaced with a fresh bituminous wearing course or a hot in-situ recycled mix to remove the cracked and deformed spots and restore the riding quality. The design has to be done for 90 per cent reliability to eliminate frequent interruption for repair.

Assumed Design Parameters

Resilient modulus of subgrade = 75 MPa (corresponding to Effective subgrade CBR of 10 per cent).

Thickness of Granular Sub-base = 350 mm for separation and drainage

Lower 200 mm of GSB is close graded (MoRTH) to act as separation layer and the top 150 mm GSB is an open graded granular material treated with 1.5 to 2 per cent bitumen emulsion to have a permeability of 300 m/day or higher to act as a drainage layer. Its Los Angeles's abrasion value must be less than 40 to avoid crushing during rolling.

Bituminous layer must be bottom rich, that is, the bottom layer should have an air-void of 3 per cent after the compaction by traffic. This is achieved by having additional bitumen of 0.5 per cent to 0.6 per cent higher than the optimum bitumen content. This can be established from the laboratory tests and a field trial. The bitumen should be of grade VG-40 for the plains in India to control rutting, where temperatures are much higher. In case of non-availability of VG 40 bitumen, PMB/CRMB has to be used to obtain rut resistant mixes.

Resilient Modulus of Bituminous layer = 3000 MPa (As per IRC: 37)

Thickness of the Pavement is Worked out as:

Thickness of the bituminous layer = 225 mm.

Thickness of Granular Sub-base = 350 mm.

Strains in different layers for a design traffic of 300 msa,

Allowable tensile strain in the bitumen rich bottom bituminous layer = $131 \mu\epsilon$

(Computed maximum tensile strain = $125 \mu\epsilon$).

Allowable vertical subgrade strain = $250 \mu\epsilon$. (Computed maximum vertical subgrade strain = $239 \mu\epsilon$).

Perpetual Pavements

The pavements which have a life of 50 years or longer are termed as perpetual pavements. If the tensile strain caused by the traffic in the bituminous layer is less than 70 micro strains, the endurance limit of the material, the bituminous layer never cracks (Asphalt Institute, MS-4, 7th edition 2007). Similarly if vertical subgrade strain is less than 200 microstrain, rutting in subgrade will be negligible (**Fig. I-1**). Design of such a pavement is illustrated in the guideline.

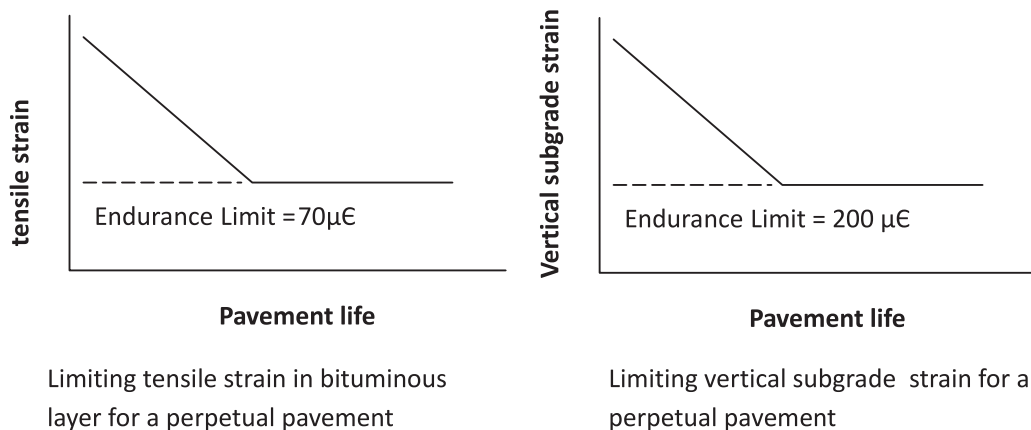


Fig. I-1 Limiting Design Strain for a Perpetual Pavement

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Design Example of Perpetual Pavement

Allowable subgrade strain = 200 $\mu\epsilon$.

Allowable tensile strain in the bituminous layer = 70 $\mu\epsilon$.

Modulus of the Bituminous layer = 3000 MPa (VG 40 Bitumen).

Elastic Modulus of subgrade = 60 MPa (corresponding to CBR of 7 per cent).

Granular Drainage and Separation layer = 200 mm.

Modulus of drainage layer = 130 MPa.

Thickness of the Bituminous layer to meet the above requirement = 380 mm.

The computed strain in the bituminous layer is 68 $\mu\epsilon$ and the vertical subgrade strain is obtained as 168 $\mu\epsilon$. (The analysis is done by IITPAVE software).

ANNEX-III

Equivalence of Thickness of Bituminous Mixes of Different Moduli

Two elastic layers are approximately of equal flexural stiffness if their moduli, poisson's ratios and thickness are related as

$$E_1 H_1^3 / 12(1 - \mu_1^2) = E_2 H_2^3 / 12(1 - \mu_2^2) \quad \dots \text{III-1}$$

Where,

E_1 , H_1 , μ_1 , and E_2 , H_2 , μ_2 are the Elastic Modulus, Thickness and Poisson's Ratio of the two mixes. Different layers can be combined into less number of layers for computation if necessary.

Example Convert 180 mm of DBM with VG 30 into that with VG 40

180 mm DBM with VG 30

$$180 \times (1700/3000)^{0.333} = 150 \text{ mm DBM with VG 40 bitumen}$$

Though bending behaviour may be comparable, rutting in the bituminous layer will be reduced with stiffer bitumen. Analysis indicates that rutting of mixes with VG 40 bitumen is half of that with VG 30 bitumen.

ANNEX-IV

Preparation of Laboratory Test Specimens for CBR Test and Selection of Subgrade CBR for Pavement Design

Sample Preparation

1. Wherever possible, the test specimens should be prepared by static compaction, but if not possible, dynamic method may be used as an alternative.

Static Compaction

2. The weight of wet soil at the required moisture content to give the intended density when occupying the standard test mould is calculated as follows:

Volume of mould = 2209 cc

Weight of dry soil = 2209 d gm

Weight of the Wet Soil = $\frac{(100 + m)}{100} \times 2209 \text{ d gm}$

Where,

d = Required dry density in gm/cc

m = Required moisture content in per cent.

3. The soil lumps are broken down and stones larger than 20 mm are removed. Sufficient quantity of the soil is mixed with water to give the required moisture content. The correct weight of wet soil is placed in the mould. After initial tamping with a steel rod, a filter paper is placed on top of the soil, followed by the 50mm displacer disc, and the specimen compressed in the compression machine until the top of the displacer is flush with the top of the collar. The load is held for about 30 seconds and then released. In some soil types where a certain amount of rebound occurs, it may be necessary to reapply load to force the displacer disc slightly below the top of the mould so that on rebound the right volume is obtained.

Dynamic Compaction

4. The soil is mixed with water to give the required moisture content, and then compacted into the mould in three layers using a standard soil rammer. After compaction, the soil is trimmed flush with the top of the mould with the help of a metal straight edge. The mould is weighed full and empty to enable determination of wet bulk density, and from it, knowing the moisture content, the dry density is calculated.
5. Further specimens, at the same moisture content, are then prepared to different dry densities by varying the number of blows applied to each layer of soil so that the amount of compaction that will fill the mould uniformly with calculated weight of wet soil (vide para 2 above) is known.

Selection of Subgrade CBR for Pavement Design

The CBR values of the subgrade soil varies along a highway alignment even on a homogeneous section. 90 percentile CBR is recommended in the guidelines. Method of determination of the 90th percentile is given below The following example illustrates the procedure for finding the design.

16 CBR values for a highway alignment are as follows:

3.5, 5.2, 8.0, 6.8, 8.8, 4.2, 6.4, 4.6, 9.0, 5.7, 8.4, 8.2, 7.3, 8.6, 8.9, 7.6

Arrange the above 16 values in ascending order

3.5, 4.2, 4.6, 5.2, 5.7, 6.4, 6.8, 7.3, 7.6, 8.0, 8.2, 8.4, 8.6, 8.8, 8.9, 9.0

Now calculate the percentage greater than equal to each of the values as follows:

For CBR of 3.5, percentage of values greater than equal to 3.5 = $(16/16) * 100 = 100$

For CBR of 4.2, percentage of values greater than equal to 4.2 = $(15/16) * 100 = 93.75$ and so on.

Now a plot is made between percentages of values greater than equal and the CBR values versus the CBR as follows.

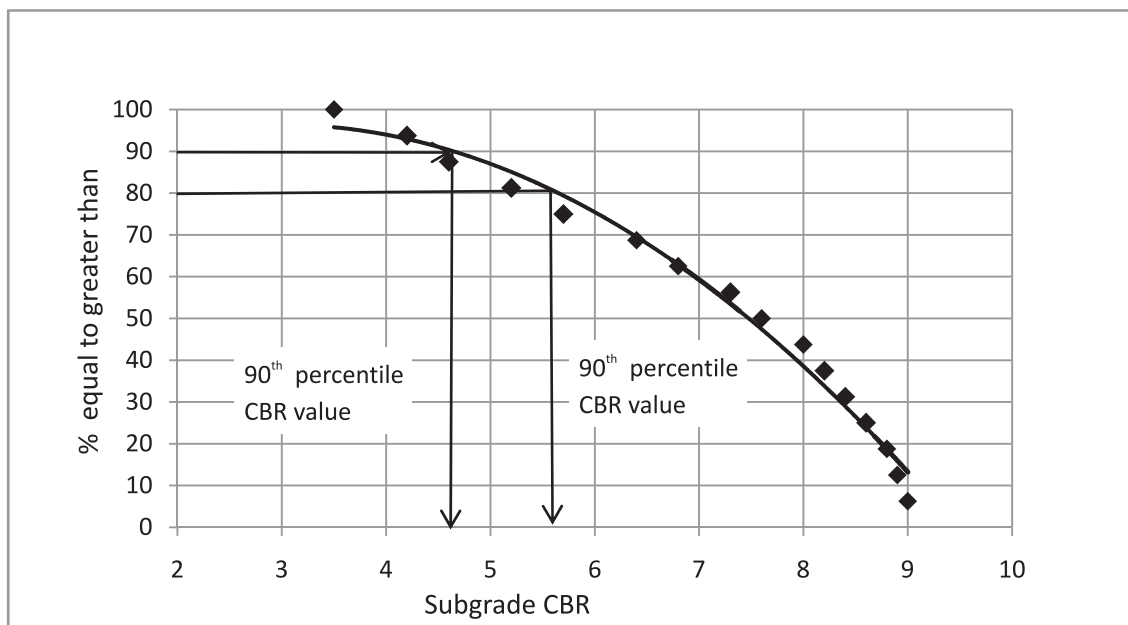


Fig. IV.1 Evaluation of Subgrade CBR for Pavement Design

The 90th percentile CBR value = 4.7, and 80th percentile CBR = 5.7 in. Asphalt Institute of USA (6) recommends 87.5 percentile subgrade modulus for design traffic greater than one msa.

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NOTE: If the data is very large, the CBR values can be grouped for homogenous sections and the same procedure followed.

Special Points Relating to Design of Pavement on Expansive Soils

Potentially expansive soils, such as, black cotton soils are montmorillonite clays and are characterized by their extreme hardness and deep cracks when dry and with tendency for heaving during the process of wetting. Roadbeds made up of such soils when subjected to changes in moisture content due to seasonal wetting and drying or due to any other reason undergo volumetric changes leading to pavement distortion, cracking and general unevenness. In semi-arid climatic conditions, pronounced short wet and long dry conditions occur, which aggravate the problem of swelling and shrinkage. Due recognition of these problems at the design stage itself is required so that counter measures could be devised and incorporated in the pavement structure. A proper design incorporating the following measures may considerably minimize the problems associated with expansive soils.

The amount of volume change that occurs when an expansive soil road bed is exposed to additional moisture depends on the following:

- (a) The dry density of the compacted soil.
- (b) The moisture content.
- (c) Structure of soil and method of compaction.

Expansive soils swell very little when compacted at low densities and high moisture but swell greatly when compacted at high densities and low moisture. Hence, where the probability of moisture variation in the subgrade is high, it is expedient to compact the soil slightly wet of the field optimum moisture content (+2 per cent) determined on the basis of a field trial. Experience shows that generally, it is not practicable to compact expansive soils at OMC determined by Laboratory Proctor Test. It is, therefore, necessary to study its field moisture density relationship through compacting the soil at different moisture contents and under the same number of roller passes. A minimum density corresponding to 95 per cent of the standard proctor density should be attained in the field and recommended moisture content should be. 1-2 per cent wet of optimum moisture content.

Buffer Layer

There is a definite gain in placing the pavement on a non-expansive impermeable soil cushion of 0.6-1.0 m thickness. It prevents ingress of water in the underlying expansive soil layer, counteracts swelling and secondly even if the underlying expansive soil heaves, the movement will be more uniform and consequently more tolerable. However, where provision of non-expansive buffer layer is not economically feasible, a blanket course of suitable impermeable material and thickness as discussed below must be provided.

Blanket Course

An impermeable blanket course of at least 225 mm thickness and composed of coarse/medium sand or non-plastic moorum having PI less than five should be provided on the expansive soil subgrade as a sub-base to serve as an effective intrusion barrier. It must have very low permeability. The blanket course should extend over the entire formation width.

Alternatively, lime-stabilized black cotton sub-base extending over the entire formation width may be provided together with measures for efficient drainage of the pavement section.

ANNEX-V

Drainage Layer

Improvement of drainage can significantly reduce the magnitude of seasonal heave. Special attention should, therefore, be given to provision of good drainage measures. The desirable requirements are:

- a. Provision must be made for the lateral drainage of the pavement structural section. The granular sub-base/base should accordingly be extended across the shoulders
- b. No standing water should be allowed on either side of the road embankment.
- c. A minimum height of 1 m (or 0.6 m in case of existing road having no history of being overtopped) between the subgrade level and the highest water level should be ensured.

Example of Design of a Drainage Layer

Design a granular drainage layer for a four lane heavy duty divided highway for an annual precipitation of 1200 mm. Longitudinal slope = 3 per cent, Camber = 2.5 per cent.

Crack Infiltration Method

Water travels along AD (Fig. V-1) due to camber and the longitudinal slope

Depth of drainage layer = 450 mm (Assuming BT = 200 mm and WMM = 250 mm)

Width of the drainage layer (one side of the median only)

$$= 8.5 \text{ m} + 1.0 \text{ m} + 2 \times 0.45 = 10.4 \text{ m}$$

with 1.0 m wide unpaved shoulder

Fig. V-1, AB = 10.4 m, AC = $10.4 \times 0.03 / 0.025 = 12.48 \text{ m}$.

$$AD = (10.4^2 + 12.48^2)^{0.5} = 16.24 \text{ m}$$

$$\text{Elevation drop along AC} = 12.48 \times 0.03 = 0.374 \text{ m}$$

$$\text{Elevation drop along CD} = 10.4 \times 0.025 = 0.26 \text{ m}$$

$$\text{Total drop along AD} = 0.634 \text{ m.}$$

$$\text{Hydraulic gradient} = (\text{Elevation drop}) / \text{length} = I = 0.634 / 16.24 = 0.039$$

$$q_i = I_c [N_c / W_p + W_c / (W_p C_s)]$$

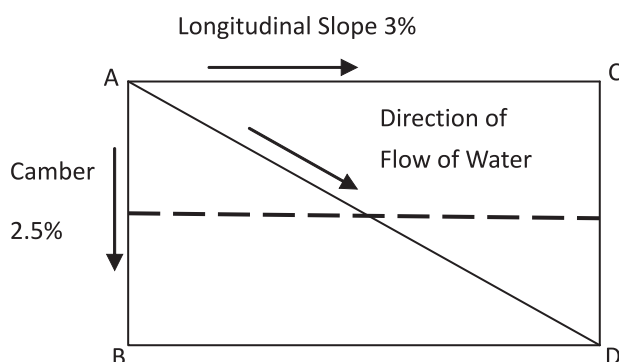


Fig. V-1 Direction of Flow of Water

$I_c = 0.223 \text{ m}^3/\text{day}/\text{m}$, N_c (centre line and two edges) = 3, W_p (paved width + shoulder) = 10.4 m, W_c (crack width) = W_p , C_s (assumed intervals of transverse cracks) = 12 m for flexible pavement

$$q_i = 0.083 \text{ m}^3/\text{day}/\text{m}^2.$$

Amount of water infiltration in pavement per metre width along the flow path AD

$$= 0.083 \times 1 \times 16.24 = 1.35 \text{ m}^3/\text{day} = Q$$

$$\text{Gradient} = 0.039$$

$Q = KAI$, $KA = 1.35/0.039 = 34.62$, where A = Area of Cross Section = Thickness of drainage Layer, m x 1.0 m, K = coefficient of Permeability, m/day,

If depth of drainage layer is 100 mm

$A = 1 \times 0.1 = 0.1 \text{ m}^2$, $K = 34.62/0.1 = 346.62 \text{ m/day}$ If the thickness of drainage layer is doubled, the permeability requirement is half.

For major highways in which thick bituminous layer are provided, very little water can enter in the initial period of four to five years due to absence of cracking. Rain water may however enter through the pervious median if not designed properly. The AASHTO 93 gradation of the drainage layer is given below for guidance.

Table V-1 Permeability of Untreated Graded Aggregates as per AASHTO (1993)

Per cent Passing Sieve Opening, mm	Grading 1	Grading 2	Grading 3	Grading 4	Grading 5	Grading 6
20	100	100	100	100	100	100
12.5	85	84	83	81.5	79.5	75
9.5	77.5	76	74	72.5	69.5	63
4.76	58.3	56	52.5	49	43.5	32
2.36	42.5	39	34	29.5	22	5.8
2.00	39	35	30	25	17	0
0.84	26.5	22	15.5	9.8	0	0
0.42	18.2	13.3	6.3	0	0	0
0.25	13.0	7.5	0	0	0	0
0.105	6.0	0	0	0	0	0
0.075	0	0	0	0	0	0
Coeff. of permeability m/day	3	35	100	350	850	950

ANNEX-VI

Recommendation for Bituminous Wearing Courses for Flexible Pavements

VI-1: India is a large country with vastly different climate in different areas and regional agencies have developed specifications suited to the local conditions. In wet climate, the wearing course has to be impermeable to prevent entry of water to lower layers.

VI-2: It is the long duration low intensity rainfall that damages the road rather than a low duration heavy downpour which drains away fast. High annual rainfall is not always the indicator of the wet weather damage though extensive damage may occur by water ponding. Even areas having rainfall less than 1000 mm suffer extensive damage during the rain when the bituminous surface is porous, and surface and sub-surface drainage does not drain away the water fast.

VI-3: Pavements with granular bases and sub-bases having a design traffic of 5 msa or higher have a minimum thickness of 50 mm of DBM with a good quality wearing course of SDBC or BC. Properly designed mixes of DBM and SDBC/BC having an air void content of about 4 per cent after the compaction by traffic are practically impermeable. They are expected to prevent entry of water into the lower layers even in high rainfall area if shoulders are protected and lateral entry of water from high ground is prevented. All care is to be taken to see that raveling is avoided by ensuring good bond between aggregates and bitumen by using lime or anti-stripping compound particularly in wet area.

VI-4: The wearing course of premix carpet and seal coat has given mixed performance in built up area because of poor drainage while it has performed reasonably well on well drained roads in rural area having a rainfall around 1500 mm. Applying seal coat is a manual operation and has to be done very carefully for proper sealing. Mixed Seal surfacing is the preferred alternative by most field engineers in Eastern India having a heavier rainfall because of better sealing property.

VI-5: Roads in high rainfall area are expected to have adequate provision for subsurface drainage as laid down in the guidelines so that the bituminous wearing course is not damaged due to stored water in the lower layers.

VI-6: Thickness charts in the guidelines with BC and SDBC wearing courses are valid for all rainfall area

VI-7: Two coat surface dressing has been used with success in South Africa (22) with traffic up to 5 msa even in wet region. The bitumen film in surfacing dressing is thick and makes the pavement completely impervious to ingress of water. Thick film does not undergo fatigue cracking also. In wet area such as North-East where clear days are fewer, bitumen emulsion can be used since the aggregates need not be dry and even windy conditions will help in evaporation of water from the emulsion and necessary bond is created among the aggregates used in the surface dressing.

VI-8: Bituminous wearing course laid over Water Bound Macadam (WBM) has performed very well in South Africa. WBM bases consist of a coarse single-sized aggregates together with fines added during the construction to fill the voids. Such bases are recommended by South Africa (66) for pavements carrying heavy traffic under wet weather condition. Tests in South Africa by Heavy Vehicle Simulator (48) found that WBM resists deformation better than the crushed stone base courses even under wet condition because of interlocking of larger aggregate size of WBM. The work is labour intensive, but it can be one of the options in areas where there is serious problem with construction equipment.

ANNEX-VII

Selection of Grade of Binders and Mixes for Bituminous Courses

VII-1 IRC: 111-2009 (29) recommends VG-40 bitumen if commercial vehicle exceeds 2000 per lane per day. Mix design, selection of grade of bitumen, gradation of aggregates and traffic loading are interrelated as explained in the guidelines. Local experience is the best guide.

VII-2 The British practice (23) is to use high modulus bases having bitumen of 50 penetration which allows 10-15 per cent reduction in thickness for equivalent performance or an extended life for the same thickness. It is to be noted that the summer temperatures are much lower in UK and other European countries where harder grade of bitumen (15, 25, 35 penetration) also is used in bases for very heavily trafficked highways. The filler content in DBM in UK (grading is same as that of IRC: 111-2009) (29) is increased from 2-9 per cent to 7-11 per cent in high modulus mixes and the resulting high modulus mix is designated as Heavy-duty Macadam (HDM). Higher filler content stiffens the HDM mix increasing its load spreading capacity.

VII-3 SUPERPAVE Mix design recommends binder which is one grade higher than required from temperature consideration for heavy traffic. For signalized intersection, two grades higher binder is recommended. If the most suitable binder is VG30 for 450 to 1500 CVPD, VG 40 should be selected for higher volume of commercial vehicles. For areas on intersection and traffic signals, mixes like SMA and those with VG 40/polymer or crumb rubber modified bitumen would be suitable.

VII-4 Research Scheme R-55 of MORTH (55), Use of Rubber and Polymer Modified Bitumen in Bituminous Road Construction) by Central Road Research Institute indicates that wearing course of polymer and rubber modified bituminous mixes have longer lives and the intervals of resurfacing can be increased by two to three years than the bituminous mixes with normal bitumen. This could result in savings though initial cost may be marginally higher. The layer of DBM below the wearing course should have stiffer binder such as VG 40 for highway of heavy traffic where air temperature may be 40°C or higher in summer.

Table VII-1 Selection of Binder for Bituminous Mixes

Maximum Average air Temperature °C	Traffic (CVD)	Bituminous Course	Grade of Bitumen to be used
≤ 30°C	≤ 1500 commercial vehicles per day	BM, DBM and BC	VG 10/VG20
< 40°C	For all types of traffic	BM, DBM, SDBC and BC	VG 30
≥ 40°C	Heavy Loads, Expressways msa>30msa	DBM, SDBC, BC	VG 40 bitumen for wearing course as well as binder course, Modified bitumen may be used for the wearing course

ANNEX-VIII

Resilient Modulus of Granular Materials

The guidelines for the resilient modulus of granular materials over subgrade recommend use of widely used Shell's equation given by Equation 7.1, which somewhat gives a conservative value. There is now increasing trend of using a more scientific approach for determination of resilient modulus, MR_{gram} , by triaxial test since it is dependent upon the sum of the principal stresses as well as the octahedral stress as given below (14).

$$MR_{\text{gram}} = K_1 \times \left[\frac{\theta}{\rho} \right]^{K_2} \times \left[\frac{\tau_{\text{oct}}}{\rho} + 1 \right]^{K_3} \quad \dots \text{VIII-1}$$

θ = sum of the principal stresses

$$\tau_{\text{oct}} = \text{Octahedral stresses} = \frac{1}{\sqrt{2}} \left(\sqrt{(\sigma_1 - \sigma_2)^2 + (\sigma_2 - \sigma_3)^2 + (\sigma_3 - \sigma_1)^2} \right) \quad \dots \text{VIII-2}$$

σ_1 , σ_2 and σ_3 are the principal stresses in the granular layer

ρ = atmospheric pressure = 100 kPa, K_1 , K_2 and K_3 are experimental test constant. The constants of Equation VII-1 are to be evaluated from repeated triaxial test as per the AASHTO – T307-99. The default values of the constants k_1 , k_2 and k_3 may be taken as 300, 1.05 and -0.4 respectively (14) for crushed rocks meeting the gradation of Wet Mix Macadam as per MORTH specifications. A typical modulus value of 450 MPa over a cemented base may be taken for design. The suggested modulus of different types of granular layers over uncracked cemented layer is given in **Table-VIII-1(65)**.

Table: VIII-1 Recommended Values of Resilient/Elastic Modulus of Aggregate Interlayer (48) Over Uncracked Cemented Layer

S. No	Material Description	Modulus Over uncracked cemented layer (MPa)	Recommended modulus (MPa)	Poisson's ratio	Remarks
1	High quality graded crushed rock (WMM)	250-1000	450	0.35	Stresses in pavement not very sensitive to minor variation Poisson ratio
2	Graded Crushed stone and soil binder; fines PI < 6	200-800	350	0.35	
3	Natural gravel; PI < 6, CBR > 80 Fines PI<6	100-600	300	0.35	

ANNEX-IX

Reclaimed Asphalt Pavement and Mix Design

Recycling of Reclaimed Asphalt Pavements (RAP) is required to be used for technical, economical, and environmental reasons. Use of RAP has been favoured all over the world over virgin materials in the light of the increasing cost of bitumen, the scarcity of quality aggregates, and the pressing need to preserve the environment. The use of RAP also decreases the amount of waste produced and helps to resolve the disposal problems of highway construction materials. Reclaimed Asphalt Pavements contain best quality aggregates and they can be effectively improved with foamed asphalt/bitumen emulsion along with fresh aggregates and crusher dust to impart necessary strength for a durable pavements. If only the surface layer is weathered or damaged, hot recycling can be an attractive proposition.

Several recycling techniques, such as hot mix plant recycling, hot in-place recycling, cold mix plant recycling, cold in-place recycling, and full depth reclamation, have evolved over the past 35 years. In-place recycling not only reduces the use of new materials but also reduces emissions, traffic, and energy associated with the transport and production of these materials.

Hot Mix Recycling is the most common method of recycling asphalt pavements in developed countries. It involves combining RAP with new or “virgin” aggregate, new asphalt binder, and recycling agents in a central hot mix plant to produce a recycled mix. The amount of RAP allowed in a recycled mix and guidelines as to where the recycled mix can be used in the pavement structure varies from agencies to agencies. Some routinely allow 15 per cent or less RAP while others permit larger amounts of RAP. Higher RAP concentrations require adjustments in mix design and binder selection. Agency’s recommendations and international guidelines such as those given by Asphalt Institutes may be used in different trials because of lack of experience in India.

Cold Mix Recycling is a method of recycling where RAP, new aggregate (if needed), and emulsified bitumen or foamed bitumen without the need for heat are mixed in a centrally located cold mix plant. Many old road alignment having thick bituminous layers are being abandoned in four and six laning projects and the entire RAP and aggregates can be salvaged by milling machine and reused in new construction. Even cement treated aggregates have been milled and reused in South Africa and China. Since the components of a cold mix plant are fairly portable, it can be assembled in satellite locations close to a project site. Cold recycled mix is hauled to the job site with conventional dump trucks or belly dump trucks. Placement and compaction of cold recycled mixes are done with the same conventional pavers and rollers used for hot mix asphalt construction. Cold recycled mixes are normally overlaid with hot mix asphalt or surface dressing (chip seal) depending on the anticipated traffic level for the finished pavement.

Cold recycling (21) also involves rehabilitation of the existing asphalt or granular road surface. The existing surface is pulverized and the material is mixed on the site with foamed bitumen or Bitumen emulsion. The process of in-situ recycling of distressed pavement using cold-mix technology is referred to as cold in-place recycling (CIPR). CIPR thus is a pavement rehabilitation measure that typically consists of the following operations, Often all are carried out in one -pass of a recycling machine and badly distressed pavement is transformed into a stronger nice looking pavement

1. Milling the existing pavement layers upto a depth of 300 mm;
2. Treatment with bitumen emulsion or foamed bitumen, often in combination with addition of crusher dust, fresh aggregates if required, and a small percentage of active filler such as cement;
3. Adding compaction water; and
4. Repaving the mix.
5. Compaction

In a CIPR process as described above, the top bituminous layer (Reclaimed asphalt pavement) as well as a part or whole of the granular or stabilised base layer are recycled. The residual binder content added to the mineral aggregates in the process of CIPR is generally lower (<4 per cent) in comparison to hot bituminous mixtures. The recycled product is not used as final surfacing layer but used as base or sub-base layer. CIPR is an attractive alternative for highway rehabilitation operations because of its economic and environmental advantages. Major economic advantages involve the recycling of existing road surface aggregates and reduced haul requirements for incorporating new aggregates. In India, there are many regions where aggregates resources are limited or will be depleted in the near future. Aggregate haul in these regions is quite expensive. By recycling existing in-place road materials and providing additional strength with mixing of different emulsions or strengthening agents, new aggregates and bitumen requirements are reduced. In addition, impacts on adjacent haul roads are minimized or eliminated because of reduced new aggregate requirements. A major environmental advantage involved in the use of cold in-place recycling is that there is no requirement for heat during construction work. CIPR is an energy efficient process that does not produce harmful emissions and does not require the bituminous mixtures to be transported to an off-site plant. In addition, transportation of large amounts of aggregate are reduced and hence it is fuel efficient also.

Design for Bitumen Emulsion RAP Mixes

Gradations of Aggregates

The aggregates from RAP may not have the required gradation for a good mix. RAP alone has poor internal friction and its CBR may be as low as 30 though a fresh close graded aggregates may have CBR as high as 200. Addition of crusher dust containing particle size from 6 mm to 0.075 mm and fines passing 0.075 mm adds to angle of internal friction as

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well as some cohesion to the RAP mixes. The crusher dust requirement can be 15 to 30 per cent and 1 per cent cement or lime or both by weight of dry aggregates helps in dispersion of the bitumen emulsion in the mix. Lime modifies the clay that may have contaminated the RAP. RAP may need re-crushing if they have lumped up during storage. If milled aggregates are from those of Bituminous Macadam, it may be open graded and some additional fresh aggregates may be necessary for the adjustment of gradation. The grading of the blend of RAP/fresh aggregates and crusher dust should meet the requirement shown in Table IX-1 adopted from the South African Standard 'TG2 (64) CSIR Built Environment, Pretoria. The grading has been slightly adjusted to correspond to the sieve size designation in MORTH.

Table IX-1 Gradation of RAP Mixes

Sieve size,mm	per cent passing
45	100
37.5	87-100
26.6	77-100
19	66-99
13.2	67-87
4.74	33-50
2.36	25-47
0.60	12-27
0.3	8-21
0.075	2-9

Some RAP may be contaminated with clay which might have risen from the subgrade during the wet weather. Addition of 2 per cent lime would modify the clay and the mix becomes suitable for use.

Bitumen Emulsion Type

Since the blend of RAP and crusher dust consists of plenty of fine particles, only slow setting emulsion (SS2) with minimum residual bitumen content of 60 per cent is recommended to prevent the emulsion from breaking during the mixing and construction.

Determination of Optimum Fluid Content

A RAP bitumen emulsion mix can be compacted to maximum density only at optimum fluid content. Compaction tests are to be done at different fluid content to arrive at the optimum fluid content. Procedures given in Manual 14 'The design and Use of Granular Emulsion Mixes' Published by South African Bitumen and Tar association (SABITA) (7) and TG-2 of

South Africa (64) have been suggested for mix design. Users may adopt other methods of mix design given in 'Cold Mix Recycling' and 'Asphalt cold Mix Manual (MS-14)' Published by Asphalt Institute, USA.

Step 1 Prepare a 50:50 blend of bitumen emulsion and water by volume. Water is added to bitumen emulsion and not the emulsion to water for dilution to prevent premature breaking. Compatibility for dilution may be checked.

Step 2 Actual water content of the blend of RAP, crusher dust and filler may be determined by oven drying and fluid increment of 1 per cent by weight of the blend may be added and thoroughly mixed. The mix is transferred to a standard 100mm diameter Marshall mould and compacted by 75 blows on each face at ambient temperature. A minimum of three samples are cast at each fluid content.

Step 3 Dry density should be computed at each fluid content as per the following

$$D_{dd} = \frac{D_{bulk}}{1 + FC} \quad \dots IX-1$$

Where D_{dd} = Dry density in kg/m^3 , D_{bulk} = Bulk density in kg/m^2 , FC = Fluid content by dry weight of aggregates in decimal.

A plot is made for dry density vs. fluid content as shown below and maximum dry density and the corresponding optimum fluid content is determined. Optimum fluid content is necessary for the compaction of the RAP mixes to the maximum density.

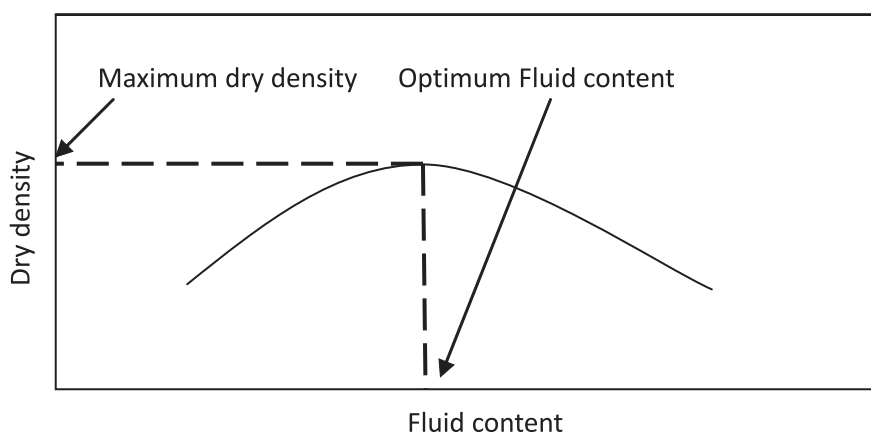


Fig. IX-1 Dry Density-Fluid Content Relation for Blended Rap Mix

Step 4 Marshall samples are prepared at different emulsion content starting from 3 per cent to 4 per cent by weight of the total mix in increment of 0.5 per cent. Additional water is added first and mixed then the bitumen emulsion is added and mixed again. The total fluid is close to the optimum. The sample is compacted in a Marshall mould by applying 75 blows on each face. Six samples are prepared at each fluid content.

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Step 5 The samples should be left in the mould for 24 hours and then placed in an oven for 72 hours at 40°C for curing after the extraction. The sample should be kept on a tray. Most of the moisture will be lost through evaporation.

Step 6 Laboratory tests: Indirect tensile strength tests are to be carried out on dry samples in a standard Marshall loading frame which applies load at rate of nearly 50 mm per minute (50.8 mm per minute) and the maximum load is determined at 25°C. Three samples are also tested at 25°C after 24 hours of soaking in water.

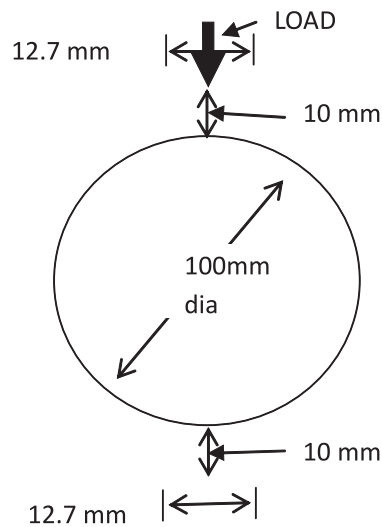
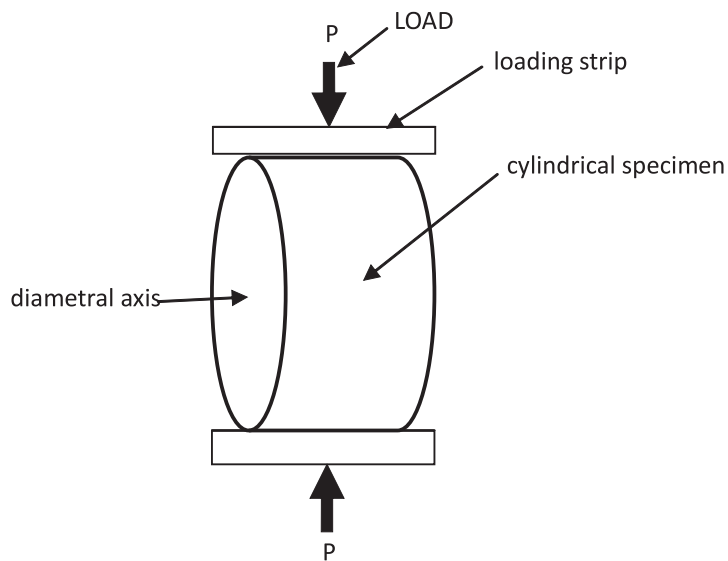


Fig. IX-II Marshall Samples of RAP 100 mm Diameter and 63 mm Long Under Indirect Tensile Test



The loading strip is 12.7 mm wide and about 70 mm long to test samples of height up to 70 mm. A modified version of Marshall Test apparatus as per **Fig. IX-2** can be fabricated in a workshop. It is available commercially also.

$$\text{Indirect tensile strength, ITS (kPa)} = \frac{2000P}{\pi dh} \quad \dots \text{IX-2}$$

Where P = the maximum load in Newton, d = diameter of the sample, mm (may be close to 100 mm), h = height (thickness) of the sample, mm

Table IX-2 Minimum Strength Requirement of RAP Mixes

Strength Test	Specimen diameter	Minimum strength, KPa
ITS _{dry} , 25°C	100 mm	> 225 kPa
ITS _{wet} , 25°C	100 mm	> 100 kPa

If ITS_{dry} is greater than 400 kPa and ITS_{wet} is less than 50 per cent of the dry value, it is indicative of contamination with clay and 1 to 2 per cent lime may be necessary for modifying the plasticity of the clay (64). For 100 mm diameter samples, aggregates passing 26.5 mm sieve should be used for mix design. Effect of higher aggregate size is to increase the strength of the mixes.

The bitumen emulsion content satisfying the minimum strength requirement given in **Table IX-2** can be used for the mixing. Additional 1.5 to 2.5 per cent water may be added to the RAP mixes during the construction due to rapid evaporation of water from the RAP mixes in the hot weather since optimum fluid content is necessary for maximum compaction and strength gain. Within a few hours of laying of RAP mix, the top layer is able to stand the construction traffic due to loss of water on hot sunny days.

Design of Foamed Bitumen RAP Mixes

Foamed bitumen is produced by injecting water into hot bitumen resulting in instantaneous foaming. The injected water turns into steam which is enclosed by finely divided bitumen bubbles. The foamed bitumen is injected into the cold RAP mixes or even fresh aggregates containing optimum amount of moisture for compaction. Such operation is highly specialized and agencies expertise may be used for the production and construction of RAP mixes or fresh aggregates treated with foamed bitumen. The gradation of aggregates can be same as that given in **Table IX-1**. The properties such as maximum expansion ratio (ER_m), half-life (HL), type of binder used for foaming, viscosity of foamed bitumen etc play important role in quality of mix production.

Mixing Moisture Content: The Mixing Moisture Content (MMC) of a foamed bitumen mix is moisture content in the RAP mix when foamed bitumen is injected which is practically same as Compaction Moisture Content (CMC) required for maximum compaction. A few trials are needed to determine the MMC. Methods of sample preparation and curing are same as

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that of the bitumen emulsion mixes. Mixes are prepared with different amount of foamed bitumen and that which meets the minimum strength requirement in dry and wet condition is adopted for production of foamed mixes. 75 blow compaction on each face of 100mm diameter Marshall samples is adopted for sample preparation. Test procedures and strength requirement are also identical as given earlier for bitumen emulsion mixes. Foamed asphalt mixes need less water and cure faster but in hot weather prevalent in most parts of India, emulsion mixes also may cure fast due to migration of moisture from high vapour pressure region in the interior to low vapour pressure region on the surface. Recommendation of TG-2 published by Asphalt Academy, South Africa may be used.

One of the advantages of the cold mixes are that they can be stock piled and used later when needed. Wet weather damage of RAP due to lack of an impermeable wearing course as well as due to poor drainage can be a serious problem.

Table-IX-1: Recommended Values of Resilient Modulus and Poisson Ratio of RAP Mixes

Material	Recommended Resilient Modulus (MPa) and Poisson's Ratio	Range of Moduli (MPa)	Remarks
Bitumen Emulsion/ Foamed bitumen treated RAP	600	600-1200	Higher modulus of RAP is not sustainable due to heavy load. Wet water damage can be a serious problem hence higher modulus is not recommended These values can be revised based on FWD test on in-service pavements
Bitumen emulsion/ Foamed bitumen treated aggregates	600	600-1200	

A modulus of 600 MPa is recommended for RAP mixes for pavement design considering the variability of RAP mixes though laboratory tests under controlled conditions give modulus values ranging from 600-1200 MPa under a haversine loading pulse of duration 0.1 seconds with a rest period of 0.9 seconds. FWD tests on in-service pavements having RAP mixes can help the designers to determine the in situ modulus values over a period of time and compute the remaining life of the pavement. RAP mixes keep on gaining strength with loss of moisture but high modulus determined in the laboratory is not sustainable due to tensile stresses caused by heavy traffic on highway in India.

Fines of the RAP mixes captures most of the bitumen both for bitumen emulsion and foamed bitumen mixes and particulate nature of the RAP is maintained. Its behaviour over granular and cemented sub-bases is different due to different level of confinement from the top and the bottom.

ANNEX-X

Pavement Layers with Chemical Stabilized Materials

X-1 Chemically stabilized soils and aggregates may include all kinds of stabilization such as cement, lime, lime-flyash, or their combination, proprietary chemical stabilisers, enzymes, polymers and any other stabilizer provided these meet the strength and durability requirements. While cement, lime, lime- flyash stabilized materials are well known for their strength, performance and durability, the commercially produced stabilizers should meet the additional requirements of leachability and concentration of heavy metals. Where stabilized materials are used in the pavement, only mechanized method of construction for laying and compaction should be used. The equipment should be capable of administering the design doses of stabilizer and quantity of water and producing a uniform and homogeneous mix. Such materials are also termed as cemented or cementitious materials.

X-2 IRC:SP: 89-2010 Guidelines for soil and granular material stabilisation using cement, lime & fly ash' has very comprehensively described the entire process of stabilization. High strength chemically stabilized layer having a 7-day unconfined strength of 6- 12 MPa given Table 8 of IRC:SP-89-2010 is not recommended because of wide shrinkage and thermal cracks that may occur during the service. Cementitious materials having lower strength can be used in bases and sub-bases. Since a cementitious base is required to act as an important load bearing layer, a minimum strength of 4.5 MPa for bases of cement treated aggregate at seven days is necessary for long term durability as measured by Wetting and drying/freezing and thawing tests (BIS: 4332 (Part IV) - 1968). Specimens having a strength of 5 MPa and above are generally stable under durability tests. Cement stabilised aggregate specimens should be stored in a moist curing room/ curing chamber undisturbed for seven days before tests. Modulus of rupture of cementitious bases may be taken as 20 per cent of the 28 day UCS (MEPDG) for flexure strength evaluation.

X-3 Lime-Soil and Lime-flyash-aggregate mixes develop strength at a slow rate and strength for their acceptability should be determined at 28 days. These slow setting stabilizers develop fine cracks unlike cement treated materials in which the rate of strength gain is high. These binders need less water for compaction which indirectly reduces shrinkage also. Long term strength of lime-soil or lime-flyash- soil mixtures can be determined by curing sealed samples at 400 C (as per ASTM D5102-09 'Standard Test Methods for Unconfined Compressive Strength of Compacted Soil-Lime- Mixtures'. Accelerated curing may be used to provide a correlation between normal and accelerated curing strengths for the material-binder combination. Three day curing of lime or lime-flyash soil at 500C is found to be equivalent to about 33 to 38 days of moist curing at ambient temperature of about 300 C (16). Some typical values of unconfined compressive strength and modulus of rupture of lime-flyash concrete suitable for cemented bases extracted from IRC: SP:20-2002' Rural road Manual' are given below:

Table X-1 Expected Strength of Lime-Flyash Concrete Mixes

S.No	Proportion of Lime: Fly Ash and Coarse Aggregate by Weight	Water Content, per cent by Weight of Mix	28 day strength in MPa	
			UCS	MR
1	1:2.0:2.5:5.25	10.0	6.9	1.48
2	1:2.0:2.7:6.3	11.0	7.5	1.48
3	1:1.5:2.25:5.25	9.7	7.5	1.48

Extracted from IRC:SP:20-2002'Rural Road Manual'

The proportions may vary depending upon the quality of materials and laboratory tests are required to be done prior to construction to ensure that the materials have the minimum strength. Different trials are necessary to arrive at a good mix proportion for a base and a sub-base. Construction procedure is explained in IRC:SP:20-2002. **Table X-1** indicates that even for lime-fly ash stabilized materials, flexural strength can be about 20 per cent of the UCS. Published literature also (16) shows that flexural strength may be as high as 35 to 40 per cent of the UCS of lime or lime-flyas stabilized soil. The recommendation of MEPDG (3) taking the flexural strength as 20 per cent of the UCS is very reasonable if laboratory data is not available. Long term strength gain for slow setting stabilizers can be considered in design.

X-4 Laboratory tests: A number of laboratory tests such as flexure tests, direct tension test, longitudinal resonant frequency test, indirect tensile strength test, direct compression test etc can be used to measure elastic modulus of cementitious material. Unconfined compression tests give high values of modulus. AUSTROADS recommend flexure load test since this is considered to closer to stress/strain in the cemented base layer caused by traffic loading. Relation between UCS and elastic modulus was recommended (14) as

$$E \text{ (cemented base)} = k \times \text{UCS} \quad \dots 9-I$$

UCS = Unconfined strength at 28 days, MPa; $k = 1000$ to 1250 .

E value of the cemented bases containing 4 to 6 per cent Ordinary Portland and, slag or Pozzolanic cements is recommended as 5000 MPa. If field evaluation by FWD indicates higher modulus, fresh estimate of pavement life can be made.

Poisson's ratio of the cemented layer may vary from 0.2 to 0.25. A value of 0.25 may be adopted. Stresses are not very sensitive to Poisson's ratio.

Cemented granular sub-base may have cement from 2 to 4 per cent to get a 7-day strength of 1.5 to 3.0 MPa. Its modulus as determined in laboratory may range from 2000 MPa to 3000 MPa. Since it forms the platform for the construction traffic, it cracks and cannot retain the initial modulus. A value of 600 MPa is recommended and its fatigue behaviour is not considered because of cracks. If the stabilized soil sub-bases have 7-day UCS values in

the range 0.75 to 1.5 MPa, the recommended E value for design is 400 MPa. Field tests by FWD should be routinely done to collect data for obtaining pavement design parameters. Cement requirement for a given strength is much higher for soils than for granular materials. For the commercially available propriety cementing materials, the binder contents have to be determined from laboratory tests to meet the strength requirement.

X-5 Cemented bases should be compacted in a single layer to a maximum compacted thickness of 200 mm. Layers laid at different times may not have the strength because of lack of interface bond unless special care is taken.

X-6 After the construction, curing as recommended in IRC:SP:89-2010 must be done immediately to aid in development of strength and prevent drying shrinkage. Spraying of bitumen emulsion is a very effective method of curing. Exposing the compacted layer to sun damages the stabilised layer and it does not develop strengths as intended.

X-7 Cemented layers normally develop transverse and longitudinal cracks due to shrinkage and thermal stresses during hydration and during the service life. Hence a layer of Stress Absorbing Membrane Interlayer (SAMI) of elastomeric modified binder (AUSTROADS 2004) is to be provided over the cemented base to resist reflection cracking. The rate of spread of the binder is about 2 litres/m² followed by light coating of aggregates of size 10mm to prevent pick up of the binder by the wheels of construction machinery. Geotextile seal and many other commercially available synthetic products available commercially have the promise to retard crack propagation in the bituminous layer. SAMI is not very effective if the crack opening is more than 3 mm.

X-8 Another method of arresting the cracks from propagating to the upper bituminous layer is to provide an interlayer of good quality aggregates between the bituminous layer and the cemented base. The aggregate layer should extend beyond the cemented base by about 0.5 m so that moisture, if any, travels down to the porous sub-base. Wet Mix Macadam (WMM) meeting the IRC/MORTH specification can form a good aggregate interlayer. Being sandwiched between two stiff layers, the aggregate behaves as layer of high modulus under heavy load while its modulus is lower when lighter loads act. Priming and tack coating are required before laying of the bituminous layer. Use of 1 to 2 per cent bitumen emulsion in WMM is needed only when the construction traffic is likely to deform the compacted WMM requiring regrading. It does not improve the crack resistance of the aggregate layer. Thickness of 75 mm to 150 mm has been used for the inter layer by different organisations. The Guidelines proposes a thickness of 100 mm.

X-9 Behaviour of cemented base after traffic associated cracking: The cemented layers may get numerous cracks due to fatigue cracking and its modulus may be reduced drastically from 5000 MPa to 500 MPa. Falling Weight Deflectometer can be a good tool to examine the condition of the cemented base at any time during its service life. The bituminous layer has little tensile strain before cracking of the cemented base but the value becomes very high after the cracking of the base and fatigue failure of the bituminous layer also is imminent. If

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the thickness of the bituminous layer is higher 175 mm (14), the bituminous layer also has considerable remaining life and the total life of the pavement is the sum of the fatigue life of the cemented layer and that of the bituminous layer. If the sum of the thickness of bituminous layer and 75 per cent of the thickness of aggregate interlayer is greater than 175 mm (14), the pavement life is again equal to the fatigue lives of the cemented and that of the bituminous layers.

X-10 Maximum size of the aggregate of the granular base and sub-base should be 53 mm for obtaining a homogenous mass in mechanised construction. Close graded granular sub-base of MORTH can be used in the construction of cemented bases and sub-bases while coarse graded granular sub-base with percent passing 0.075 mm sieve less than 2 per cent can be used as a porous cemented drainage layer laid above the coarse graded cemented sub-base. Grading 4 of **Table V-I** can also be used.

X-11 Procedure for the mix design method for cementitious granular bases and sub-bases can be same as adopted for Dry Lean Concrete (MORTH) except that the cementitious stabilizer content is much lower due to low strength requirement. Optimum moisture content has to be determined by trial. Since maximum size of aggregates can be 53 mm, 150 mm cubes have to be made at different moisture content and compacted by vibratory hammer with square plates. Details are given in MORTH Specifications for determination of optimum moisture content, method of curing and evaluation of strength. The properties of cementitious bases and sub-bases are given in **Table X1**.

X-12 For stabilized soils, even 50 mm diameter, 100 mm high samples can be used for UCS after curing. Beam size can be 50 mm x 50 mm x 300 mm for flexure tests after curing. Field condition may be simulated during the curing.

X-13 If the soil is modified by addition of small percentage of lime/cement/other stabilizers, CBR tests can be done to evaluate the quality of the modified soil. If the cement content is 2 per cent or higher, unconfined compression strength should be determined to determine the strength of the stabilized soil.

ANNEX-XI**Properties of Cementitious Bases and Sub-bases**

S.No	Description	UCS(MPa)	Modulus of rupture	Elastic modulus, E (MPa) and Poisson ratio	Range of modulus	Remarks
1	Granular material for base layer	4.5-7.0 at 7days for cement (28 days for lime-flyash), determined by test on 150mm cube (IRC:SP:89:2010) Cube shall be made as per IS-516 except that they shall be compacted by the vibratory hammer at OMC as per MORTH specifications for DLC	determined by third point bending test at 28 days, as per IS-516 except that the sample should be compacted by the vibratory hammer with rectangular foot at OMC, (20 per cent of the UCS at 28days may be taken as default value for Modulus of Rupture)	E = 1000 * UCS (MPa) at 28 days (Austroads) Adopted value E=5000, $\mu=0.25$	Initial Modulus can be in the range 3000-14000 MPa(65). Austroads recommends flexural modulus of 5000MPa for pavement design assuming 28day UCS value of 5MPa	Material must pass durability test as prescribed in IRC: SP: 89: 2010 for long term durability. Loss of Weight in 12 cycles of wetting-drying or freeze thaw not more than 14 per cent
2	Granular material for sub-base	1.5-3.0 at 7days for cement (28 days for lime-flyash), determined by test on 150mm cube (IRC:SP:89:2010)	—	E = 600, $\mu = 0.25$	Initial Modulus can be in the range 2000-10000 MPa, it may be reduced to 500-800 MPa due to cracking by the construction traffic(49)	—

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3	Granular material for sub-base (Design traffic <10 msa)	0.75-1.5 at 7days for cement (28 days for lime-flyash), determined by test on 150 mm cube (IRC:SP:89:2010)	—	E = 400, $\mu = 0.25$	Initial Modulus can be in the range 500-7000 MPa, it may be reduced to 400-600 MPa due to cracking by the construction traffic (65)	—
4	Chemically stabilized soil for sub-base	UCS: 0.75 to 1.5 MPa at 7days for cement (28 days for lime flyash) UCS is to be done cylindrical specimen 50 mm dia 100 mm height. (ASTM D-5102-09)	—	E = 400 MPa	the range of the moduli depends on the soil type	Quantity of chemical stabilizer requirement is much larger than that of the granular material for the same strength. Generally not recommended for heavy traffic in wet area
5	Chemically stabilized soil for base	UCS: 4.5 to 7 MPa at 7days for cement (28 days for lime flyash) UCS is to be done on cylindrical specimen 50 mm dia 100mm height.	Mr = 0.7 MPa (MEPDG) for UCS value of 5.2 MPa for soil cement. ASTM-D1635-06 Standard Test Method for Flexural Strength of Soil-Cement Using Simple Beam with Third-Point Loading	E = 3500 MPa is recommend by MEPDG for soil cement base value is to be determined from the flexural test by measuring load and deflection after 28 days of curing		

ANNEX-XII

Roads Constructed in India with Alternate Materials

Following successful trials among many others for cemented bases, sub-bases, cold and Hot RAP mixes were done in different places in India

Cemented (Hydraulic Binders) Layers

Cemented bases with SAMI using modified bitumen topped with DBM and BC performed well in trial sections Krishnagiri-Topurghat Road project (Tamil Nadu). It was designed for 150 msa traffic. Periodical inspections indicated fine transverse cracks at about 25 m spacing after three years and riding quality was maintained within the acceptable limits Light spray of diluted bitumen emulsion across the fine cracks before the monsoon was done as a preventing maintenance to preclude any entry of water during the monsoon. FWD deflection studies also indicated low deflections.

1. Ahmedabad-Udaipur (NH8) had a cement treated layer below the WMM
2. Cement treated base was used in Jamnagar refinery in Gujarat for heavy commercial vehicles
3. Ahmedabad-Baroda expressway had a cement treated layer below the WMM
4. Achad-Manor in Maharashtra
5. Chitradurga haul road in Karnataka. The trial pavement was able to sustain heavy haul road traffic without distress. FWD test also was done to verify the design modulus
6. Durbal-Hanjik Road in Srinagar

RAP Mixes were Successfully Used in Following Places

- 1 NH-6 in West Bengal: Cold in-situ recycling of Reclaimed Asphalt Pavement was done in 2004 and pavement evaluation before and after the recycling showed marked improvement in the strength of the pavement. Pavement performance is evaluated by FWD and modulus of the RAP improved considerably. (21)
- 2 Plant recycling was done in Kolkata on a heavily trafficked main road (Prince Anwershah Road) using foamed bitumen. Pavements were evaluated both before milling the bituminous surface and after the construction of the foamed bituminous base and Semi Dense Carpet wearing course . The road was found to be sound even after the two heavy monsoons along with occasional water logging
- 3 Hot in-situ recycling recycling was done on Mehraulli-Badarpur Road under Delhi P.W.D.

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STANDARDS FOR TWO LANING OF HIGHWAYS
WITH PAVED SHOULDER**
(First Revision)

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AND STANDARDS COMMITTEE (GSS)**

(As on 13th January, 2015)

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3.	Secretary General Indian Roads Congress	(Nahar, Sajjan Singh)

MANUAL OF SPECIFICATIONS & STANDARDS FOR TWO LANING OF HIGHWAYS WITH PAVED SHOULDER

INTRODUCTION

IRC:SP:73 “Manual of Standard & Specifications for Two Laning of State Highways on B.O.T. Basis” was first published in August, 2007. The Project Preparation, Contract Management & Quality Assurance Committee (G-1) felt the necessity to revise this document and constituted a sub-group comprising S/Shri R.S. Sharma, M.P. Sharma, A.K. Banerjee, Ashok Kumar, R.K. Pandey, S.K. Nirmal, L.P. Padhy, K. Venkataramana, Jacob George and Col. (Retd.) A.K. Bhasin. The G-1 Committee finalised the draft document in its meeting held on 6th December, 2014 for placing before the General Specifications & Standards Committee (GSS). The GSS Committee in its meeting held on 13th January, 2015 approved this document. The Executive Committee in its meeting held on 18th January, 2015 considered and directed IRC Secretariat to place the document approved by the GSS Committee before the Council for consideration and approval. The Council in its 204th meeting held at Bhubaneshwar (Odisha) on 19th January, 2015 approved the draft revision of IRC:SP:73 “Manual of Specifications and Standards for Two Laning of Highways with Paved Shoulder” after taking on board the comments offered by the members.

The Composition of Project Preparation, Contract Management and Quality Assurance Committee (G-1) is as given below:

Puri, S.K.	-----	Convenor
Datta, P.K.	-----	Co-Convenor
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Honorary Treasurer, Indian Roads Congress	(Das, S.N.), Director General (Road Development) & Special Secretery to the Govt. of India, Ministry of Road Transport & Highways
Secretary General Indian Roads Congress	(Nahar, Sajjan Singh)

SECTION - 1

GENERAL

- 1.1** This Manual is applicable for Two Laning of Highways with paved shoulder through Public Private Partnership (PPP) or any other mode. The general planning aspects laid out in this Manual shall be applicable for widening from single/intermediate lane to two lane or new construction of two lane highways. The scope of the work shall be as defined in the Concession Agreement. This manual shall be read harmoniously with the intent of the Concession Agreement. Any reference to two lane or two laning in this Manual shall mean two lane with paved shoulders.
- 1.2** The Project Highway and the project facilities shall conform to the requirements of design and specifications set out in this Manual, which are the minimum prescribed. The project report and other information provided by the Authority shall be used by the Concessionaire only for its own reference and for carrying out further investigations. The Concessionaire shall be solely responsible for undertaking all the necessary surveys, investigations and detailed designs in accordance with the good industry practice and due diligence, and shall have no claim against Authority for any loss, damage, risk, costs, liabilities or obligations arising out of or in relation to the project report and other information provided by the Authority.
- 1.3** At least 2 weeks prior to commencement of the work, the Concessionaire shall draw up a Quality Assurance Manual (QAM) covering the Quality System (QS), Quality Assurance Plan (QAP) and documentation for all aspects of the bridge and road works and send three copies of each to the Independent Engineer (IE) for review. The class of quality assurance shall not be less than Q-3 (Refer IRC: SP: 47 and IRC: SP: 57).
- 1.4** The Codes, Standards and Technical Specifications applicable for the design and construction of project components are:
- i) Indian Roads Congress (IRC) Codes and Standards;
 - ii) Specifications for Road and Bridge Works issued by the Ministry of Road Transport & Highways (MORTH) hereinafter referred to as MORTH or Ministry's Specifications.
 - iii) Any other standards referred to in the Manual and any supplement issued with the bid document.
- 1.5** Latest version of the Codes, Standards, Specifications, etc. notified/published at least 60 days prior to the last date of bid submission shall be considered applicable.
- 1.6** The terms 'Ministry of Surface Transport', 'Ministry of Shipping, Road Transport & Highways' and 'Ministry of Road Transport and Highways' or any successor or substitute thereof shall be considered as synonymous.

- 1.7**
- a) The terms 'Inspector' and 'Engineer' used in MORTH Specifications shall be deemed to be substituted by the term "Independent Engineer" for PPP projects to the extent it is consistent with the provisions of the Concession Agreement and this Manual. The role of the Independent Engineer shall be as defined in the Concession Agreement.
 - b) In case of EPC contracts the term 'Independent Engineer' shall be replaced by 'Authority Engineer' and the term 'Concessionaire' and 'Concession Agreement' shall be replaced by 'Contractor' and 'Contract Agreement' respectively.
- 1.8** In case of any conflict or inconsistency in the provisions of the applicable IRC Codes, Standards or MORTH Specifications, the provisions contained in this Manual shall apply.
- 1.9** This Manual generally provides for design and construction as per Codes, Standards, Specifications, Guidelines, etc. as published by IRC, MORTH and BIS for road and bridge works. Where the Concessionaire intends to use an alternative to these Standards and Guidelines for delivering an equal or better product, he shall be permitted to use such alternative subject to the following conditions:
- i) He shall demonstrate that the proposed alternative conforms to any of the following International Standards, Codes of Practice, Specifications, Guidelines, etc.
 - a) IRC revised codes or new codes or amendments to existing codes which are effective after the date of calling of bids
 - b) American Association of State Highway and Transportation Officials (AASHTO)
 - c) American Society for Testing of Materials (ASTM)
 - d) Euro Codes
 - e) National Standards of any of the following countries•
 United States of America (USA), Canada, United Kingdom (UK), France, Germany, Sweden, Denmark, Norway, Netherlands, Spain, Australia, New Zealand, Japan and South Africa.
 - ii) In case the Concessionaire intends to use any alternative material, technology/method, whether patented or otherwise, that is not specifically covered in the Indian or International Standards as listed above, but the use of which has been permitted on similar projects (similar in category of road, traffic and climatic conditions) as the Project Highway, he would be permitted its use on certification by the owners of such similar projects regarding the continued successful performance of such materials, technologies, methods, procedures or processes for at-least 5 years of the service life of the project. Such a certification shall be supported with details of critical performance parameters.

1.10 All items of building works shall conform to Central Public Works Department (CPWD) Specifications for Class 1 building works and standards given in the National Building Code (NBC). To the extent specific provisions for building works are made in IRC/MORTH Specifications, the same shall prevail over the CPWD/NBC provisions. For this purpose, building works shall be deemed to include toll plaza complex, road furniture, road side facilities, landscape elements and/or any other works incidental to the building works.

1.11 Alternative Standards and Specifications

- a) Where alternative standards and specifications are intended to be used in accordance with para 1.9, all such proposals shall be submitted by the Concessionaire to the Independent Engineer together with certification and details mentioned in para 1.9. In case, the Independent Engineer is of the opinion that the proposal submitted by the Concessionaire is not in conformity with any of the International Standards or Codes or evidence by successful performance, then he will record his reasons and convey the same to the Concessionaire for compliance. A record shall be kept by the Independent Engineer, of non-compliance, if any, by the Concessionaire. Adverse consequences, if any arising from adoption of any such alternative proposals shall be treated as "Concessionaire Default" and shall be dealt in accordance with the provisions of the Concession Agreement.
- b) Provisions under Para 1.9 and 1.11 (a) above shall not be applicable for EPC projects.

1.12 Guidelines for Preparing Schedules of the Concession Agreement

Certain paras (fully or part) in Sections 1 to 14 of this Manual refer to the Schedules of the Concession Agreement. While finalizing the feasibility/project report for the Project Highway, and the scope of the project, each of these par as should be carefully examined and addressed by the Authority with a view to making appropriate provisions in the Schedules of the Concession Agreement.

1.13 General considerations for Planning, Design and Construction

The Concessionaire shall take measures to overcome the physical and operational constraints and plan, design and construct the Project Highway using appropriate methods, management techniques and technologies. The objective, therefore is to construct a 2 lane highway for all road users as an active infrastructure facility for people for their safety and services and as a catalyst in development of economy based on an inclusive approach.

General considerations shall, without being limited to, be as follows:-

a) The constraints

The physical constraints in the existing highway are in the form of limitation of right of way, un-regulated access, inadequate service roads and underpasses, numerous at-grade junctions, lack of physical separation between local and

through traffic etc. The operation constraints arise out of the necessity or possibility of closing a portion of the road for construction and/or diverting the traffic to temporary diversions, thereby reducing the capacity and safety of the existing highway. The solutions evolved by the Concessionaire shall be such that these operational constraints are overcome through appropriate planning, design and construction method, techniques and technologies and by adopting suitable traffic management measures.

b) Safety of design

All designs shall be safe to ensure that the Project Highway or any part thereof (for example embankment, pavement, retaining structures, bridges, culverts, etc.) does not collapse (global stability) nor its serviceability/performance (for example settlement, roughness, undulations, deflections, etc.) deteriorates below acceptable level as prescribed in Schedule 'K' of the Concession Agreement.

c) Durability

The Project Highway shall not only be safe but also durable. This would mean that the deteriorating effects of climate and environment (for example wetting and drying, freezing and thawing, if applicable, temperature differences, aggressive environment leading to corrosion, etc.) in addition to the traffic shall be duly considered in design and construction to make the Project Highway durable.

d) Mitigating disruptive effects of construction

The planning, design and construction of the highway shall be such that the construction of Project Highway does not have adverse impact on the environment and does not disrupt the lives and business activities of the people living close to the Project Highway.

1.14 Safety during Construction and Operation & Maintenance

1.14.1 The Concessionaire shall develop, implement and administer a surveillance and safety programme for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in the Concession Agreement.

1.14.2 Before taking up any construction or maintenance operation/work, the Concessionaire shall prepare a Traffic Management Plan for each work zone and furnish it to the Independent Engineer for comments duly incorporating the following:

- i) Designate a Site Safety Team headed by a qualified Safety Officer.
- ii) Traffic safety devices as per IRC:SP:55 with the following specifications:
 - a) Signages of retro-reflective sheet of high intensity grade.
 - b) Delineators in the form of cones/drums (300 to 500 mm diameter and 1000 mm high) made of plastic/rubber having retro reflective red and

white band, at a spacing of maximum 5 m along with a reflective tape (red and white band) to be tied in between the gaps of cones/drums. A bulb/flasher using solar energy is to be placed on the top of the cone/drum for night delineation.

- c) Barricades using iron sheet (plain) with adequate iron railing/frame painted with retro-reflective paint in alternate black and white (or yellow and black) stripes. Warning lights at 5.0 m spacing shall be mounted on the barricades and kept lit in the dark hours and night.
- iii) The arrangement of traffic during construction and maintenance shall conform to the requirements of IRC:SP:55, Clause 112 of MORTH Specifications and provisions of the Concession Agreement. During the construction period, the Concessionaire shall maintain, at its cost, the existing lane(s) of the Project Highway or divert the traffic on to an alternative route-diversion road so that the operating width and safety standards shall be equal to those of existing lanes (excluding paved shoulders, if any) for each direction. The crust of such alternative route/diversion road shall be provided for minimum 10 msa. The drainage of existing road and construction zone during construction shall be given special attention by the Concessionaire. Prior to commencement of construction works, the Concessionaire shall submit to the Independent Engineer, the detailed construction methodology to meet the aforesaid requirement including temporary drainage plan of existing road and construction zone.
- iv) Sprinkling of water for dust control at work zones, haul roads and plant camp sites.
- v) Noise/Pollution suppression measures at work zones, haul roads and plant/camp sites.
- vi) Mechanical, electrical and fire safety practices.
- vii) Safety measures like PPE (Personal Protection Equipment) for workers engaged.
- viii) First Aid and Emergency Response Arrangements i.e. First Aid Box, Ambulance, paramedical staff, alarms, etc.
- ix) Safety training/awareness programmes.
- x) Formats to maintain the accident records/emergency response provided during accidents.

1.14.3 The Concessionaire shall also be responsible for ensuring compliance of all labour laws and regulations including those relating to the welfare of workers engaged both directly and indirectly on the Project Highway, besides their occupational safety and health.

1.15 The Concessionaire shall set up field laboratory for testing of materials and finished products as stipulated in Clause 121 of MORTH Specifications. It shall make necessary

arrangements for additional/confirmatory testing of any materials/products at the government accredited laboratory, for which facilities at site laboratory are not available.

1.16 Environment Mitigation Measures

The Concessionaire shall carry out tests/monitor various parameters impacting the environment of the Project Highway keeping in view the guidelines of the Ministry of Environment and Forests and submit proposals for mitigation of adverse environment impact including provision of noise barriers, etc. for review and comments of the IE, if any and undertake implementation of the proposals in consultation with the IE. The type and locations of the Noise Barriers required to be provided shall be specified in Schedule 'B'.

1.17 Utilities

The details of the new-utilities which are to be constructed or provided for along or across the Project Highway shall be as specified in Schedule 'B' of the Concession Agreement. The Concessionaire shall be responsible for protection of the existing utilities on the Project Highway that are not required to be shifted.

1.18 Review and Comments by Independent Engineer

- a) For PPP projects, in cases where the Concessionaire is required to send any drawings or documents to the Independent Engineer for review and comments, and in the event such comments are received by the Concessionaire, it shall duly consider such comments in accordance with the Concession Agreement and Good Industry Practice for taking appropriate action thereon. The correspondence between the Concessionaire and the Independent Engineer shall be deemed valid only if a copy thereof is endorsed to and received by the Authority
- b) For EPC Projects, the design and drawings shall be got reviewed and approved from the Authority Engineer as per the Contract Agreement.

1.19 Definitions and Interpretation

1.19.1 Unless specified otherwise in this Manual, the definitions contained in the Concession Agreement shall apply.

1.19.2 Built-up area shall mean sections of the Project Highway that are situated within the municipal limits. Sections of 200 m or more in non-municipal areas where permanent structures are built on one or both sides of the Project Highway on at least 50 per cent of the total length comprising such section shall also be treated as built up area. The location and chainages of Built up areas shall be as specified in Schedule 'B' of the Concession Agreement.

Rural areas are synonymous to non-built up areas and urban areas are synonymous to built-up areas for the purpose of deciding various provisions given in this Manual.

1.19.3 The definition of PCU used in this Manual shall be as per IRC Codes and Guidelines.

1.20 Grade Separated Structures

- i) The structures through which the traffic flows at different levels are called grade separated structures.
 - ii) A grade separated structure which is provided for crossing of vehicles under the Project Highway is called as Vehicular Underpass (VUP).
 - iii) A grade separated structure which is provided for crossing of vehicles over the Project Highway is called as Vehicular Overpass (VOP).
 - iv) A structure provided below the Project Highway to cross the pedestrians is called Pedestrian Underpass (PUP).
 - v) A structure provided below the Project Highway to cross the cattle is called Cattle Underpass (CUP).
 - vi) A pedestrian/cattle underpass through which light vehicles of height up to 3 m can also pass is called Light Vehicular Underpass (LVUP).
 - vii) Flyover is synonymous to VUP/VOP/LVUP/PUP/CUP.
 - viii) A structure provided above the Project Highway to cross pedestrians is called Foot Over bridge.
 - ix) A structure provided over the railway lines to carry the Project Highway is called Road Over Bridge (ROB).
 - x) A structure provided below the railway lines to carry the Project Highway is called Road Under Bridge (RUB).
 - xi) A Trumpet interchange is a grade separator structure provided at major T-junction facilitating uninterrupted flow of traffic in each direction.
 - xii) A Cloverleaf is a grade separator structure provided at a major cross road junction facilitating uninterrupted flow of traffic in each direction.
-

SECTION - 2

GEOMETRIC DESIGN AND GENERAL FEATURES

2.1 General

- i) This Section lays down the standards for geometric design and general features for upgrading the existing highways to two-lane.
- ii) Stretches passing through built up areas shall normally be provided with 4-lane divided carriage way (**Fig. 2.5**). Such stretches where 4-laning is to be provided, shall be indicated in Schedule-B of the Concession Agreement.
- iii) Where there are constraints of existing ROW width or difficulty in acquiring land along the existing alignment in built up areas, the Authority may decide for construction of a by pass instead of 4-laning. The alignment of the bypass shall be given in Schedule 'B'. The bypass shall be access controlled 4-lane divided carriage way (**Fig 2.6**), unless specified otherwise. In case, the Authority decides to provide only two- lane carriageway for the bypass, the same shall be specified in Schedule 'B' of the Concession Agreement and placed eccentrically with respect to the ROW to facilitate proper widening to four lanes in future (**Fig 2.7**).
- iv) The geometric design of the Project Highway shall conform to the standards set out in this Section as a minimum. The Concessionaire shall ensure that liberal geometric standards are followed to the extent feasible within the given Right of Way.
- v) As far as possible, uniformity of design standards shall be maintained throughout the length. In case of any change, it shall be effected in a gradual manner.
- vi) Where the existing road geometrics are deficient with respect to minimum requirements and its improvement to the prescribed standards is not feasible due to any constraint in acquisition of additional land, such stretches shall be as specified in Schedule-B of the Concession Agreement.
- vii) Existing horizontal curves, which are found deficient in radius, layout, transition lengths or super elevation shall be corrected to the standards specified in this section.
- viii) Any deficiencies in the vertical profile in respect of grades, layout of vertical curves and sight distance shall be corrected to meet the minimum requirements in this section.

2.2 Design Speed

2.2.1 The design speeds given in **Table 2.1** shall be adopted for various terrain classifications (Terrain is classified by the general slope of the ground across the highway alignment).

Table 2.1 Design Speed

Nature of Terrain	Cross Slope of the Ground	Design Speed (km/h)	
		Ruling	Minimum
Plain and Rolling	Up to 25 percent	100	80
Mountainous and Steep	More than 25 percent	60	40

Short stretches (say less than 1 km) of varying terrain met with on the road stretch shall not be taken into consideration while deciding the terrain classification for a given section of Project Highway

2.2.2 In general, the ruling design speed shall be adopted for the various geometric design features of the road. Minimum design speed shall be adopted only where site conditions are restrictive and adequate land width is not available. Such stretches where design speed other than ruling speed is to be adopted shall be as indicated as deviation in Schedule 'D' of the Concession Agreement.

2.3 Right of Way

Two laning shall be accommodated within the existing ROW to the extent possible. However, additional land, if required for accommodating the two laning cross sections, improvement of geometrics, realignment, junctions, bypasses etc., shall be acquired by the Authority. For bypasses, Right of Way shall be 60 m. The existing and proposed ROW shall be indicated in Schedule A of the Concession Agreement. The consideration for planning, design and construction described in Para 1.13 shall apply.

2.4 Lane Width of Carriageway

The standard lane width of the Project Highway shall be 3.5 m.

2.5 Median

2.5.1 In built-up areas with 4-lane divided carriageway the median shall be raised and the width of median (distance between inside edges of carriage way) shall be 2.5 metres including kerb shyness of 0.50 m on either side (**Fig 2.5**). In 4-lane bypasses the median and median drainage shall be provided as per IRC:SP:84.

2.5.2 The median in built up areas shall be paved and railings of steel and suitable antiglare measures such as plastic screens shall be provided at the center of median to reduce headlight glare from opposite traffic. The total height of screen including the height of the barrier shall be 1.5 m and spacing shall be such as to effectively cut the glare.

2.6 Shoulders

2.6.1 Width of Shoulders

The shoulder width on both sides of the carriageway shall be as given in **Tables 2.2 and 2.3**.

Table 2.2 Width of Shoulders in Plain and Rolling Terrain

Type of Section	Width of Shoulder (m)		
	Paved	Earthen	Total
Open country with isolated built up area	1.5	2.0	3.5
Built up area (2-lane section)	2.5	-	2.5
Built up Area (4-lane section)	-	-	-
Approaches to grade separated structures	2.0	-	2.0
Approaches to bridges	1.5	2.0	3.5

Table 2.3 Width of Shoulders in Mountainous and Steep Terrain (Hilly Area)

Type of Section		Width of Shoulder (m) *		
		Paved	Earthen	Total
Open country with isolated built up area	Hill Side	1.5 m	-	1.5 m
	Valley Side	1.5 m	1.0 m	2.5 m
Built up area and approaches to grade separated structures/ bridges	Hill Side	0.25 m + 1.5 m (Raised)	-	1.75 m
	Valley side	0.25 m + 1.5 m (Raised)	-	1.75 m

* exclusive of parapet on valley side and side drains on hill side

- Notes :**
- In case retaining wall with parapet is provided on valley side, the earthen shoulder may not be provided.
 - Width of paved shoulders in approaches to grade separated structures as indicated in Table 2.2 and 2.3 above shall extend on either side of the structure in the entire length of retaining/RE wall. The retaining/RE wall on either side shall be abutting the paved shoulders and shall have crash barriers on top.
 - In built up area where two lane highway is provided and extra right of way is available, the space between the paved shoulder and foot path cum drains on both sides shall be covered with paver block flooring. Similarly in 4-lane sections the space between carriageway and footpath cum drains on both sides shall be covered with paver block flooring,

2.6.2 Where embankment is more than 6 m high, kerb with channel shall be provided at the end of paved shoulder to channelize the drainage as an erosion control device in accordance with Section 6 of this Manual and earthen shoulder shall be raised upto the level of kerb.

2.7 Roadway Width

2.7.1 The width of roadway shall depend upon the width of carriageway, shoulders and the median.

2.7.2 On horizontal curves with radius upto 300 m, width of pavement and roadway shall be increased as per **Table 2.4**.

Table 2.4 Extra Width of Pavement and Roadway

Radius of Curve	Extra Width
75-100 m	0.9 m
101-300 m	0.6 m

2.8 Camber or Cross Fall

2.8.1 The crossfall on straight sections of road carriageway, paved shoulders and paved portion of median shall be 2.5 percent for bituminous surface and 2.0 percent for cement concrete surface.

2.8.2 The cross fall for earthen shoulders on straight portions shall be at least 0.5 percent steeper than the slope of the pavement and paved shoulder subject to a minimum of 3.0 percent. On super elevated sections, the earthen portion of the shoulder on the outer side of the curve shall be provided with reverse crossfall of 0.5 percent so that the earth does not drain on the carriageway and the storm water drains out with minimum travel path.

2.8.3 The two-lane roads shall be provided with a crown in the middle. On horizontal curves, the carriageway shall be super elevated.

2.9 Geometric Design and Alignment

2.9.1 Geometric design shall conform to IRC:73 except as otherwise indicated in this Manual. While designing the horizontal alignment, the following general principles shall be kept in view:

- i) Alignment should be fluent and it should blend well with the surrounding topography.
- ii) On new roads, the curves should be designed to have largest practical radius, but in no case less than ruling value corresponding to ruling design speed.
- iii) As a normal rule, sharp curves should not be introduced at the end of long tangent since these can be extremely hazardous.
- iv) The curves should be sufficiently long and they should have suitable transitions to provide pleasing appearance.
- v) Reverse curves shall be avoided as far as possible. Where unavoidable, sufficient length between two curves shall be provided for introduction of requisite transition curves.
- vi) Curves in the same direction, separated by short tangents known as broken back curves, should be avoided as far as possible.
- vii) To avoid distortion in appearance, the horizontal alignment should be coordinated carefully with the longitudinal profile.
- viii) Hair pin bends on hilly terrain should be avoided as far as possible.

2.9.2 All horizontal curves shall consist of circular portion flanked by spiral transitions at both ends.

2.9.3 *Super Elevation*

Super elevation shall be limited to 7 percent, if radius of curve is less than the desirable minimum. It shall be limited to 5 percent, if the radius is more than desirable minimum and also at at section where Project Highway passes through an urban section or falls on a major junction.

2.9.4 *Radii of Horizontal Curves*

The desirable minimum and absolute minimum radii of horizontal curves for various classes of terrain are given in **Table 2.5**.

Table 2.5 Minimum Radii of Horizontal Curves

Nature of Terrain	Desirable Minimum Radius	Absolute Minimum Radius
Plain and Rolling	400 m	250 m
Mountainous & steep	150 m	75 m

The radius of horizontal curves for various terrain conditions shall not be less than the desirable values given in **Table 2.5** except for sections as indicated in Schedule 'D'. For such sections radius shall not be less than the absolute minimum.

2.9.5 *Transition Curves*

Minimum length of transition curve shall be determined from the following two considerations and the larger of the two values adopted for design:

- i) The rate of change of centrifugal acceleration should not cause discomfort to drivers. From this consideration, the length of transition curve is given by:

$$L_s = 0.0215 V^3/CR,$$

Where,

L_s = Length of transition curve in metres,

V = Speed in km/hr,

R = Radius of circular curve in metres,

C = $80/(75+V)$ (subject to a maximum of 0.8 and minimum of 0.5)

- ii) The rate of change of super elevation should be such as not to cause discomfort to travelers. Further, rate of change should not be steeper than 1 in 150 for roads in plain/rolling terrain, and 1 in 60 in mountainous/steep terrain. The formula for minimum length of transition on this basis is:

$$L_s = 2.7V^2/R$$

2.9.6 *Sight Distance*

- i) Visibility is an important requirement for the safety of travel on roads. For this, it is necessary that sight distance of adequate length is available in different situations, to permit drivers enough time and distance to control their vehicles so that chances of accidents are minimized.

- ii) On two-lane roads, normally intermediate sight distance should be available throughout. The attempt should, however, be to provide overtaking sight distance in as much length of the road as possible. In stretches where even intermediate sight distance is not available, the safe stopping sight distance should be provided as a last resort. Such sections shall be specified in Schedule 'B'. Traffic signs depicting "Overtaking Prohibited:" shall be installed at all such locations.
- iii) The recommended sight distances for various speeds are given in **Table 2.6**.

Table 2.6 Sight Distances for Various Speeds

Speed (km/hr)	Stopping Sight Distance (m)	Intermediate Sight Distance (m)	Overtaking Sight Distance (m)
100	180	360	640
80	120	240	470
60	90	180	340
40	45	90	165

- iv) The requisite sight distance shall be available across the inner side of horizontal curves.
- v) Where horizontal and summit curves overlap, the design shall provide for the required sight distance, both in the vertical direction, along the pavement and in the horizontal direction on the inner side of curve.

2.9.7 Vertical Alignment

2.9.7.1 The vertical alignment should provide for a smooth longitudinal profile. Grade changes should not be too frequent as to cause kinks and visual discontinuities in the profile.

2.9.7.2 The ruling and limiting gradients are given in **Table 2.7**.

Ruling gradients shall be adopted as far as possible. Limiting gradients shall be adopted in difficult situations and for short length.

Table 2.7 Gradients

Nature of Terrain	Ruling Gradient	Limiting Gradient
Plain and rolling	2.5%	3.3%
Mountainous	5.0%	6.0%
Steep	6.0%	7.0%

2.9.7.3 Long sweeping vertical curves shall be provided at all grade changes. These shall be designed as square parabolas.

2.9.7.4 Design of vertical curves and its co-ordination with horizontal curves shall be in accordance with IRC:SP:23.

2.10 Lateral and Vertical Clearance at Underpasses

Wherever the Project Highway is proposed to be taken above/over a cross road, minimum clearances at underpasses shall be as follows:

2.10.1 Lateral Clearance

- i) Full roadway width of the cross road shall be carried through the Vehicular Underpass. The lateral clearance shall not be less than 12 m (7 m carriageway + 2 x 2.5 m shoulder width on either side) or as indicated in Schedule 'B'.
- ii) For Light Vehicular Underpass the lateral clearance shall not be less than 10.5 m including 1.5 m wide raised footpath on either side.
- iii) For pedestrian and Cattle underpasses the lateral clearance shall not be less than 7 m.
- iv) Guard rails/crash barriers shall be provided for protection of vehicles from colliding with the abutments and piers and the deck of the structures.

2.10.2 Vertical Clearance

Vertical clearance at underpasses shall not be less than the values given below:

i) Vehicular Underpass	5.5 m
ii) Light Vehicular Underpass	3.5 m
iii) Pedestrian and Cattle Underpass	3.0 m (to be increased to 4.5 m, in case certain categories of animals such as elephant/camel are expected to cross the Project Highway frequently. This will be as specified in Schedule 'B')

Wherever existing slab/box culverts and bridges allow a vertical clearance of more than 2 m, these can be used in dry season for pedestrian and cattle crossing by providing necessary flooring. However, these will not be a substitute for normal requirements of pedestrian and cattle crossings as per Para 2.13. 4.

2.11 Lateral and Vertical Clearance at Overpasses

Wherever any structure is provided over the Project Highway; the minimum clearances at overpasses shall be as follows:

2.11.1 Lateral Clearance

Full roadway width shall be carried through the overpass structure unless otherwise specified in Schedule 'B'. Provision shall also be made for future widening of the Project Highway to 4-lane. The abutments and piers shall be provided with suitable protection against collision of vehicles. Crash barriers shall be provided on abutment side and on sides of piers for this purpose. The ends of crash barriers shall be turned away from the line of approaching traffic. The span arrangement for the overpass structure shall be as specified in Schedule 'B'.

2.11.2 Vertical Clearance

A minimum 5.5 m vertical clearance shall be provided at all points of the carriageway of the Project Highway.

2.12 Service Roads

2.12.1 Service roads wherever required to be constructed by the Concessionaire, shall be specified in Schedule-B of the Concession Agreement.

2.12.2 Service roads shall be constructed and maintained in accordance with the provisions of the Concession Agreement. The width of service roads shall be minimum 5.5 m.

2.12.3 Wherever service roads are provided, provision shall be made for proper entry and exit ramps between the main highway and the service roads through properly designed acceleration and deceleration lanes. The layout for entry/exit at service road shall be as per **Fig. 2.1A to 2.1 B**. Any deviations to these layouts due to site constraints shall be specified in Schedule 'D' of the Concession Agreement.

2.12.4 Design speed: A minimum design speed of 40 km/h shall be adopted for service roads.

2.12.5 Acceleration and deceleration lanes: The following requirements shall apply:

- i) Length: Designed for a speed differential of 60 km/h
- ii) Width: 5.5 m (minimum)
- iii) Taper at merge: 1 in 15 beyond design length

2.12.6 The acceleration and deceleration lanes and transition length will be considered as incidental to the project and shall not be counted towards service road length.

2.13 Grade Separated Structures

2.13.1 The vehicular under/overpass structures shall be provided at the intersection of the Project Highway with all the National Highways and State Highways. Such under/over passes shall also be provided across other categories of roads as per site requirements for crossing of traffic. The structure may be either an underpass or an overpass depending upon the nature of terrain, vertical profile of road and availability of adequate right of way etc. Decision whether the cross road or the Project Highway will be carried at the existing level will be taken at the time of preparing the feasibility report and would be based on considerations of drainage, land acquisition, provision of ramps for the grade separated facility, height of embankment and project economy etc.

2.13. 2 Cattle/Pedestrian Underpass (CUP/PUP) and Foot Over Bridge

- i) A PUP/CUP/Foot Over Bridge may not be necessary within a distance of 2 km from Vehicular underpasses/overpasses and Light Vehicular Underpasses.
- ii) The pedestrian crossings (PUP/FOB) shall have provision for movement of physically challenged persons.
- iii) Underpasses shall be preferred to Foot Over Bridges.
- iv) Pedestrian underpass/Foot Over Bridge shall also be provided within a distance of 200 m from a school or hospital or factory/industrial area.
- v) The Bus Bays along with the Bus Shelters shall be provided at the identified pedestrian Underpass/Foot Over Bridge locations as specified in Para 12.5 of this Manual. Such locations shall be specified in Schedule B.

Typical cross-section for cattle/pedestrian under pass are given in **Fig. 7.10 to 7.12**. The central portion open to sky shall be so covered as to allow air and light, but not rain water.

2.13.3 The type and location of various grade separated structures (VUP, LVUP, PUP/CUP, VOP) shall be as specified in Schedule 'B' of the Concession Agreement. In case the lateral/vertical clearance and total length of viaduct to be provided is different from the minimum specified in this Section, the same shall also be specified in Schedule 'B'. The entry/exit arrangement at grade-separated structures with slip roads shall be provided as shown in **Figs. 2.1C to 2.1F**. Depending on the traffic volume and speed and other factors, the layout to be adopted for each case as per **Figs. 2.1C to 2.1F** shall be specified in Schedule B.

2.13.4 Road Over Bridges (ROBs)/Road Under Bridges (RUBs) for crossing the Railway tracks shall be provided as per Section-7 of this Manual.

2.13.5 Tunnels

Standards for Tunnels shall be as given in Section 15 of this Manual

2.14 Footpath, Drain and Pedestrian Railing in Built-up Areas

2.14.1 Footpath, drain and pedestrian railing in built-up areas shall be provided as per relevant cross sections. The shape and size of drain shall be as per drainage design conforming to Section 6 of this Manual.

2.15 Utility Corridor

Two metre wide strip of land at the extreme edge of ROW shall be kept for accommodating utilities, both over as well as underground. Provisions contained in IRC:98 shall be followed to accommodate utility services in built-up areas of Project Highway. Utility ducts in the form of 600 mm diameter NP-4 Pipe across the Project Highway along with inspection box/chamber at a spacing of 1 km shall be provided for crossing of underground utilities in built up areas.

2.16 Typical Cross-Sections

2.16.1 Typical cross-sections of Project Highway are given in **Figs. 2.2 to 2.13**. These shall be adopted for various locations, as applicable. **Fig. 2.3, and 2.8** and **Fig 2.10** are applicable for two lane highway without paved shoulders. These shall be used if deviation is made and specified in Schedule D.

2.16.2 Where cross-section changes from two lane to four lane a transition of 1 in 20 to 1 in 30 shall be provided as per IRC:73 and IRC:86.

2.17 Capacity of Two-Lane Highway

The design service volume of two-lane highway for different type softer rain shall be as given in **Table 2.8**.

Table 2.8 Design Service Volume of Two-Lane Highway in PCUs per day

Nature of Terrain	Design Service Volume in PCUs per day
Plain	18,000
Rolling	13,000
Mountainous and Steep	9,000

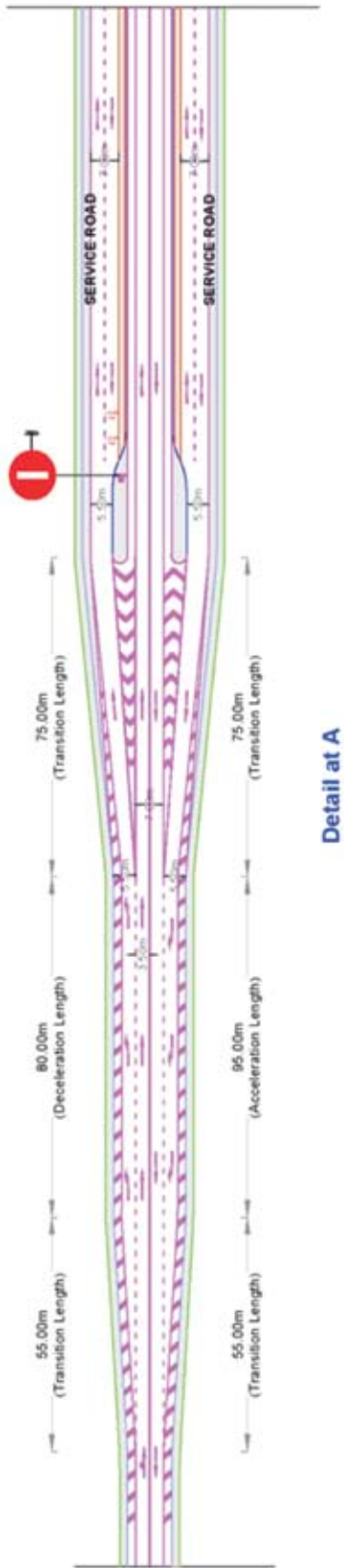
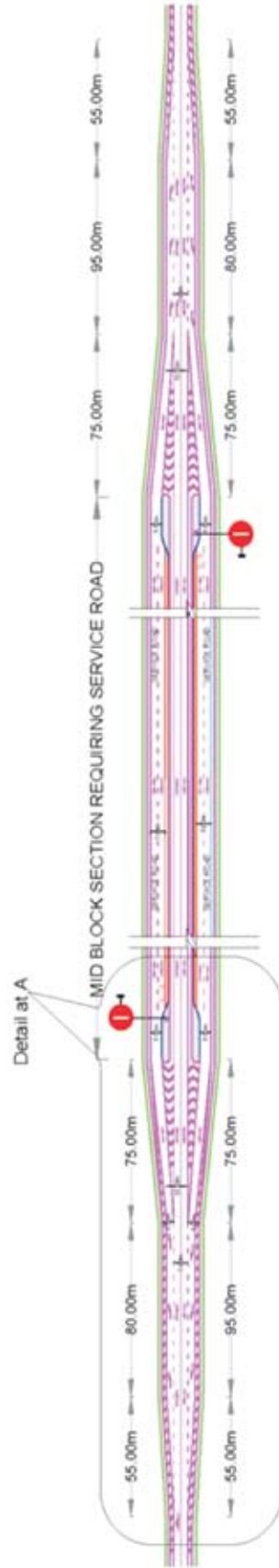


Fig. 2.1A Entry/Exit Arrangement with Service Road

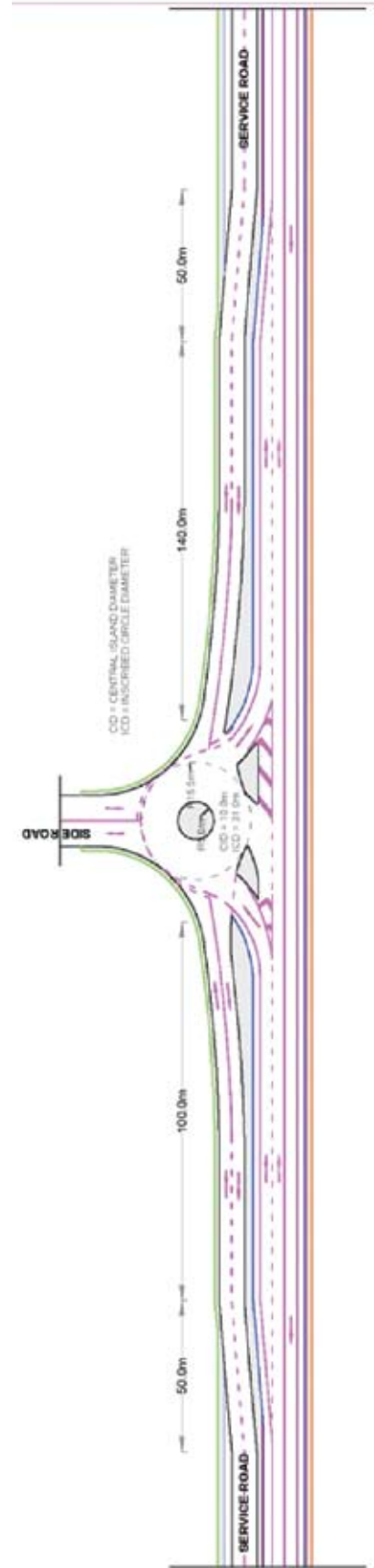


Fig. 2.1B Entry/Exit Arrangement with a Side Road (Service Road Continuing)

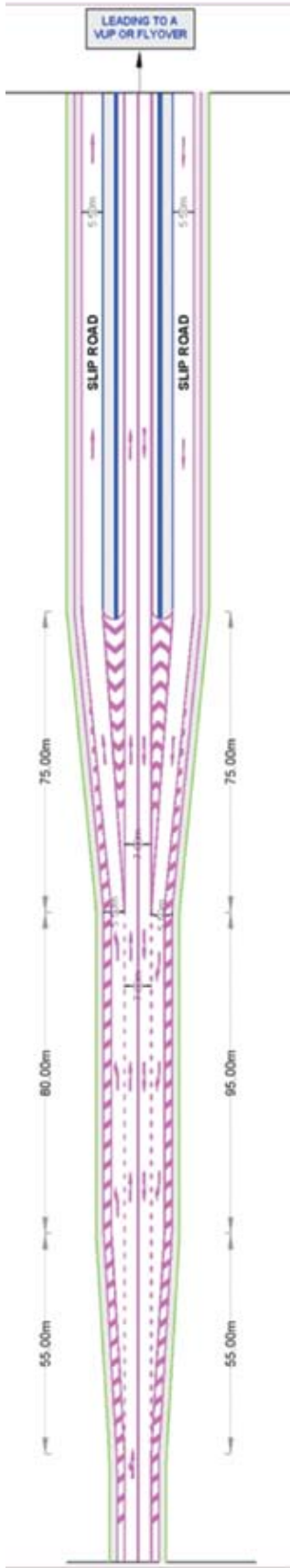


Fig. 2.1C Entry/Exit Arrangement at Grade-Separated Structures with Slip Road (No Service Road)

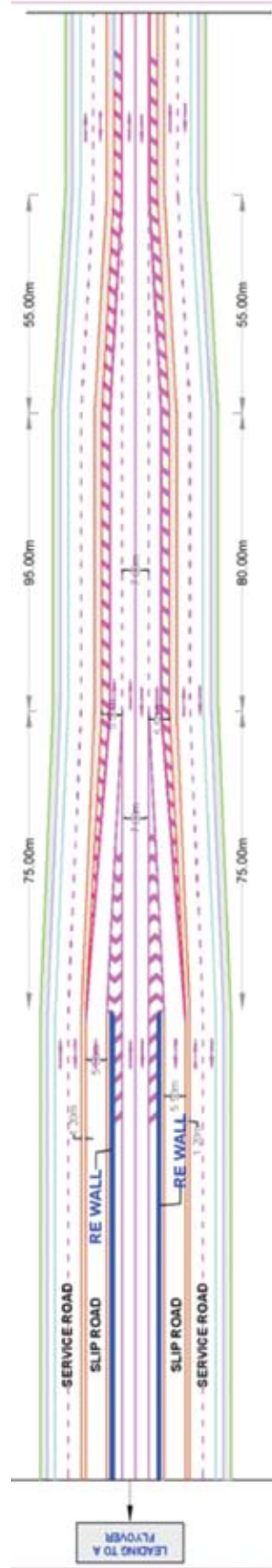


Fig. 2.1D Entry/Exit Arrangement at Grade-Separated Structures with Slip Road (Service Road & Slip Road Segregated)

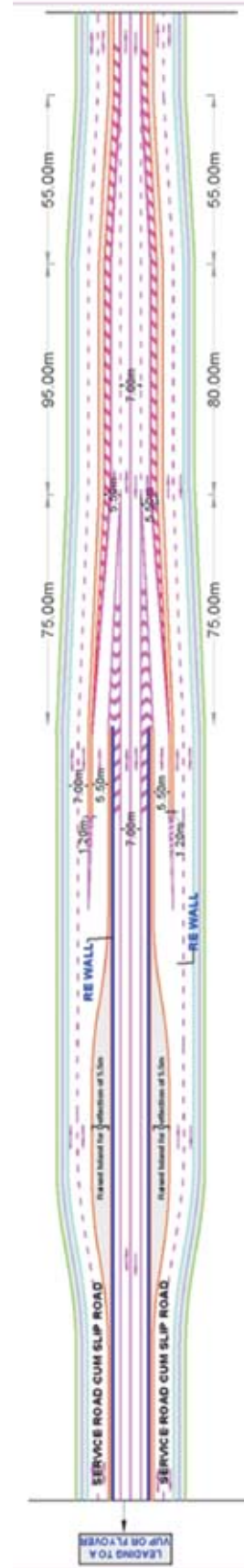


Fig. 2.1E Entry/Exit Arrangement at Grade-Separated Structures with Service Road cum Slip Road (Speed Reduction by Deflection)

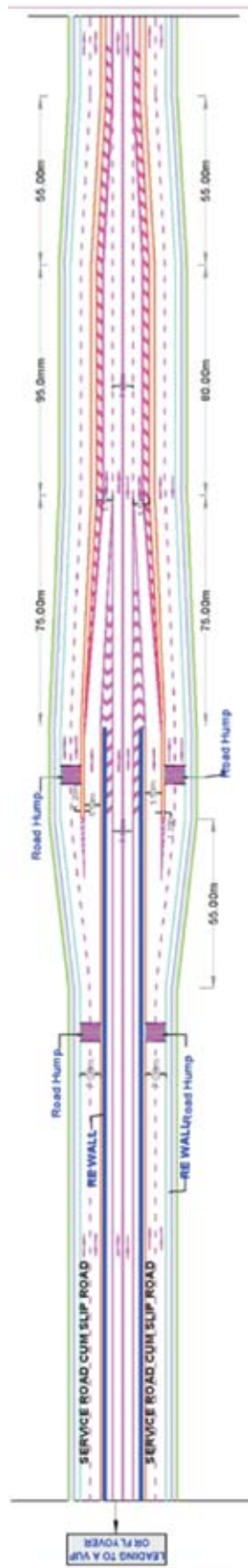


Fig. 2.1F Entry/Exit Arrangement at Grade-Separated Structures with Service Road cum Slip Road (Speed Reduction by Road Hump)

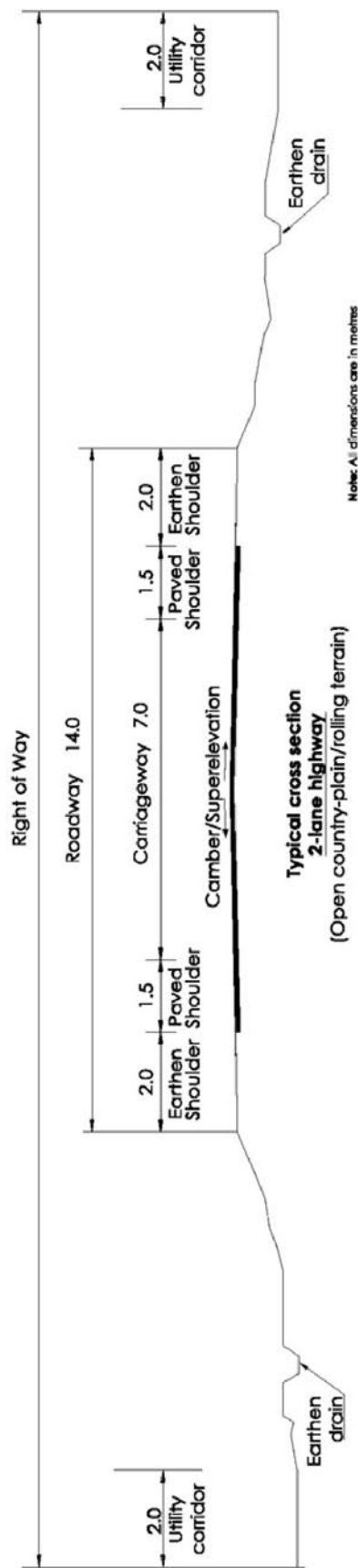


Fig. 2.2

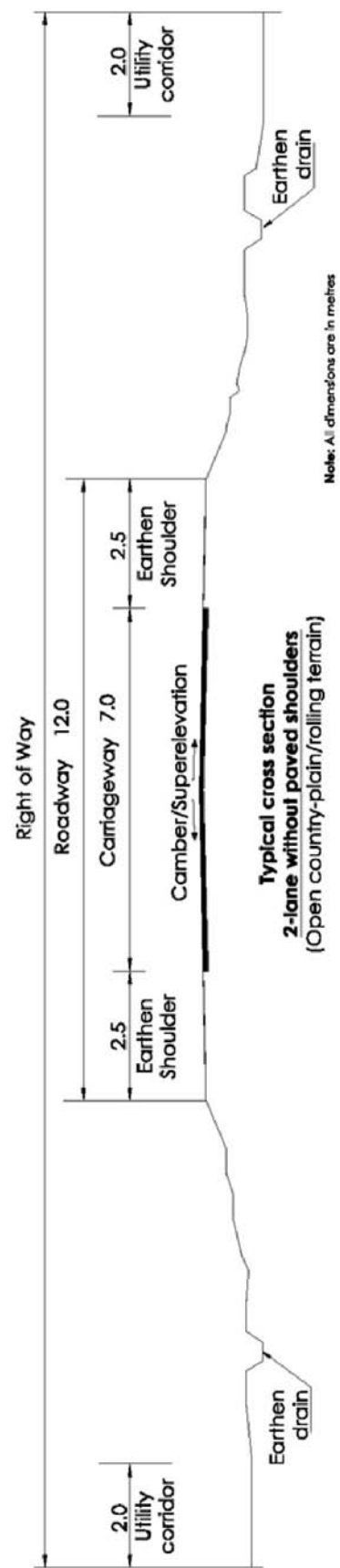


Fig. 2.3

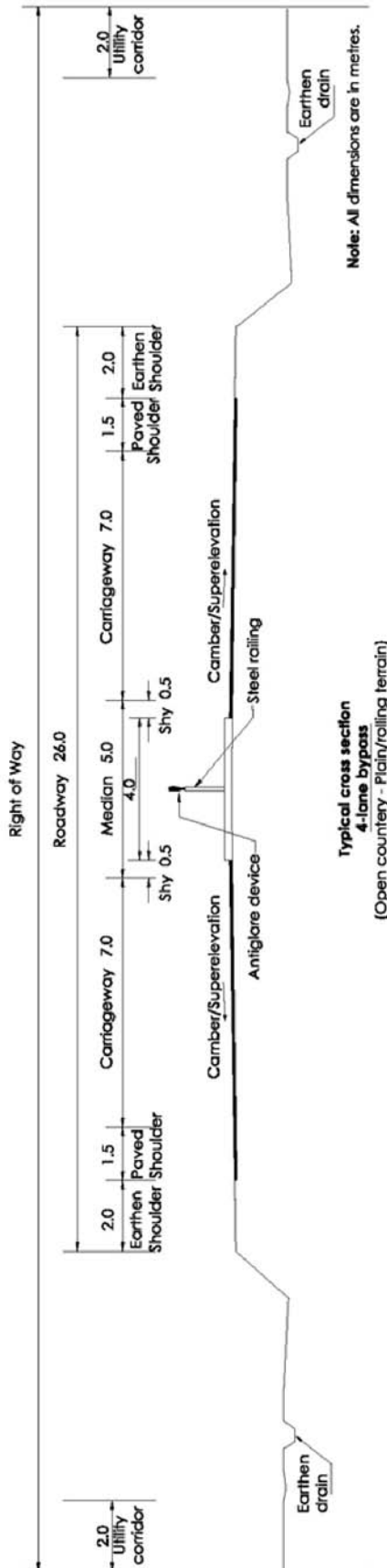
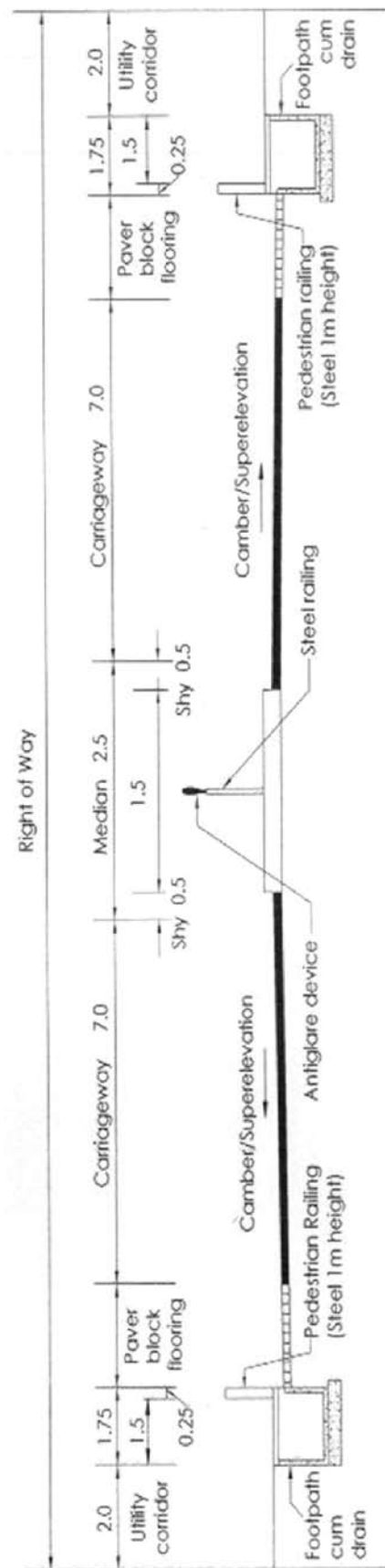


Fig. 2.4



**Typical cross section
4-lane divided carllageway
(Built-up Area)**

- Notes:
1. The shape and size of drain shall be as per drainage design conforming to section 6 of this Manual. The footpath shall however be of minimum 1.5m width as shown.
 2. Paver block flooring shall be provided between the paved shoulder and raised footpath to cover the space within the Right of Way.

Fig. 2.5

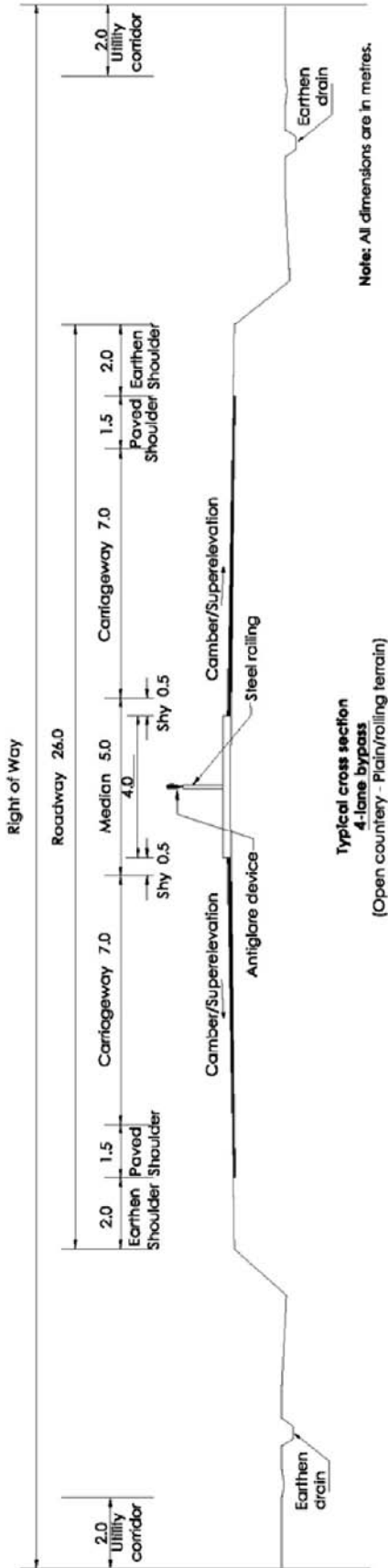
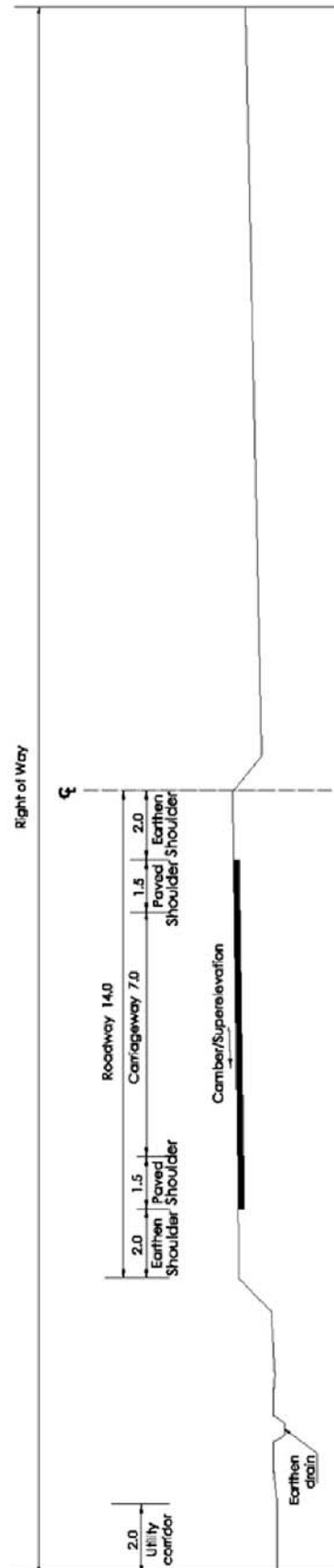


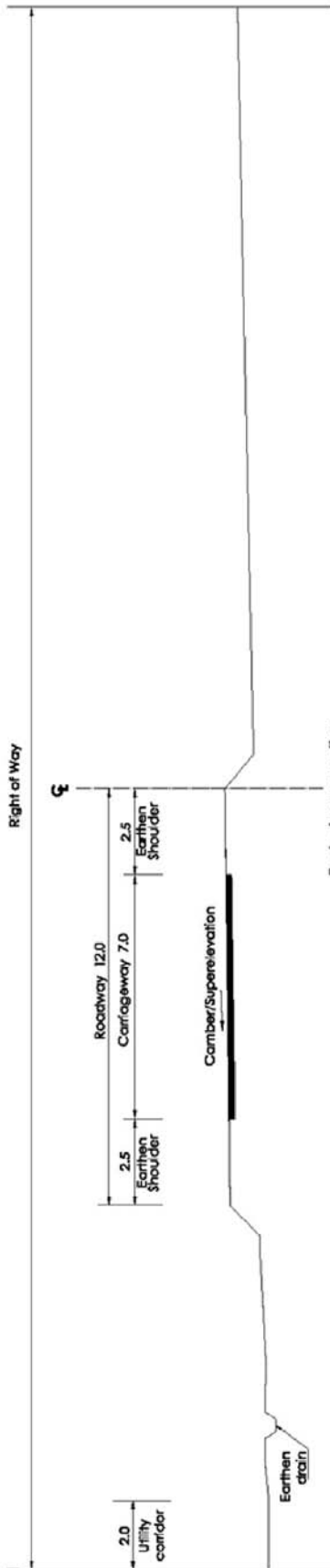
Fig. 2.6



Typical cross section
Eccentrically placed 2-lane bypass
(Open country - Plain/rolling terrain)

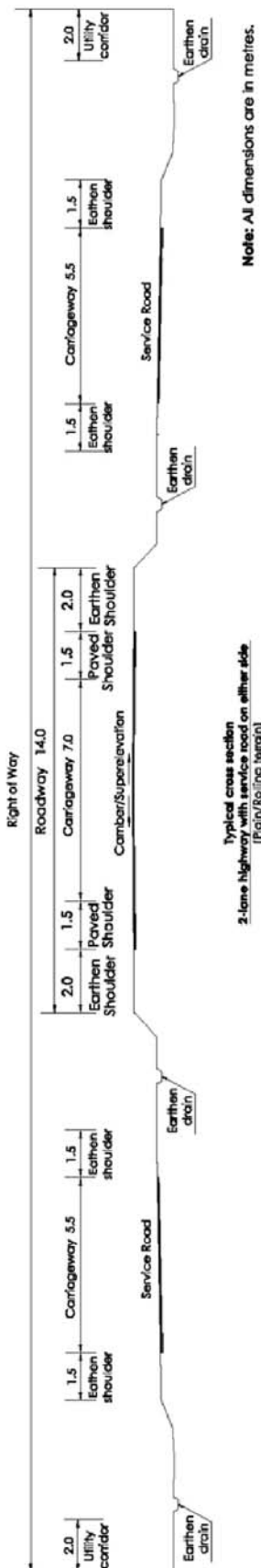
Fig. 2.7

Note: All dimensions are in metres.



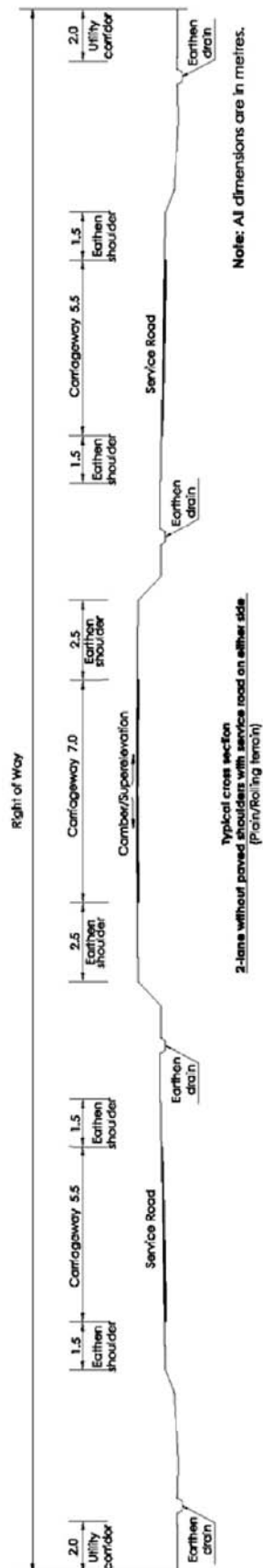
Typical cross section
Eccentrically placed 2-lane bypass without paved shoulders
(Open country - Plain/rolling terrain)

Fig. 2.8



Typical cross section
2-lane highway with service road on either side
(Plain/rolling terrain)

Fig. 2.9



Typical cross section
2-lane without paved shoulders with service road on either side
(Plain/rolling terrain)

Fig. 2.10

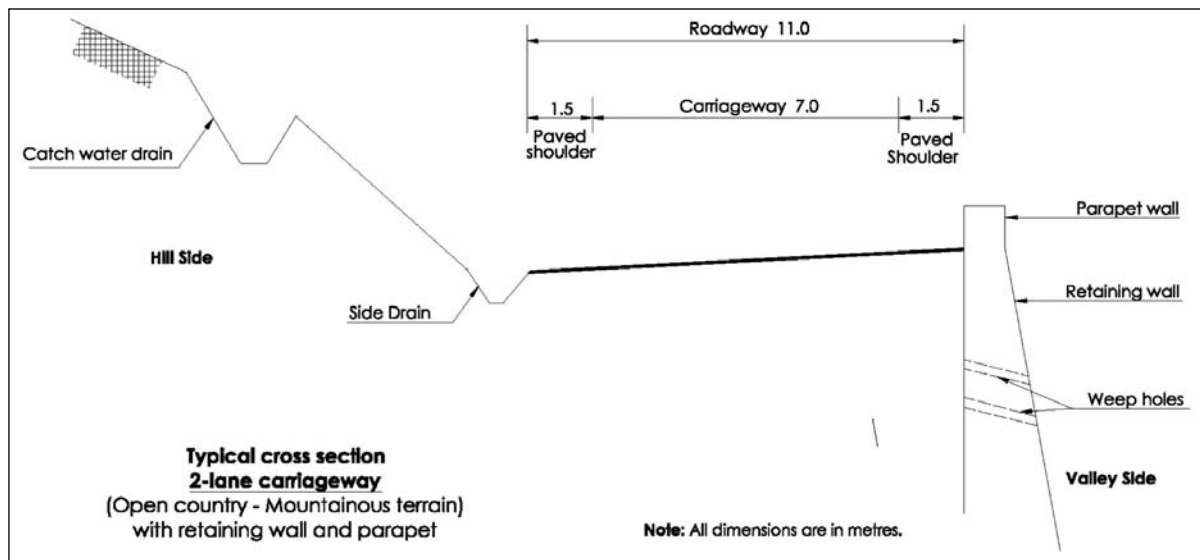


Fig. 2.11

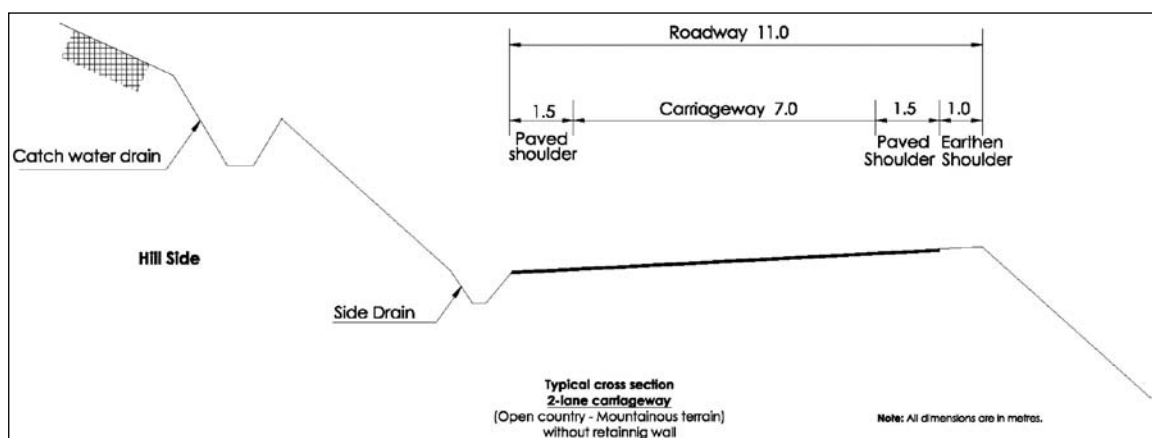


Fig. 2.12

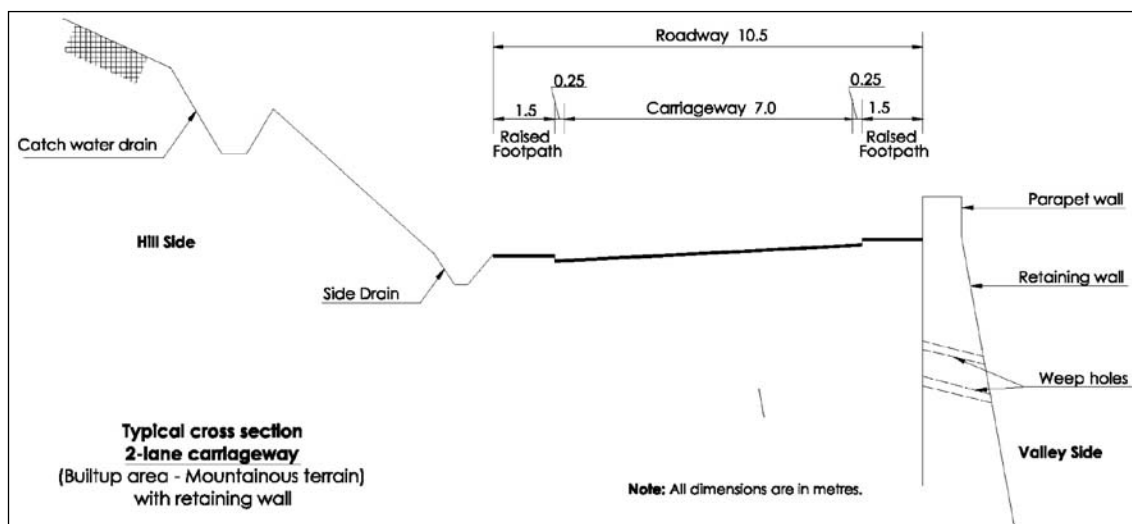


Fig. 2.13

SECTION - 3

INTERSECTIONS AND GRADE SEPARATORS

3.1 Introduction

3.1.1 Subject to the provisions of this Manual, properly designed intersections shall be provided at all road crossings/junctions. The types and locations of Grade-separated Intersections shall be specified in Schedule-B of the Concession Agreement. The intersections to be provided shall be one of the following types:

- i) At-grade intersections
- ii) Grade separated intersections

3.1.2 The existing intersections, which are deficient with respect to the minimum requirements shall be improved to the prescribed standards. Additional land, if any, required for improving the existing intersections shall be provided by the Authority. The types and locations of new Intersections, and grade-separated Intersections shall be based on requirements stipulated in IRC:SP:41, IRC:5, IRC:92 and MORTH Specifications for Road and Bridge works. These shall be specified in Schedule 'B' of the Concession Agreement.

3.1.3 The exit and entry arrangement before and after a grade separator shall also be treated as part of the development of grade separator intersection.

3.2 At-Grade Intersections

3.2.1 General

- i) The majority of the intersections to be encountered will be of At-grade type. These are most economical and are provided at crossing locations, where the traffic on cross roads is low to moderate. These intersections should be properly designed as per details below.
- ii) Type of intersections to be adopted shall be decided on the basis of parameters like number of intersecting legs, traffic volume/speed, available right of way, type of traffic control (signalized/non-signalized) etc. Necessary traffic surveys for the design of road junctions shall be carried out as per IRC:SP:19.
- iii) Normally, the type of intersection shall be:
 - a) Three leg intersection.
 - b) Four leg intersection.
 - c) Multi leg intersection/ roundabout
- iv) The design of different elements of intersection shall be done as per IRC:SP:41
- v) The design shall aim at simplicity and uniformity in design standards. Complex designs which may involve complicated decision making by drivers shall be avoided.

- vi) The intersection control shall be of 'Stop Control' unless specified otherwise. This will mean that traffic on the minor road must stop prior to entering the major road. Where roads of equal importance intersect, priority will be given to the traffic on the right. The traffic control by "STOP" or by "GIVEWAY" shall be decided based on the guidance given in IRC:67 and IRC:35.
- vii) At the intersection, the alignment of project highway should be as straight and the gradient as flat as practicable. Gradients in excess of 2 per cent will normally not be allowed at intersections.
- viii) The alignment and grade of intersecting roads shall be corrected to improve traffic conditions and safety. The intersecting roads shall be regarded, if required so that at least 30 m length of the intersecting road beyond junction is at the same level as that of main carriageway at the junction.
- ix) The sight distance to be adopted shall normally be intermediate sight distance as specified in Section 2. However, in exceptional situations it should not less than minimum stopping sight distance specified in Section 2. At such locations, cautionary speed limit signboards shall be displayed.
- x) At multi leg intersections, the points of conflict should be studied carefully and possibilities of realigning one or more of the intersecting legs and combining some movements to reduce the conflicting movements shall be examined. The objective shall be to simplify the design and appropriate control devices added to ensure more efficient and safe operation.

3.2.2 *Design Standard*

Design standards shall be as per IRC:SP:41 Salient features are given below:

- i) **Design Speed:** The approach speed shall be taken as the design speed adopted for the section of Project Highway on which the intersection is located. The design speed for various elements of the intersection shall be taken as 60% of the approach speed.
- ii) **Design Traffic Volume:** The traffic volume for the design of intersection and its distribution at peak hours shall be assessed, up to the operation period, taking into consideration the past trend, likely new development of land, socio- economic changes, etc.
- iii) **Design Vehicle:** Semi-trailer combination (refer IRC:3) shall be used in the design of intersections.
- iv) The number of lanes to be provided at the intersection shall be governed by peak hour traffic volume in each direction of travel and shall be determined based on the projected traffic for the year in which further capacity augmentation is considered. The minimum width of carriageway and slip road in junction area shall be as indicated in the junction layouts. Widening of carriageway shall be achieved depending upon the approach speed of traffic and based on taper rate stipulated below. Generally desirable minimum taper

shall be followed. In unavoidable situations, absolute minimum values given in the table can be adopted.

Taper Rate		
Speed (kmph)	Désirable Minimum Taper	Absolute Minimum Taper
< 50 kmph	1:35	1:20
50 to 65 kmph	1:40	1:25
66 to 80 kmph	1:45	1:30
>80 kmph	1:50	1:40

- v) Type and radius of curve of intersection: The type and radii of curves would depend upon the types of vehicles turning at the intersection and shall be decided based on the traffic data.
- vi) Visibility at intersection: A minimum safe stopping sight distance, appropriate for the approach speeds, shall be available for the traffic on the Project Highway.

3.2.3 Traffic Control Devices

- i) Road markings: Typical road markings for road intersection as given in IRC:SP:41 and IRC:SP:35 shall be followed. The specifications of road markings shall be as given in Section 9 of this Manual.
- ii) Signs: Traffic signs at the junctions shall be provided as per IRC:67 and Section 9 of this Manual.
- iii) Reflectors: To guide the traffic, reflectors in the form of cat's eyes, delineators, etc shall be provided, in addition to the road markings, especially at the channelizing islands.

3.2.4 Typical at-Grade Junction Layouts

Based on the general principles and design standards laid out, the typical design provided below may be adopted

- i) **Major Junctions:** For major at grade junctions, the layouts described below shall be adopted.
- ii) **Minor Junctions:** Depending upon the situations, following layouts shall be applied for minor junctions.

Figure 3.1 : Layout for T Junction with storage lane with physical island and is applicable for all junctions unless otherwise it falls in the minor junction category.

Figure 3.2 : Layout for staggered Junction with storage lane with physical island and is applicable where there is enough space to convert a cross junction into a staggered junction.

Figure 3.3 Layout for roundabout where project highway joins or intersect with another road of more or less same both hierarchically as well as traffic volume wise and witnessing

considerable right turning traffic. Roundabout can be adopted for rural and semi-urban location to have round-the-clock traffic control.

Figure 3.4 Layout for cross road with signalization and is applicable where approach traffic volume warrants traffic signal and can be adopted in junctions where there is predominate presence of pedestrians and cyclists. In order to ensure round the clock traffic control, signal shall be vehicle actuated.

Figure 3.5 Layout for Simple T junction for an insignificant side road like a property access in the project highway.

Figure 3.6 Layout for Simple Y or skew junction for an insignificant side road joining project highway, wherein the side road traffic has been made to join the project highway at nearly perpendicular in order to achieve mutual visibility between traffic approaching in project highway and that in side road. A direct taper of 50 m shall be given for merging and diverging and also to avoid rear end collision.

Figure 3.7 Layout for T Junction with storage lane with Ghost islands i.e. with markings. The layout is applicable for a minor junction, even if there is few right turning movement to side road, as at some locations, the land availability does not permit provide a junction with shelter lane protected with physical island. Unlike the simple junctions, the small vehicles can still find a shelter, avoiding waiting in the fast lane of through traffic, as they are intended to ply on priority.

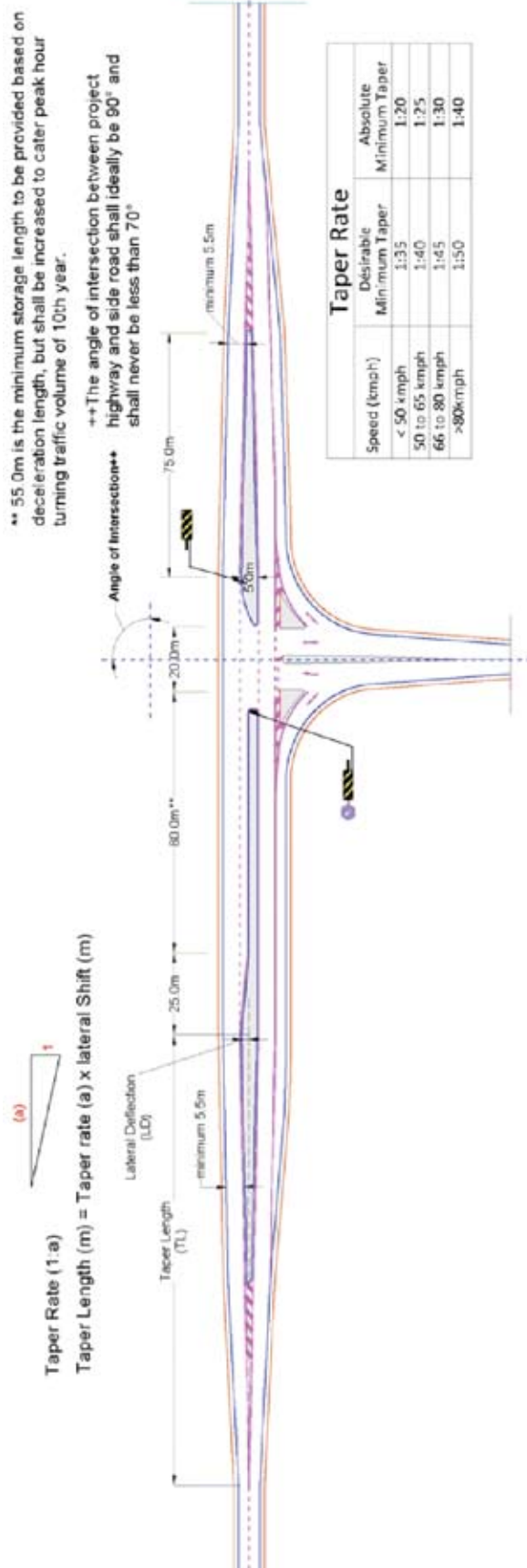
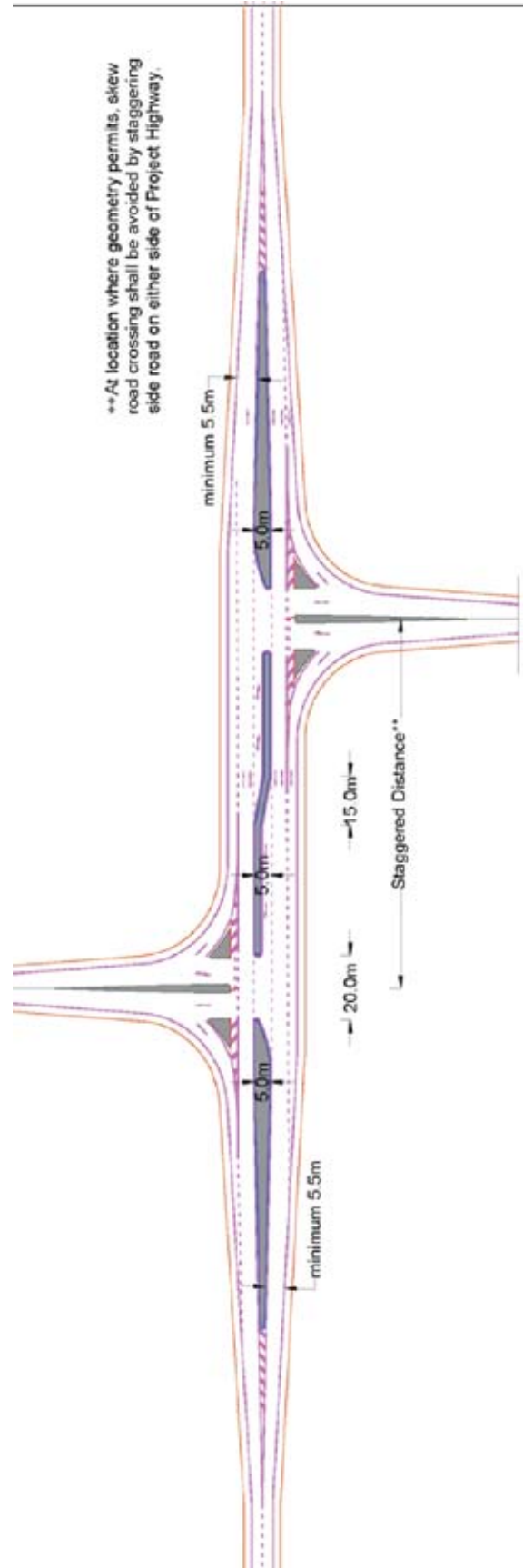
3.3 Grade Separated Intersections without Ramp

3.3.1 General

- i) Grade separated intersections without ramps provide an intermediate solution (between At-grade Intersections and Interchanges) for traffic segregation. These are relatively cheaper as compared to Interchanges. These could preferably, be provided at locations where traffic on cross roads is moderate to heavy and segregation though essential, cannot be provided by an Interchange due to cost constraints. Under this type, two cross roads separate at different grades (as Road Under Bridge or Road Over Bridge) and all turning movements for transfer of traffic between the intersecting roads including merging, diverging, etc. shall be either not catered to or shall be accomplished at surface level through parallel service roads or through similar other mechanism.
- ii) Grade separated intersections without ramps shall be provided at the locations indicated in Schedule-B of the Concession Agreement. The road to be carried over or under the structure shall be specified in Schedule-B of the Concession Agreement.
- iii) All features pertaining to structures for this type of grade separator will be same as provided in Section 2 of this Manual.

3.3.2 Geometric Standards for Design of Various Elements

The geometric design standards for various elements of this type of grade separators shall be as given in paras 3.2.1 and 3.2.2.



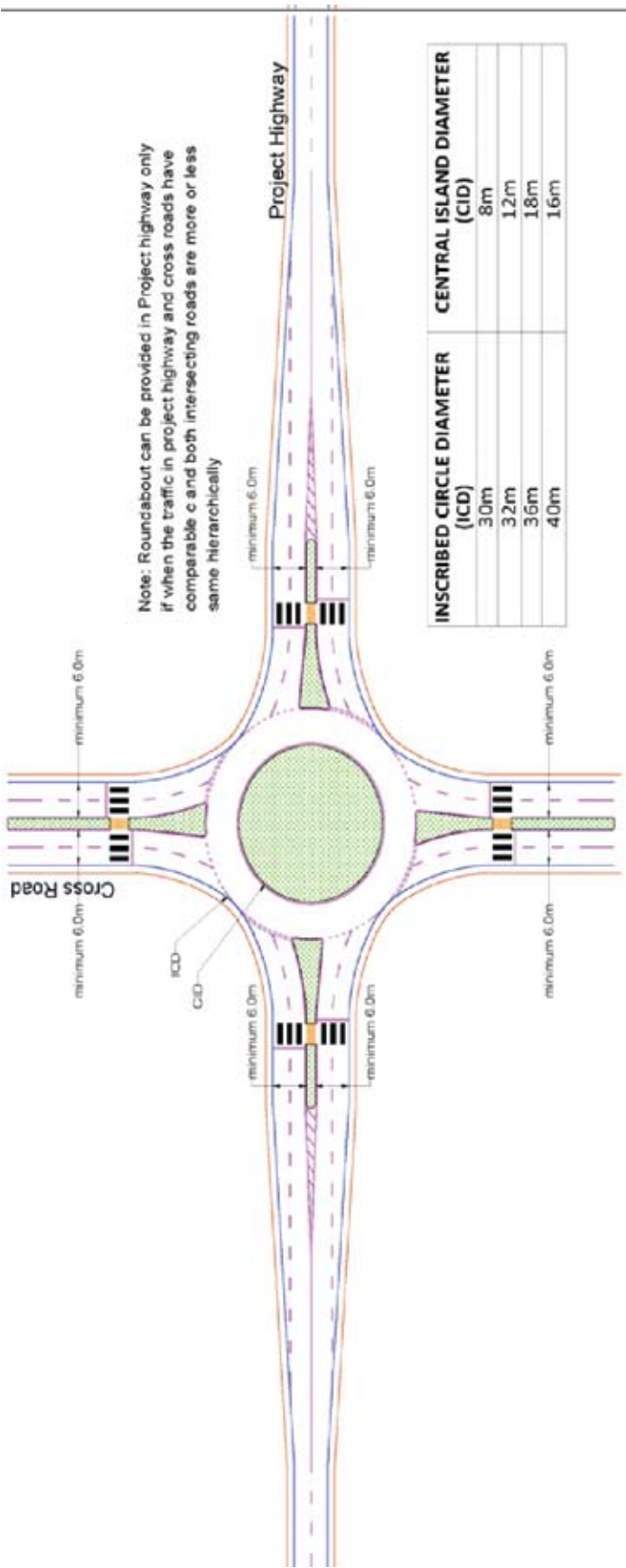


Fig. 3.3 Roundabout (Major Junction)

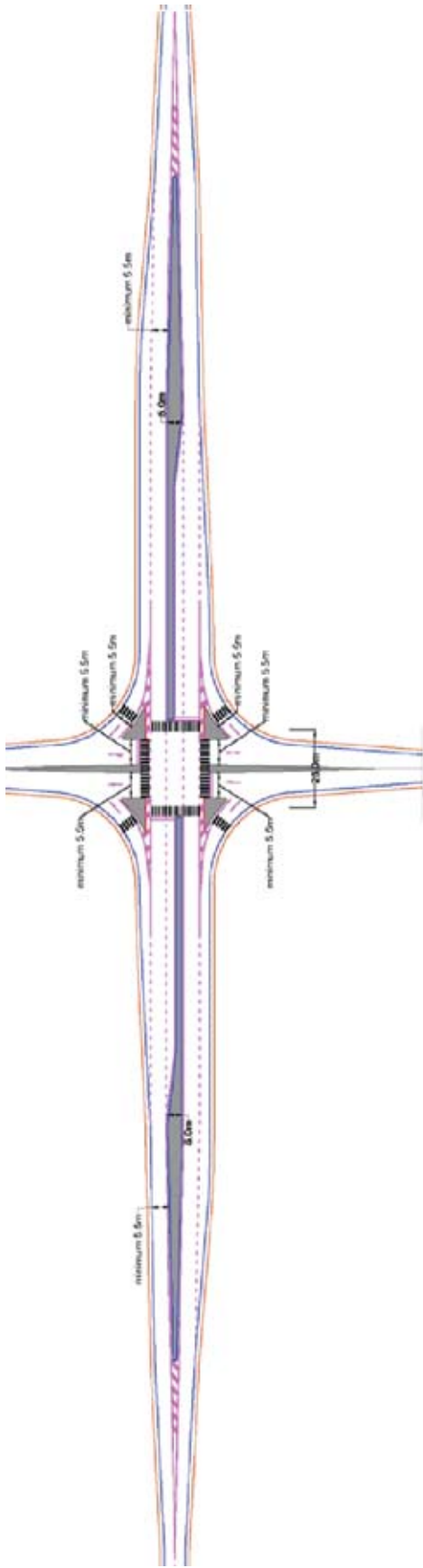


Fig. 3.4 Signalized Cross Road Junction (Major Junction)

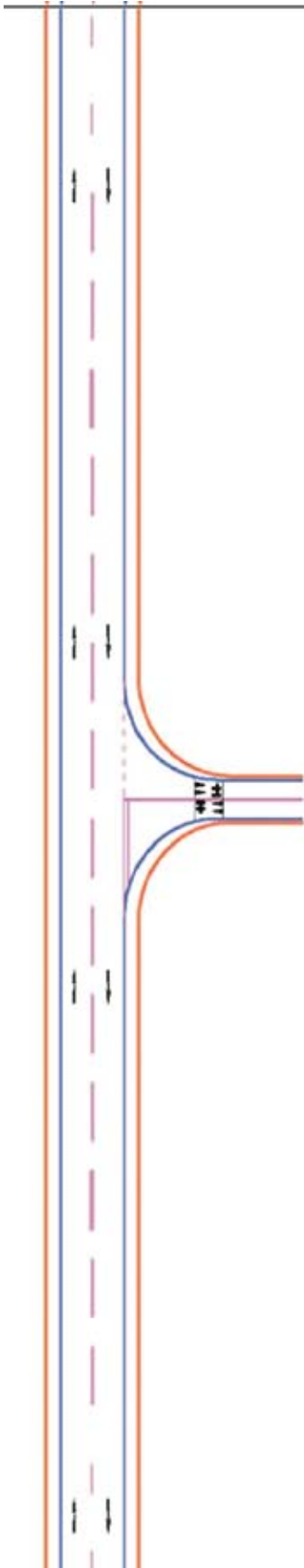


Fig. 3.5 Simple T-Junction (Minor Junction)

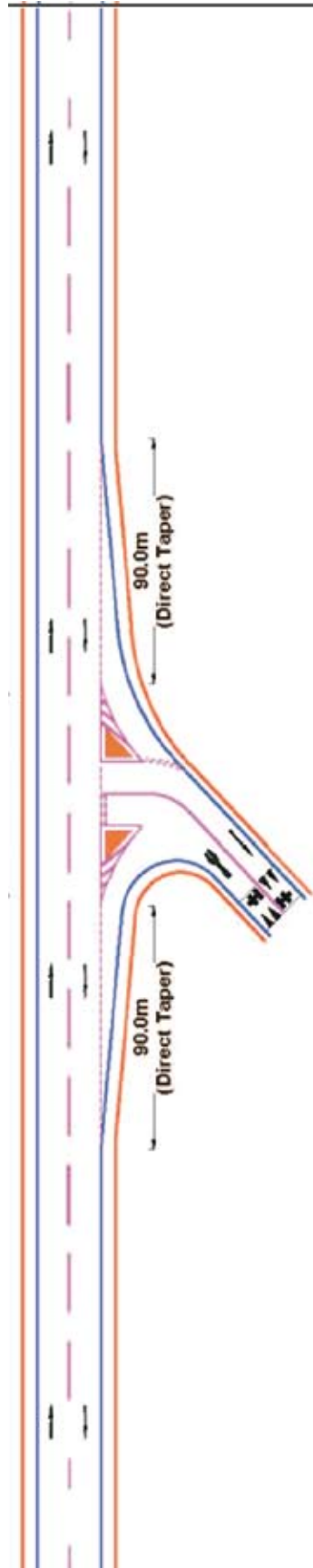


Fig. 3.6 Simple Skew or Y-Junction (Minor Junction)

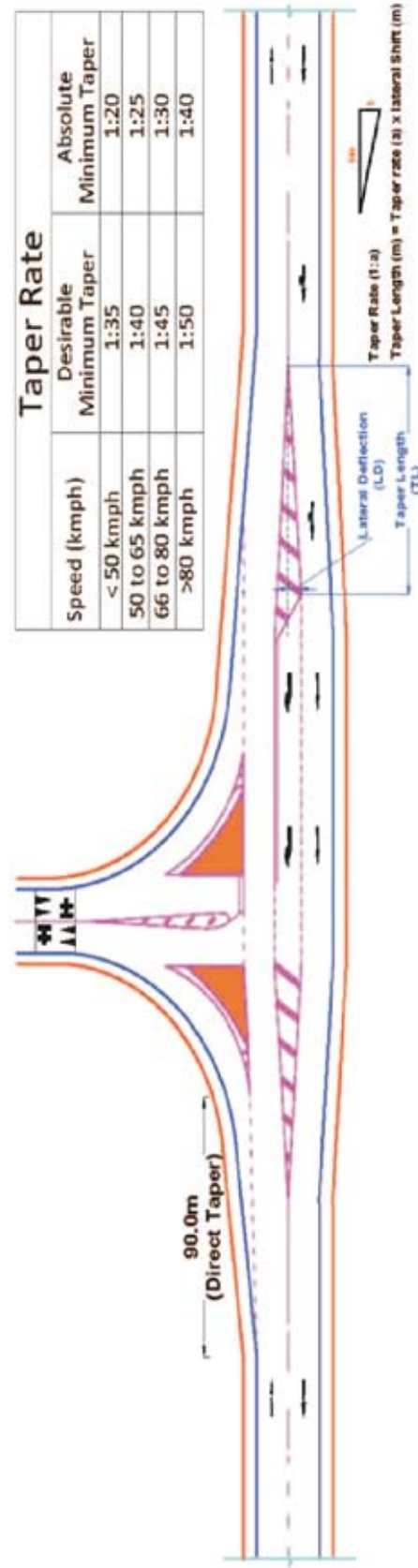


Fig. 3.7 T-Junction with Ghost Islands (Minor Junction)

3.3.3 *Design of Structures*

For design of structures of grade-separated structures, the details given in Sections 7 and 8 of this Manual shall be followed. Minimum length of viaduct required to be provided at various grade separated structures shall be specified by the Authority in Schedule-'B' of the Concession Agreement.

3.3.4 *Traffic Control Devices*

Details given in paras 3.2.3 and 3.4.6 shall apply.

3.3.5 *Detailed Design and Data for Review by IE*

The Concessionaire shall submit the details of the ground surveys, traffic data, traffic forecast, design and drawings of the grade separated intersections and the structures, showing all safety features, to the Independent Engineer for review and comments, if any.

3.3.6 *Typical Layouts for Grade Separated Junction without Ramps*

The grade separator junction is justified at locations where traffic on cross roads is moderate to heavy and for safe and efficient traffic flow, ramps are necessary for cross road traffic. The type and location of interchanges to be provided shall be specified in Schedule 'B'. The grade separator junctions shall be done with appropriate exit and entry before and after grade separator.

Figure 3.8 Junction Layout below a VUP for Low Traffic Volume (Turning Radii for Light Commercial Vehicle)

Figure 3.9 Junction Layout below a VUP for Low Traffic Volume (Turning Radii for Trucks/ Buses).

Figure 3.10 Junction Layout for Medium Traffic Volume (Single Span Flyover & Control by Priority or Traffic Signal.

Figure 3.11 Local Grade Separation where project highway made grade separation over an important arterial where cloverleaf interchange cannot be accommodated.

3.4 **Interchanges**

3.4.1 *General*

- i) An Interchange is a grade-separated intersection with connecting roadways (ramps) for turning traffic between highway approaches. Such an Interchange will be necessary at all crossings of a highway, which is to be developed to completely access controlled standards. An Interchange may also be justified at locations where traffic on cross roads is heavy and when an At-grade intersection fails to handle the heavy volume of turning, merging and diverging traffic leading to excessive delays and fatal and major accidents. Cost effectiveness will decide whether to provide full Interchange or grade separated intersection without ramps.

- ii) An Interchange may be justified at the crossing of the Project Highway with another highway, and where the total traffic on all the arms of the intersection is in excess of 10,000 PCUs in peak hour.
- iii) The decision to provide Interchange at such locations shall be taken by the Authority and the requirement shall be clearly spelt out in Schedule-‘B’ of the Concession Agreement, which shall also indicate specifications and traffic streams to be grade separated.
- iv) The detailed design and layout of the Interchange shall conform to broad parameters and requirements specified by the Authority in Schedule-‘B’ of the Concession Agreement. Based on detailed survey and investigations, the Concessionaire shall develop appropriate detailed drawings and designs and submit to the Independent Engineer for review and comments, if any.

3.4.2 *Types of Interchanges*

- i) Interchanges are generally described by the pattern of the various turning roadways or ramps, which determine their geometric configuration. The common geometric configurations of Interchanges are the trumpet, diamond, cloverleaf, rotary and directional. Within each type of Interchange, there can be several variations such as split diamond, partial cloverleaf, etc. depending on the ramp arrangements.
- ii) The type of Interchanges, the shape and pattern of the Interchange ramps and loops and their designs shall be governed by factors such as the importance of the intersecting highway, the number of intersecting legs, the design volumes of through and turning traffic movements including their composition, the design speeds, available right of way and topography. The Interchange site shall be studied in detail and alternative designs made, to determine the most suitable arrangement of structures and ramps satisfying the specified requirements.

3.4.3 *Geometric Design Standards for Interchange Elements*

The geometric design standards shall be as per IRC:92 appropriate for the design speed adopted for the Project Highway. The design speed for ramps shall not be less than 40 km per hour. The desirable values of various parameters given in IRC:92 shall be adopted, unless there are severe site constraints.

3.4.4 *Design Traffic*

The traffic volume for the design of various elements of Interchange including ramps shall be assessed up to the end of the Concession Period or twenty years, whichever is more, taking into consideration the past trends, likely new development of land, socio-economic changes, etc.

3.4.5 *Design of Structure*

For design of structure of grade-separated structure comprising of main structure and ramps, the details given in Sections 7 and 8 of this Manual shall be followed. Minimum length of

viaduct required to be provided at various grade-separated structure shall be specified by the Authority in Schedule-B of the Concession Agreement.

3.4.6 *Traffic Control Devices*

Traffic signs (refer IRC:67) shall be provided at suitable locations to:

- i) Serve as advance notice of the approaches to the Interchanges;
- ii) Direct drivers into appropriate lanes for diverging/merging movements;
- iii) Identify routes and directions;
- iv) Provide other information of importance to the drivers; and
- v) Show distances to destinations.

The specifications of road markings shall be as given in IRC:35 and as prescribed in Section 9 of this Manual.

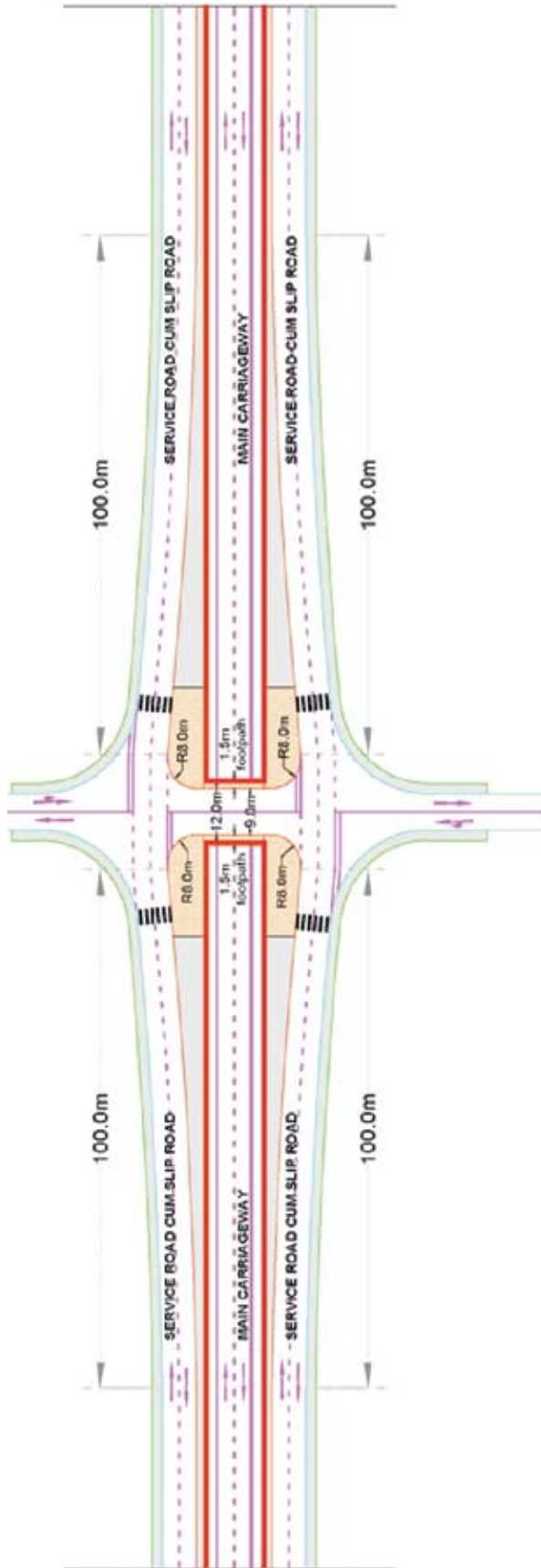


Fig. 3.8 Junction Layout below a VUP for Low Traffic Volume (Turning Radii for Light Commercial Vehicle)

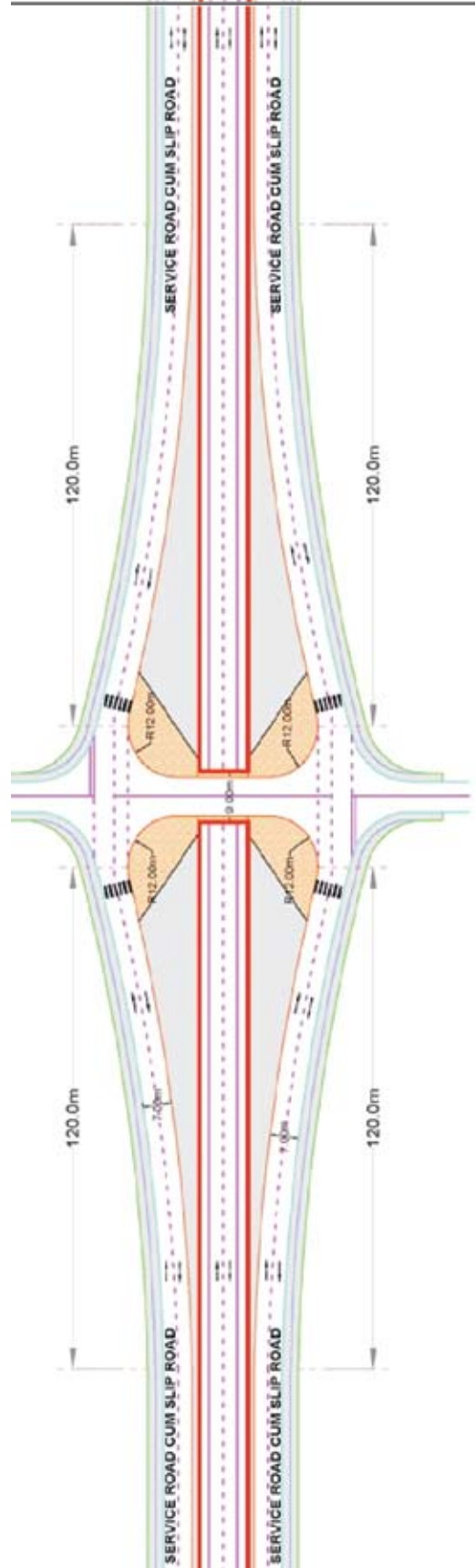


Fig. 3.9 Junction Layout below a VUP for Low Traffic Volume (Turning Radii for Truck/Buses).

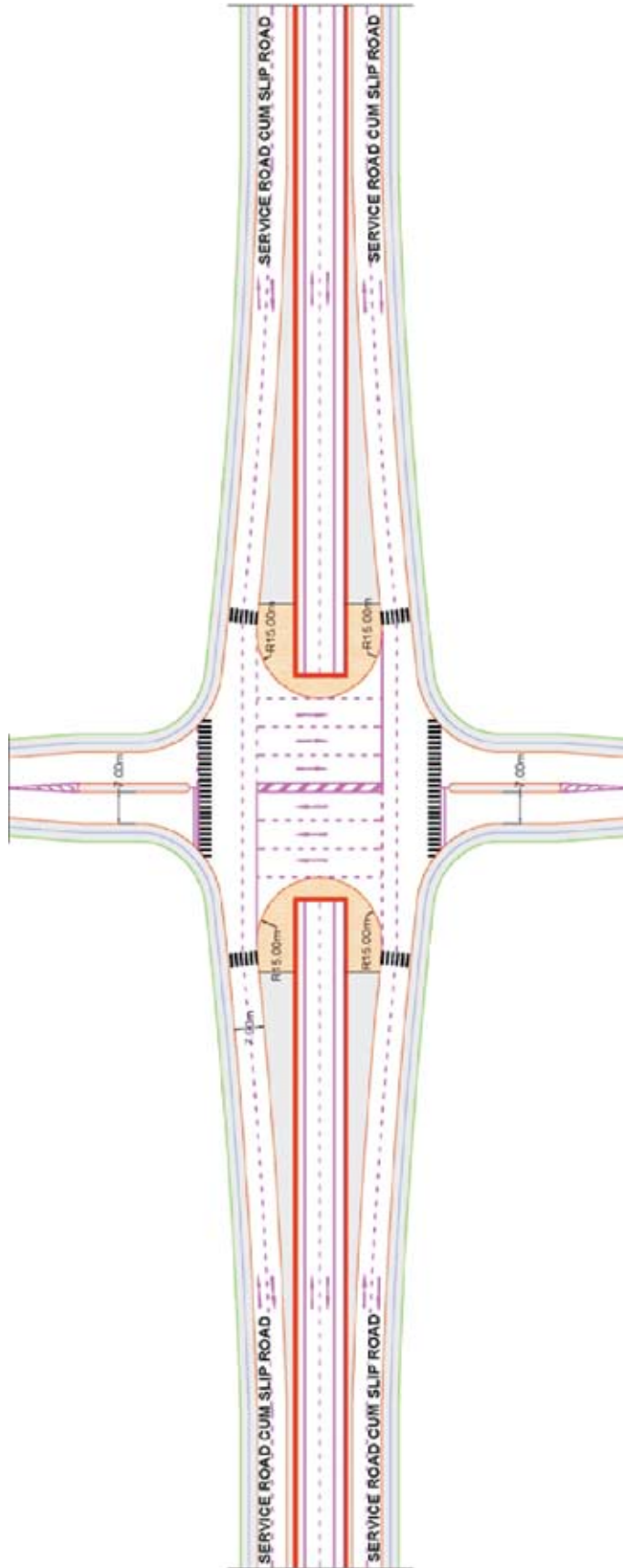


Fig. 3.10 Junction Layout for Medium Traffic Volume (Single Span Flyover & Control by Priority or Traffic Signal)

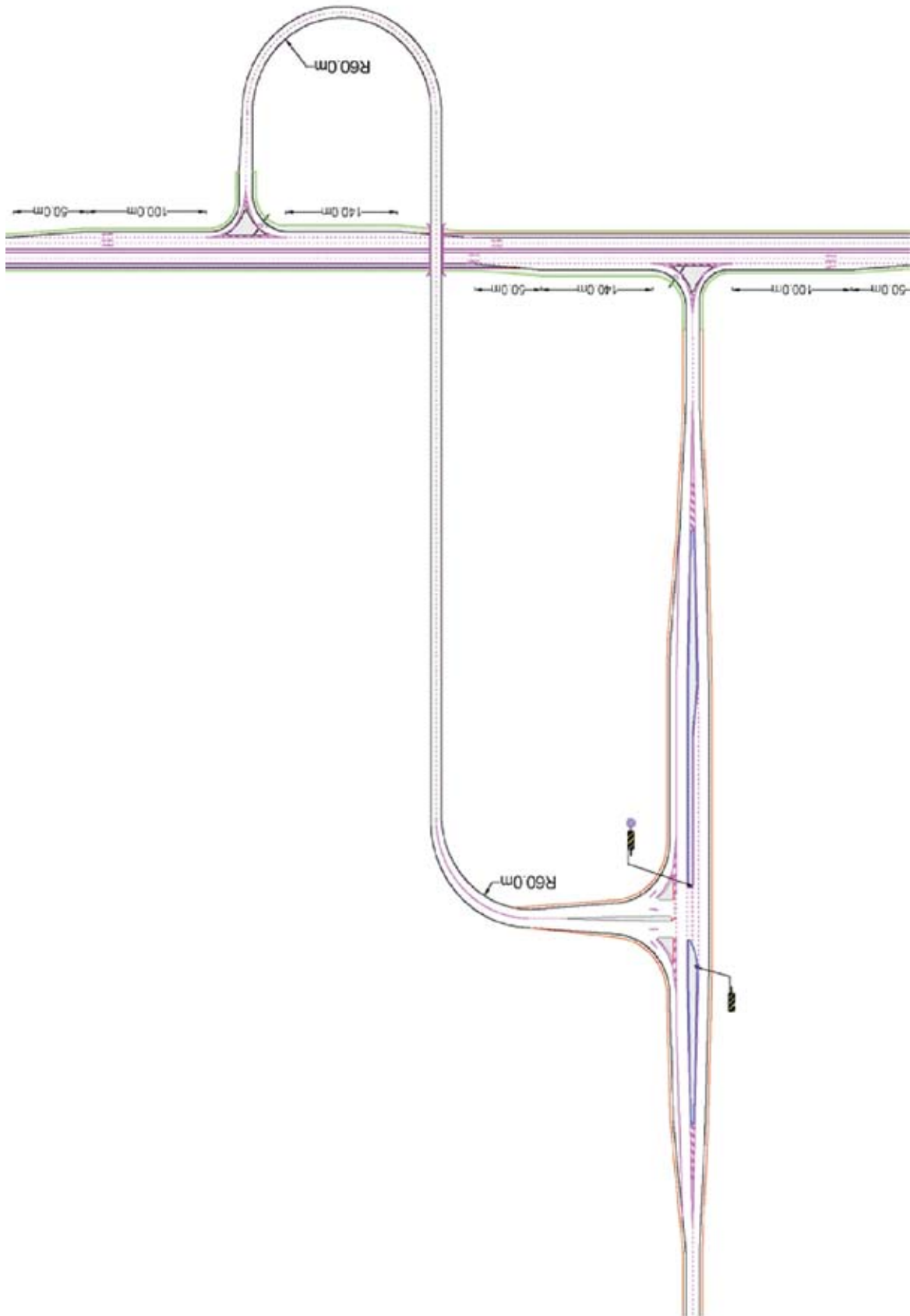


Fig. 3.11 Local Grade Separation for Project Highway upon an Important Arterial Road

SECTION - 4

ROAD EMBANKMENT

4.1 General

4.1.1 The design and construction of the road in embankment and in cuttings shall be carried out in accordance with Section 300 of MORTH Specifications and the requirements, and standards and specifications given in this Section. This Section also covers specifications for sub-grade and earthen shoulders.

4.1.2 Efforts should be made to remove the inherent deficiencies in plan and profile of the existing road. The final centre line of the road and the road levels shall be fixed duly considering all the relevant factors covering structural soundness, safety and functional requirements as per relevant IRC Codes and provisions of this Manual.

4.1.3 The existing road embankment shall be widened/modified to the specified cross-sectional details.

4.2 Embankment

4.2.1 The height of the embankment shall be measured with respect to the finished road levels. The following principles shall be kept in view while fixing the road level :

- i) No section of the road is overtopped. Top of subgrade shall be at least 0.5 m above the general ground level
- ii) The bottom of sub-grade shall be 1.0 m above the High Flood Level (HFL)/ level of water table. The HFL should be decided by intelligent inspections, local observations, enquiries and studying the past records. This shall be relevant to situations where road alignment is sited within the flood plain or in the vicinity of water bodies or where ponding of water is encountered and cannot be efficiently drained. If raising of any section(s) of the existing road is required, the same shall be specified in Schedule 'B' of the Concession Agreement.

4.2.2 *Materials and Physical Requirements*

4.2.2.1 Sourcing of materials for embankment and sub-grade construction, as well as compliance with environmental requirements in respect of excavation and borrow areas under the applicable laws shall be the sole responsibility of the Concessionaire.

4.2.2.2 The material to be used in sub-grade shall satisfy the design California Bearing Ratio (CBR) at the specified density and moisture content.

4.2.2.3 The embankment and sub-grade shall be compacted to satisfy the minimum compaction requirements given in Clause 305 of MORTH Specifications.

4.2.3 *Structural Features and Design of Embankment*

4.2.3.1 Embankment with height 6.0 more above shall be designed in accordance with IRC: 75 taking into account slope stability, bearing capacity, consolidation, settlement and

safety considerations based on geotechnical and investigation data. Where the embankment is to be supported on a weak stratum, appropriate remedial/ground improvement measures shall be taken.

4.2.3.2 Side slopes shall not be steeper than 2H: 1V unless soil is retained by suitable soil retaining structures.

4.2.3.3 The side slopes and the earthen shoulders shall be protected against erosion by providing a suitable vegetative cover, kerb channel, chute, stone/cement concrete block pitching or any other suitable protection measures depending on the height of the embankment and susceptibility of soil to erosion. Drainage arrangement shall be provided as per Section 6 of this Manual. In high rainfall areas and where soil is susceptible to erosion, before providing turfing on slopes and shoulders, a coir or jute blanket shall be placed on such slopes and shoulders immediately after completion of work and in any event before onset of first monsoon after completion of work in that reach.

4.2.4 *Use of Pond Ash for Embankment Construction*

Where pond ash is used for embankment construction in pursuance of the instructions of the Ministry of Environment and Forests or otherwise, the embankment shall be designed and constructed in accordance with IRC:SP:58.

4.3 Roadway in Cutting

4.3.1 The road level shall be fixed, keeping in view the provisions of relevant IRC Codes.

4.4 Soil Investigations and Design Report

4.4.1 *General*

The Concessionaire shall carry out necessary soil surveys, and field and laboratory investigations for selecting appropriate borrow pits, identifying and treating problematic ground locations, if any, and for finalizing structural features and design of the embankment and cut sections and establishing improved ground properties. A report on the soil investigation shall be furnished along with the design.

4.4.2 *Soil Investigations for Embankment*

Soil investigations shall cover the following:

- a) Soil investigations and tests in accordance with the requirements specified in IRC:SP:19 and shall be reported in the Proforma given in **Table 1** of IRC:SP:19. In addition to this, all tests as per the requirements of MORTH Specifications shall be reported.
- b) In respect of embankments with height more than 6 m, additional investigations and soil tests as per IRC:75 and Appendix 10 of IRC:SP:19.
- c) Information regarding the topography, high flood level, natural drainage conditions, highest sub-soil water level, and the nature and extent of inundation, if any.

- d) The characteristics of embankment foundation including the presence of any unsuitable/weak strata, marshy areas, waterlogged areas, etc.
- e) Along the alignment of the road, where unstable strata, soft material or poor subsoil conditions have been met with at the foundation level, the soil profile shall be drawn after determining through borings, the type of soil at different levels. The borings shall be at maximum interval of 100 m to a depth of 2 m or more below the existing ground as necessary. In the case of high embankments, the borings shall be taken down to a depth equal to twice the height of the embankment.
- f) Any particular construction problems of the area or other important features.
- g) Geotechnical properties of pond ash, covering parameters specified in Table 1 of IRC:SP:58 and Optimum Moisture Content (OMC) - dry density relationship for heavy compaction. This information shall be furnished, in case pond ash is used in embankment construction.

4.4.3 *Soil Investigations for Cut Sections*

Soil investigations and tests shall be carried out in accordance with the requirements specified in IRC:SP:19 and information regarding depth of water table, seepage flow, presence of any weak, unstable or problematic strata.

4.4.4 *Design Report*

The Concessionaire shall prepare the design report with all relevant details including the following:

- i) Road Embankment
 - a) The detailed design of the embankment, remedial/ground improvement treatment where required. For embankments with height more than 6 m, construction methodology should also be included.
 - b) Design of retaining walls/reinforced earth structures.
 - c) Design of protection measures for embankment slope and drainage arrangement.
 - d) Design of pond ash embankment in case use of pond ash is proposed.
 - e) Any additional information relevant to the design of embankment.
- ii) Cut Section
 - a) Type of cutting involved and proposed cut slopes shall be provided in accordance with the nature of the soil encountered. Where required, benching including use of slope stability measures like pitching, breast walls, etc. shall be adopted to make the slopes stable and safe
 - b) Design and details of erosion control, slope protection measures, etc.

- c) In cut sections in hilly terrain, the problem of seepage flow is common. Where such conditions exist, necessary measures shall be taken including provision of deep side drains to intercept the seepage flow and discharge the drained water into suitable outlets to avoid any damage to road and cut slopes. Design and details of drainage arrangement for sub-soil and surface water shall be furnished. It should be ensured that rain water and seepage water is quickly drained out. The gradient of drain shall not be flatter than 1 in 200.
 - d) Any other additional information relevant to the design of cut slopes.
-

SECTION - 5

PAVEMENT DESIGN

5.1 General

5.1.1 The design and construction of new pavement sections, and of strengthening measures (overlay) for the existing pavement shall be carried out in accordance with the criteria, standards and specifications given in this section. Where alternative specifications or materials are proposed to bring in innovation in design etc., provisions of paras 1.9 and 1.11 of this Manual shall apply.

5.1.2 Design of new pavement sections or widening and strengthening of existing pavements shall take in to account all relevant factors for assuring reliable performance that satisfies the specified minimum performance requirements.

5.1.3 The Concessionaire shall undertake the necessary soil, material and pavement investigations and traffic volume and axle load studies in accordance with the good industry practice for preparing detailed designs.

5.1.4 The materials, mixes and construction practice shall meet the requirements prescribed herein and MOSRTH Specifications/IRC Specifications.

5.1.5 Where problematic conditions such as expansive soils, swamps or marshes, flooding, poor drainage, frost susceptible areas etc. are found to exist, adequate measures shall be adopted to deal with such site conditions.

5.2 Type of Pavement

5.2.1 The type of pavement to be provided shall be specified in Schedule 'B'. If nothing is specified the Concessionaire may adopt any type (flexible/rigid) of pavement structure for new construction and/or widening of existing carriageway.

5.2.2 Strengthening of the existing flexible pavement will be carried out by providing appropriate bituminous overlay, unless specified otherwise in Schedule 'B' of the Concession Agreement.

5.3 Method of Design - New Pavements

5.3.1 *Method of Design of Flexible Pavement*

The new pavement shall be designed in accordance with the IRC:37. "Guidelines for the Design of Flexible Pavements".

5.3.2 *Method of Design of Rigid Pavement*

Rigid pavement shall be designed in accordance with the method prescribed in IRC:58. "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways" or IRC:101 "Guidelines for design of Continuously reinforced Concrete Pavement".

5.4 Design Requirements for New Pavement Sections

5.4.1 Flexible Pavement - Design Period and Strategy

- i) Flexible pavement shall be designed for a minimum design period of 15 years, subject to the condition that design traffic shall not be less than 20 msa. .
- ii) Stage construction shall not be permitted.

5.4.2 Rigid Pavement-Design Period and Strategy

Rigid pavement shall be designed for a minimum design period of 30 years. The stage construction shall not be permitted.

5.4.3 Pavement performance requirements for main carriageway, service roads, entry/exit ramps and acceleration/deceleration lanes shall be follows :

- i) The pavement structure shall be capable of giving the specified performance over the entire operation period.
- ii) The new pavement surface shall satisfy the following standards,
 - a) Surface Finish As per requirements of Clauses 902 and 903 of MORTH Specifications
 - b) Roughness in each lane Not more than 2000 mm/km for each lane in a km length
 - c) Rutting in wheel path Nil
measured by 3 m Straight Edge.
 - d) Cracking or any other distress Nil
- iii) During the operation period, the pavement surface roughness or any structural or functional distress shall not exceed the values specified in Schedule-K of the Concession Agreement. Generally the pavement condition in terms of roughness, cracking and rutting should not deteriorate to the maximum values specified in Schedule-K for rectification, earlier than 5 years from the original level from the year of rectification. Any treatment in the form of renewal/overlay carried out or required to restore/correct/ improve the riding quality or any distress shall be of such thickness and specification that will restore the riding quality to roughness not exceeding 2000 mm/km.
- iv) During the operation and maintenance period, the pavement strength shall be evaluated periodically through deflection measurements (Refer to Para 5.8 (ii) of this Section) and the stretches exhibiting any structural deficiency shall be rectified. If the deflection measurements are more than 1.2 mm, the pavement shall be strengthened in those reaches.

5.4.4 The performance of the rigid pavement shall meet the requirements as specified in IRC:SP:16 and IRC:SP:83.

5.5 Design Traffic

5.5.3 The design traffic shall be estimated in terms of cumulative number of standard axles (8160 kg) to be carried by the pavement during the design period.

5.5.4 *Initial Daily Average Traffic Flow shall be Assessed based on IRC:9.*

5.5.5 Any likely change in traffic due to proposed improvement of the facility and/or future development plans, land use, shall be duly considered in estimating the design traffic.

5.5.6 Traffic growth rate shall be established for each category of commercial vehicles to be considered for design of pavement. For traffic projections, the procedure outlined in IRC:108 may be followed. The Concessionaire shall adopt an realistic value of the rate of traffic growth, provided that annual rate of growth of commercial vehicles adopted shall not be less than 5 percent.

5.5.7 Axle load surveys shall be carried out to estimate the Vehicle Damage Factor (VDF) for each category of commercial vehicles. The axle load equivalency factors recommended in IRC:37 shall be used for converting different axle load repetitions into equivalent standard axle load repetitions. VDF values so determined shall be used for estimating design traffic in standard axles.

5.5.8 *Lane Distribution Factors given in IRC:37 shall be Adopted*

5.5.9 For rigid pavements Equivalent Damage Ratio (EDR) shall be adopted as given in IRC:58.

5.5.8 The design traffic in case of service road shall be ten million standard axles. The crust composition shall be provided accordingly.

5.6 Sub-grade

The Sub-grade, whether in cut or fill, shall meet the requirements stipulated in Clause 305 of MORTH Specifications.

5.7 Pavement Components and Materials

- i) The pavement construction materials for sub-base, base and bituminous surfacing shall conform to the requirements prescribed in MORTH Specifications and IRC Standards.
- ii) Where several materials will adequately serve as component within the pavement structure, such as a sub-base or a base course, the Concessionaire shall have the option of using any of the materials specifications, subject to sound engineering practice and product quality requirements.

5.8 Performance Evaluation

- i) Roughness in each lane for full length shall be measured twice a year using appropriate approved method and equipment.
- ii) The structural evaluation of the pavement shall be made by taking deflection measurements every 5 years, in accordance with the procedure given in

relevant IRC Code, unless needed earlier for stretches exhibiting severe distress during the operation and maintenance period.

5.9 Widening and Strengthening of Existing Pavement to Two Lane

5.9.1 The thickness of the pavement layers for widening portion shall be as per IRC:37, independent of pavement composition of existing carriageway. However, the total pavement thickness of the widening portion shall not be less than the thickness of existing carriageway plus overlay. It shall also be ensured that drainage layer of exiting carriageway matches with the drainage layer of widening portion.

5.9.2 The pavement shall be widened on one side or on both sides depending on the placement of the existing road within the right of way. This aspect may be decided in consultation with the Independent Engineer, in case not specified in the relevant schedule of the Concession Agreement.

5.9.3 Before strengthening treatment is prescribed, a detailed pavement condition survey and evaluation shall be carried out in accordance with relevant IRC codes to determine:

- (i) The extent of distress and nature of deficiency in the existing pavement structure, and
- (ii) Whether any special treatments e.g. provision for remedying reflection cracking, pavement internal drainage, sub grade improvement/reconstruction, or rectification of any other deficiencies are warranted.

5.9.4 Before implementing the strengthening treatment, the existing pavement surface profile shall be checked and if found deficient, shall be corrected by providing a suitable profile corrective course or by milling and recycling. The profile corrective course shall meet the following requirements:

- (i) The profile corrective course shall not form part of the overlay thickness.
- (ii) Where the maximum thickness of profile corrective course is not more than 40 mm, it shall be constructed as an integral part of the overlay course. In other cases, the profile corrective course shall be constructed as a separate layer.
- (iii) Where it is to be laid as integral part of the overlay/strengthening course, the profile corrective course material shall be of the same specifications as that of the overlay/strengthening course.

5.9.5 Necessary corrective measures to treat the identified deficiency vide paras 5.9.3 and 5.9.4 above, shall be taken along with strengthening of the pavement.

5.9.6 In stretches where the pavement is damaged/deteriorated to such an extent that the use of Falling Weight Deflectometer (FWD) may not result in a realistic assessment of the strengthening treatment, pavement shall be designed as new pavement.

5.9.7 Where an existing pavement is built over an untreated expansive/black cotton soil sub-grade, its improvement/strengthening shall be treated separately. Such stretches

shall require reconstruction with provision of necessary measures such as replacement treatment of expansive sub-grade, drainage, etc. as per the prescribed specifications and IRC:37 and shall be designed as new pavement. Stretches to be reconstructed, whether due to expansive sub-grade or having grossly deteriorated, etc. shall be specified in Schedule 'B' of the Concession Agreement.

5.9.8 No granular layer shall be provided over an existing bituminous surfacing. Situations may arise where it is envisaged to strengthen grossly deficient existing road with a granular layer in addition to the bituminous overlay, or where for camber and/or grade correction substantial thickness of profile corrective course is needed. In such cases, the existing bituminous surfacing shall be completely removed by scarifying/milling and then the pavement built up with the granular layer(s) and bituminous overlay. The thickness and composition of bituminous surfacing (Binder course and Wearing course) over the granular layer shall conform to IRC:37.

5.9.9 *Design of Overlay*

- i) The thickness of the bituminous overlay shall be determined on the basis of FWD (Ref. IRC:115) method and the design traffic as per the procedure outlined in IRC:81
- ii) The design period will be the same as specified for the new pavement sections vide Para 5.4.1 of this Section.
- iii) The design traffic will be estimated as per the procedure described for new pavement.
- iv) The thickness of bituminous overlay for pavement strengthening shall not be less than 40 mm bituminous concrete, after attending to the requirements of profile corrective course.

5.9.10 *Bituminous Mix for Overlay*

- i) The specifications for the bituminous mixes for the overlay shall be as specified for bituminous surfacing for new pavement sections.
- ii) Design of recycled mix where provided shall conform to the requirements of Clause 517 of MORTH Specifications.

5.9.11 *Pavement Performance Requirements and Evaluation*

- i) The strengthened pavement shall satisfy the minimum standard and maintenance requirements specified for new pavement sections in this Manual and Schedule-K of the Concession Agreement.
- ii) The performance measurement and evaluation will be done as given in this Manual.

5.10 **Paved Shoulders and Paved Median Strips**

- i) The paved shoulders shall be constructed in layers, each matching the thickness of the adjoining pavement layer. The work shall be carried out in accordance with Clause 407 of MORTH Specifications.

- ii) Where the existing pavement is to be widened to two lanes with paved shoulders, the pavement layers in the main carriageway and in the paved shoulders width shall be laid and compacted together.
- iii) If the thickness of the existing paved shoulders, if any, is less than the thickness of the adjacent pavement, the paved shoulders shall be re-constructed to the new pavement thickness.
- iv) The overlay on the main carriageway pavement and on the paved shoulders shall be uniform in thickness and composition.

5.11 Earthen Shoulders

Top 150 mm of earthen shoulder shall be well graded naturals and, moorum, gravel, crushed stone or combination there of, conforming to Clause 401 of MORTH Specifications and having soaked CBR value of not less than 30%. The granular layer shall be compacted to atleast 98% of the maximum dry density for the material determined as per IS:2720 (Part 8). Remaining portion shall conform to Section 300 of MORTH Specifications.

5.12 Construction, Workmanship and Quality of works.

All materials, construction operations, workmanship, surface finish and quality of completed construction for all pavement works including sub-grade, sub-base, base course, bituminous surface courses for both new pavement and strengthening of existing pavements, shoulders, service roads, etc. shall conform to the specified requirements and comply with the provisions of Section 900 of the MORTH Specifications

5.13 Premature Distress

Not with standing the minimum design, specifications and standards specified in the preceding paras for new pavements and strengthening of existing pavements, if the pavements how prematured is tress in the form of cracking, rutting, patching, loss of camber or any other structural or functional distress, necessary remedial measures by strengthening/resurfacing/recycling shall be undertaken for conforming to the minimum requirements prescribed in Schedule-K of the Concession Agreement. In case of repetition of distress, reconstruction shall be resorted to after proper investigations.

SECTION - 6

ROADSIDE DRAINAGE

6.1 General

6.1.1 The design and construction of surface and subsurface drains for highway drainage and drainage for structures shall be carried out in accordance with the requirement of this Section.

6.1.2 For efficient drainage system for the entire Project Highway including structures, directions contained in Clause 309 of MORTH Specifications, IRC:SP:42, IRC:SP:50 and IRC:SP:90 as relevant shall be followed.

6.1.3 In road sections in cuttings and at underpasses where it may not be possible to drain out the water using gravity flow, vertical drains may be planned and if necessary, arrangement for pumping shall also be made.

6.2 Surface Drainage

6.2.1 The selection of type of roadside drains shall be based on the magnitude and duration of flow. The roadside drains shall be designed on the principles of flow in open channel.

6.2.2 The road side drains shall not pose any danger to traffic, slopes of cuttings, embankment, pavement or structures.

6.2.3 As far as possible, longitudinal slope shall not be less than 0.2 percent for lined drains and 0.3 percent for unlined drains. Permissible non-erodible flow velocity for corresponding earth surface as mentioned in Clause 9.4 of IRC:SP:42 shall be kept in view.

6.2.4 The side slopes of the unlined drains shall be as flat as possible and shall not be steeper than 2H: 1V.

6.2.5 RCC/Cement Concrete drains shall be provided in the following situations:

- i) When due to space constraint, the drains are located near the toe of the embankment or near structures.
- ii) Drains located in built-up areas.
- iii) Flow velocity is more than 1 m/s in silt and sand; and more than 1.5 m/s in stiff clay.

6.2.6 In built-up areas, covered RCC/Cement Concrete or piped drains, with manholes at suitable intervals to de-silt the drains shall be provided.

6.2.7 The drainage of cross roads shall be maintained. RCC Box of sufficient size shall be provided across the cross road to maintain the longitudinal drainage along the Project Highway.

6.3 Median Drainage

Wherever divided carriageway is provided the drainage in the median shall be provided as below:

- i) In case of depressed median, longitudinal drain (lined or unlined) shall be provided to drain off rain water. The drain should have adequate longitudinal slope to the nearest culvert to drain off transversely. In super elevated sections the longitudinal drains should be designed to take the discharge from one side carriageway also.
- ii) In case of raised median, the median shall be turfed or paved and could be crowned for drainage across the pavement. In super elevated sections combination of covered longitudinal and cross drains shall be provided

6.4 Drainage Where Embankment Height is More Than 6 m

6.4.1 In embankments with height more than 6 m and approaches to bridges, special arrangement for protection of embankment slopes shall be essential in order to ensure that embankment slopes maintain their shape during the monsoon season. In this respect, directions contained in Clause 7 of IRC:SP:42 may be followed as appropriate for the climatic conditions of the area of the Project Highway.

6.4.2 Drainage arrangement shall include provision of kerb with channel at the edges of the roadway to channelise the water and Cement Concrete (CC) lined chutes along the slopes at designed intervals with energy dissipation basin, side channels at the bottom, protection of the slope by turfing, vegetation and/or any other suitable type. The drainage system and slope protection shall be kept well maintained at all times.

6.4.3 The chute drains and drains at toe of the embankment shall be of Plain Cement Concrete (M 15 grade), over bedding in Cement Concrete M10.

6.5 Catch Water Drains

6.5.1 Suitable catch water drains shall be provided on the hill slope above cutting to collect and remove surface water run-off from upper reaches. These drains shall be of trapezoidal shape with stone lining pointed with cement and sand mortar.

6.5.2 The catch water drains shall be designed to carry the intercepted water to the nearest culvert or natural drainage channel.

6.5.3 It shall be ensured that the catch water drains are provided in stable hill slopes outside the periphery of slide/unstable areas.

6.5.4 Where required lined chutes shall be provided to lead the discharge to the catch pit of culvert or to a natural drainage channel.

6.6 Sub-surface Drains

6.6.1 *The Sub-Surface Drainage shall be Provided*

- i) for lowering the water table required for drainage of sub-grade;

- ii) to intercept or drain out free water in cut slopes; and
- iii) For drainage of pervious sub base in situations where it may not be practicable to extend the sub base across the shoulder.

6.6.2 *Sub-Surface Drains shall not be used for Surface Drainage*

6.6.3 *The sub-Surface Drains shall be:*

- i) Close jointed perforated pipes or open jointed unperforated pipes in trenches with backfill material around pipes.
- ii) Aggregate drains consisting of free draining material in the trench without any pipe.

6.6.4 Perforated pipes and unperforated pipes shall meet the requirements of Clause 309.3 of the MORTH Specifications.

6.6.5 The internal diameter of the pipe shall not be less than 150 mm.

6.6.6 The sub-surface drains shall be located not less than 0.5 m below the sub-grade.

6.6.7 *Backfill Material*

- i) Backfill material shall be free draining sand, gravel or crushed stone designed on inverted filter criteria for filtration and permeability, or of an appropriate grading conforming to the requirements of Table 300.3 of the MORTH Specifications.
- ii) Thickness of backfill material around the pipe shall not be less than 150 mm. The minimum thickness of material above the top of the pipe shall be 300 mm.

6.6.8 Sub-surface drains outside the road pavement shall be sealed at the top to avoid percolation of surface water into these drains.

6.6.9 *Use of Geo-textile*

- i) The sub-surface drains may be designed using appropriate geo-textile to serve the functions of filtration and separation
- ii) The sub-surface drains can be provided with geo-textile either along the trench or around the pipe or both.
- iii) The geo-textile shall satisfy the requirements of Clause 702 of the MORTH Specifications.

6.6.10 Trench excavation, laying of pipe, backfilling, and use of geo-synthetics shall conform to the requirements of Clause 309.3 of the MORTH Specifications.

6.6.11 The drain outlet shall be a free outlet and shall be provided as per Clause 309.3 of the MORTH Specifications.

6.6.12 *Aggregate Drains*

- i) The trench for aggregate drain shall be of minimum 300 mm width and cut to a depth to expose the granular pavement courses to be drained.

- ii) Aggregate for the drain shall be gravel, stone aggregate or slag of grading as per Table 8 of IRC:SP:42.
- iii) The aggregate drain shall be provided with a geo-textile wrap to act as filtration and separation layer

6.6.13 Design of subsurface drainage shall be based on a rational basis. Reference may be made to IRC:SP:42.

6.7 Internal Drainage of Pavement Structure

- i) Boxed type construction in which pavement is housed in earthen shoulders shall not be provided.
- ii) The sub-base shall be extended across the shoulders for efficient drainage of pavement.
- iii) The granular sub-base shall be of proper design and grading to perform satisfactorily as a drainage layer. The drainage layer shall not have material finer than 75 micron size.
- iv) A suitable filter of granular material or geo-textile to act as filtration and separation layer shall be incorporated, where necessary, between the sub-grade and sub-base to prevent clogging.

6.8 Drainage for Structures

6.8.1 *Culverts and Bridges*

6.8.1.1 For culverts and bridges provision of suitable cross slope/camber and down take pipes/spouts near the kerb, covered with gratings at the inlet points shall be provided at regular interval to facilitate rapid draining of water from the deck without any ponding. The length and location of these drainage spouts should be such that the water is not discharged on any bridge element.

6.8.1.2 The bridges particularly those in high rainfall area shall preferably be built in longitudinal gradient with suitably designed cross drains at abutment locations to facilitate proper drainage.

6.8.2 *Grade Separators/Flyovers/Road Over Bridges*

6.8.2.1 Effective drainage shall be provided both longitudinally and transversely. The transverse drainage shall be secured by means of suitable camber in the roadway surface. Longitudinal drainage shall be secured by means of scuppers, inlets, or other suitable means of sufficient size and numbers to drain the run-off efficiently.

6.8.2.2 Efficient drainage of the deck structure shall be ensured by providing a suitably designed drainage arrangement consisting of drainage spouts connected to horizontal and vertical pipe system such that the water from the structure does not fall on the road, does not stagnate over the road or at entry and exit points of grade separated structure and is discharged into the draining system of the area. Care must be taken that the pipes are taken down in such a way that they are aesthetically pleasing.

6.8.2.3 Typically, water spouts are provided at the kerbs at the rate of 1 No. per 12 sqm of the surface in level portions and 1 No. per 15 sqm of the surface area on gradients. Water spouts are connected to runner pipe of suitable diameter (minimum 100 mm) on either side of roadway and taken down by down take pipes at pier & abutment locations.

6.8.2.4 Drainage fixtures and downspouts shall be of rigid, corrosion resistant material not less than 100 mm as the least dimension and shall be provided with suitable clean out fixtures.

6.8.2.5 The arrangement of floor drains shall be such as to prevent the splashing discharge of drainage water against any portion of the structure. Overhanging portions of concrete floors shall be provided with drip moulds.

6.8.2.6 Catch water drains are necessary at the ends of viaduct portion so that water coming from grade separated structure does not over saturate and affect the earthen embankment. Similar catch water drains should be provided at the end of gradient so that water coming from the structure is properly let out to nearest drain.

6.8.2.7 An integrated drainage plan for the water coming from the deck of structures, local catchment area of the project and all other sources should be prepared so that no water falls on any surface of the structures, or remain standing or flowing over the level roads. All the water is collected through sumps and finally discharged into the local drainage system i.e. storm water drain/pipes etc. either by gravity through connecting drains or by pumping into the existing outgoing drains.

6.8.2.8 The rainwater from the deck of the structures usually does not flow transversely but flows on the high gradient slopes of the road or approaches and is collected in the valley curve portion. As such attention is to be paid to get this large quantity of water drained out fast without accumulating there causing problems for traffic flow resulting in traffic jams. The draining out systems should be designed with greater margins so as to avoid this problem, at least for grade separators, inside the cities or inhabited areas.

6.8.3 *Underpasses and Subways*

6.8.3.1 Where rain water cannot flow into the drainage system by gravity due to the requirement of depressed road to get minimum head room, necessary provision for drainage by vertical drains and/or pumping shall be made so that there is no disruption of traffic through such location on account of water logging/flooding of underpass or subway.

6.9 Existing Drains, Canals and Minor Waterways

6.9.1 For the existing drains, canals and waterways, to be over passed by the highway, draining provisions shall be maintained and the effects of prolonged heavy rainfall must be catered for.

6.9.2 Special attention shall be paid to the drainage channels carrying industrial waste and effluent in particular to those draining chloride contaminated effluents which are detrimental to the RCC structures.

6.9.3 Adequate care shall be taken while crossing irrigation canals to prevent contamination of the flow in the canal by spillage from the highway.

6.9.4 When highway runs parallel to existing channels, adequate measures shall be taken in the form of bank protection and channel alignment to avoid water build up or stagnation against the highway slope endangering the pavement drainage. The drainage channels at the toe of the highway may have to be adequately protected or reshaped for discharge in to these channels. Where the discharge from road drainage is not permitted, separate cross drainage structures are to be provided on both sides of such channel.

SECTION - 7

DESIGN OF STRUCTURES

7.1 General

- i) All structures shall be designed in accordance with the relevant Codes, Standards and Specifications, Special Publications and Guidelines of the IRC. Construction of all culverts, bridges and grade separated structures shall conform to MORTH Specifications for Road and Bridge Works.
- ii) In four lane Sections the culverts, bridges and grade separated structures shall conform to the requirements of IRC:SP:84. Four lane bridges and grade separated structures wherever provided shall have independent superstructure for each direction of travel unless specified otherwise in Schedule 'B'. Culverts may have single or independent superstructure.
- iii) All bridges shall be high level bridges.
- iv) In built up sections viaduct spans shall be provided in the approaches of the structure. However, embankment/RE wall/Retaining wall may be provided upto 5 m height. For this purpose the height shall be measured from existing road level
- v) In four lane sections the width of median in the culvert and bridge portion shall, as far as possible, be kept same as that in the approaches. In case width of median is different from that of approach section due to site constraints, transition of 1 in 30 shall be provided near approaches for guiding vehicular traffic with adequate road safety signages, well before the start of median transition.
- vi) The median in the portion of structures wherever relevant shall be treated as below:
 - a) A suitably designed catch pit shall be provided to collect and carry discharge from median drain.
 - b) The median shall be open to sky. The safety barrier on the median side shall be provided at a clear distance of 0.5 m from the edge of carriageway.
- vii) Suitable provision shall be made for retaining the earth in the median portion either by extending the abutment wall or constructing a new retaining wall. The abutment wall shall have provision for taking the discharge from the median. Care shall also be taken to merge the wing wall/return wall and flooring of the old bridge with those of the new bridge.
- viii) Any utility service to be carried by the structures shall be specified in Schedule 'B' of the Concession Agreement.

7.2 Design Loading and Stresses

- i) The design loads and stresses shall be as per IRC:6 appropriate for the width of carriageway, velocity of stream, location, altitude, environment, etc.
- ii) All new structures except ROBs shall be designed for the condition when footpath is used as carriageway. The footpath portion may be provided at the same level as the bridge carriageway and separated by crash barrier in non-built-up areas. In built-up areas, raised footpaths shall be provided.
- iii) All the components of structures shall be designed for a service life of 100 years except appurtenances like crash barriers, wearing surface and rubberized components in expansion joints and elastomeric bearings. All the requirements to achieve durability and serviceability shall be implemented

7.3 Width of Structures

Width of the culverts and bridges shall be adopted as below:

i) New culverts

Overall width of all new culverts shall be equal to roadway width of the approaches. The outer most face of railing/parapet shall be in line with the outer most edge of shoulder. Typical cross section of the new culverts for a 2-lane project highway is given in **Fig. 7.1 to 7.5** for various locations.

ii) New bridges

a) All new two lane bridges shall have footpaths on either side. The carriageway width shall be 11 m including kerb shyness. At the inner edge of footpaths crash barrier and at the outer edge pedestrian railings shall be provided. The width of footpath clear of crash barrier and railings shall be 1.5 m minimum. Typical cross sections of new two lane bridge with footpath for a 2-lane Project Highway is given in **Fig. 7.6**.

b) In built up sections where 4-lane highway is provided the bridges for either side traffic shall have 8 m carriageway and footpath on the outer side with crash barrier and pedestrian railings as in (a) above as per typical cross section at **Fig. 7.7**.

c) In four lane bypasses the width of structures shall be as per IRC:SP:84 unless specified otherwise in Schedule 'B'.

iii) Existing culverts

a) All culverts which are structurally distressed or not having sufficient vent size or unsafe for design loads due to surcharge like in approaches to structures shall be reconstructed as new structures of width as per sub para 7.3 (i) of this Section.

b) All existing culverts which are not to be reconstructed shall be widened equal to the roadway width of the approaches.

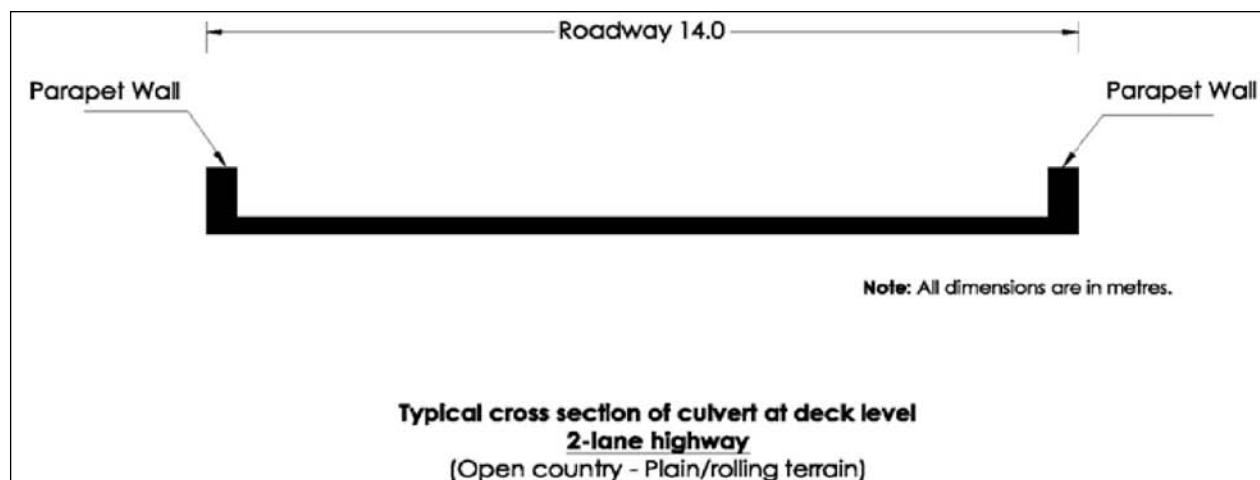


Fig. 7.1

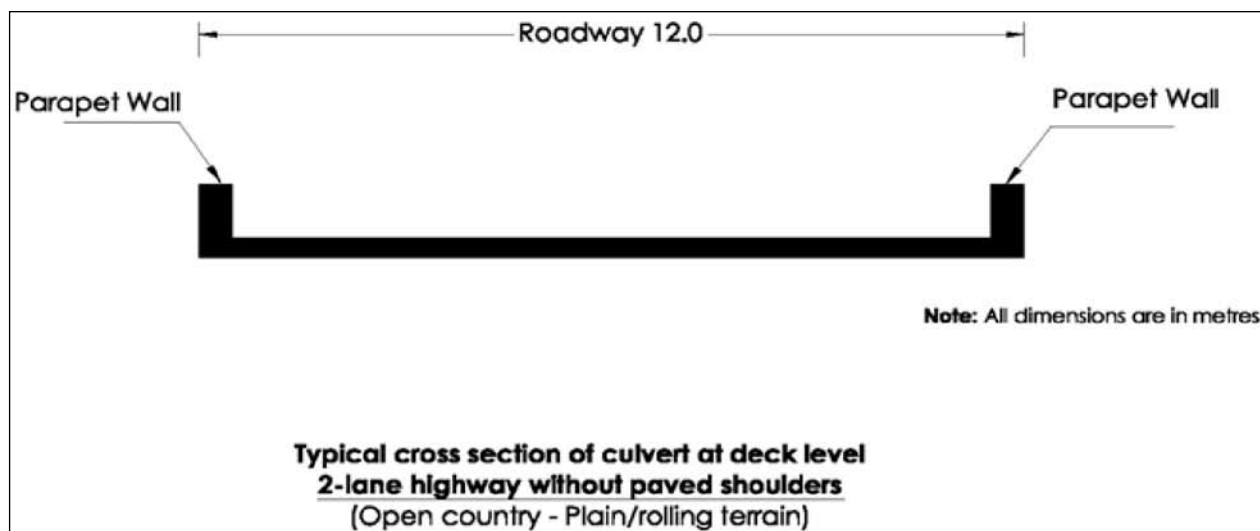


Fig. 7.2

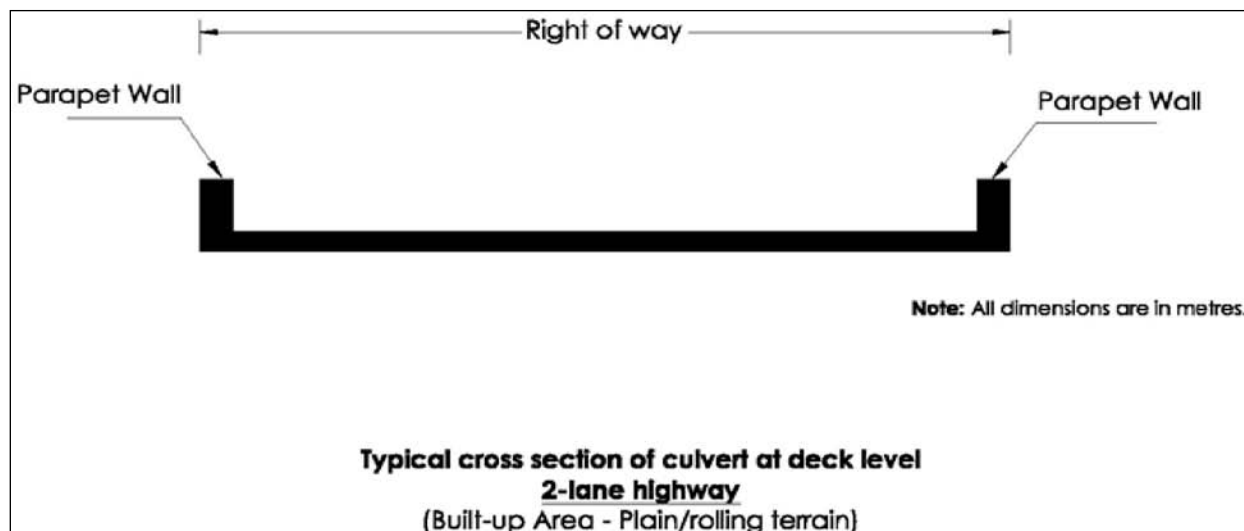


Fig. 7.3

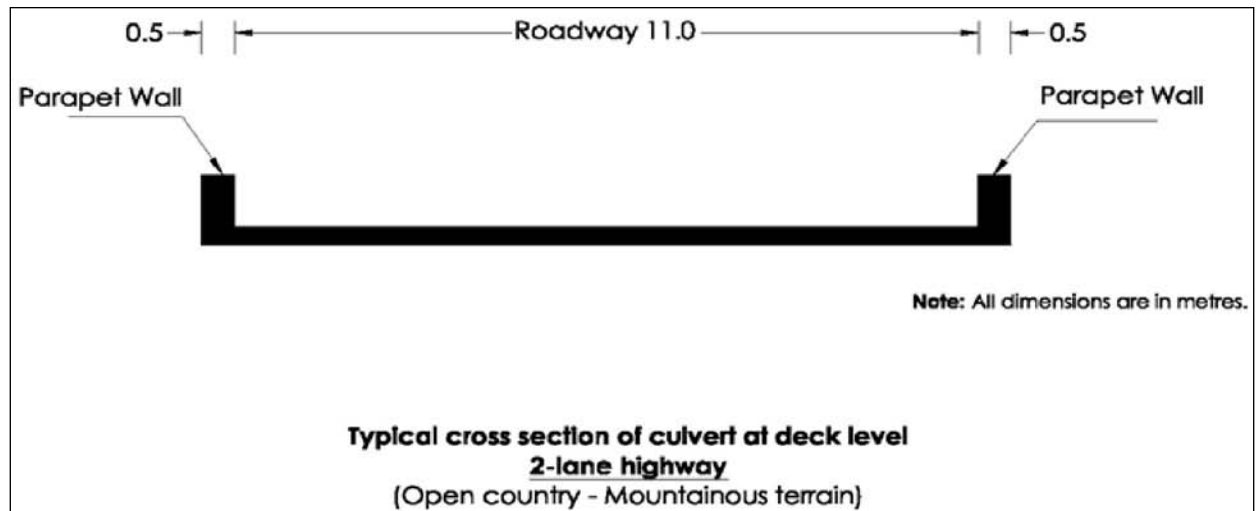


Fig. 7.4

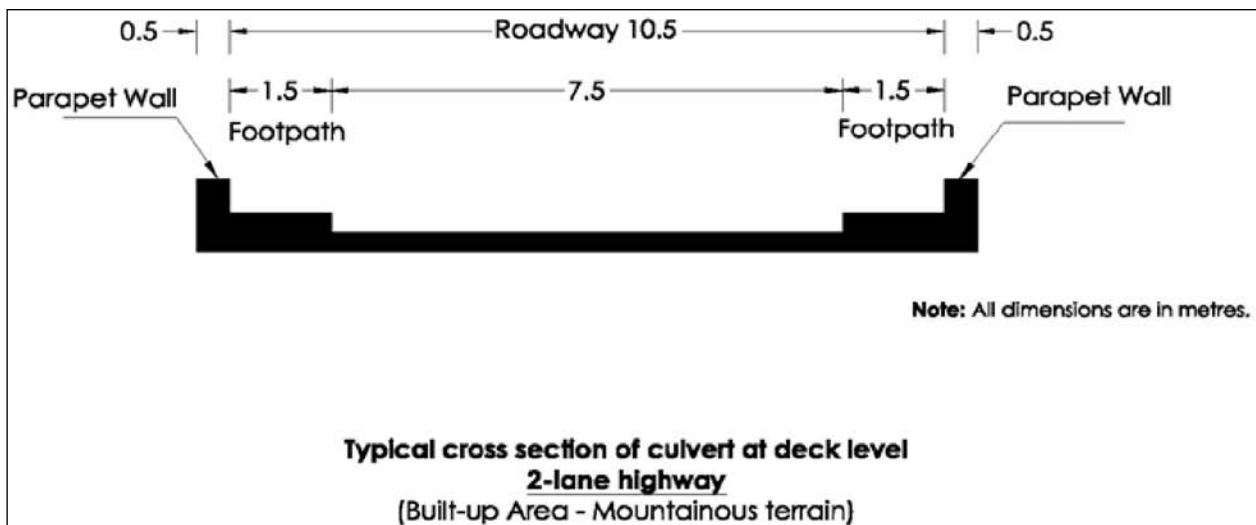


Fig. 7.5

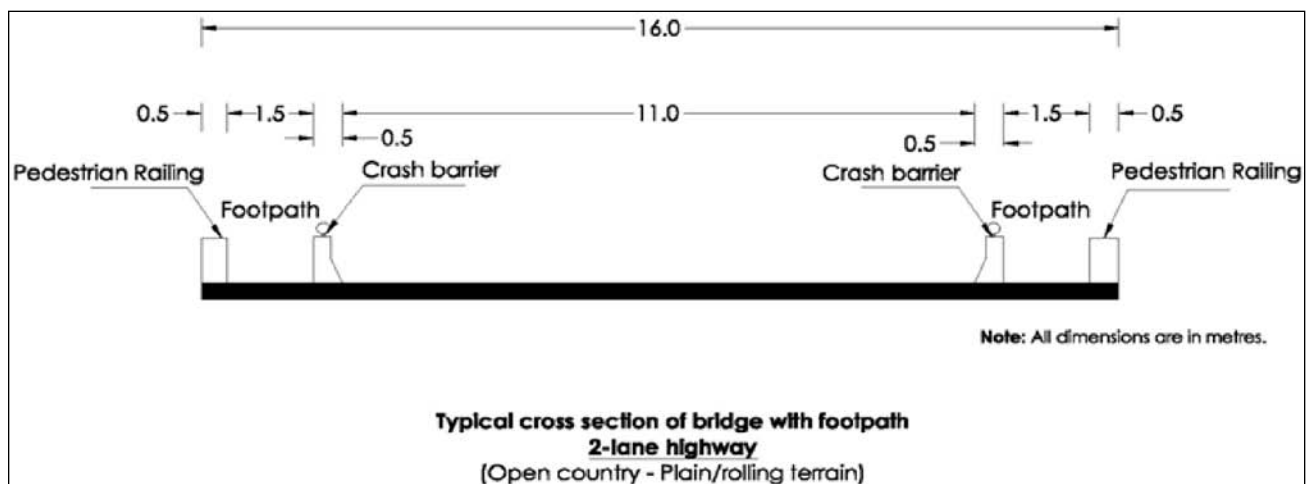


Fig. 7.6

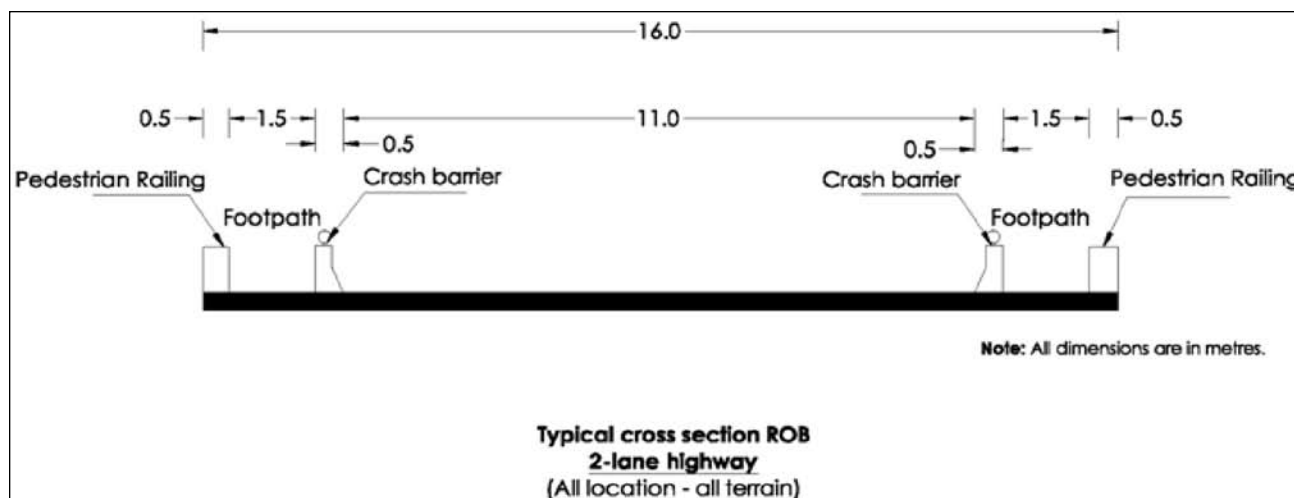


Fig. 7.7

- c) The culverts and Hume pipe structures shall be widened so as to make the deck width same as specified in Sub Para 7.3 (i) of this Section. If the width of additional widening is less than 0.5 m on either side, the widening of the structure may be dispensed with and traffic shall be guided with the help of crash barriers in a transition of 1 in 30 on either side approaches.
- d) List of culverts to be reconstructed and/or widened shall be specified in Schedule 'B' of the Concession Agreement.

iv) Existing bridges

- a) All bridges which are structurally distressed shall be reconstructed as new bridges of width as per Sub para 7.3 (ii).
- b) Components like bearings, expansion joints, railings, crash barriers, wearing surface, etc., which are not in sound condition, shall be replaced. Minor non-structural works shall be suitably repaired as per para 7.22.
- c) If the width of additional widening is less than 0.5 m on either side, the widening of the structure may be dispensed with and traffic shall be guided with the help of crash barriers in a transition of 1 in 30 on either side approaches.
- d) For four lane sections the widening of existing structures shall be as per requirements of IRC:SP:84.
- e) List of bridge structures to be reconstructed and/or widened shall be specified in Schedule 'B' of the Concession Agreement.

7.4 Structure Types

The Concessionaire may adopt any type of structure and structure system commensurate with safety, serviceability and durability requirements. General guidelines as below shall be followed:

- i) The structure should aesthetically blend with the environment.
- ii) The type and span arrangement may be such as to provide maximum riding comfort and involve minimum inspection and maintenance during the service life of structure.
- iii) Continuous superstructure with fewer number of bearings and expansion joints if not unsuitable otherwise should be preferred over simply supported spans.
- iv) For small bridges and culverts integral concept (in which sub-structures and superstructure are made joint less i.e. monolithic) is preferred.
- v) Wherever box girders are proposed for superstructure, the minimum clear depth inside the box shall be 1.50 m with suitable openings in the diaphragms and box to facilitate inspection. Haunches of minimum size of 300 mm (horizontal) and 150 mm (vertical) shall be provided at the extreme corners of the box section. Suitable arrangements for lighting shall be made to enable inspection of the box.
- vi) The following types of structures shall not be accepted.
 - a) Drop in spans with halved joints (articulations)
 - b) Trestle type frames for substructures
- vii) If constructions of structures like cable stayed suspension bridge or with special techniques is envisaged, it shall be specified in Schedule 'B' of the Concession Agreement. Similarly, in case minimum span length, spacing between joints, obligatory spans etc. are desired the same shall be specified in Schedule 'B'.
- viii) Concepts that involve precast elements are preferable for improved quality, better finish and reduction of environmental impact.
- ix) When the alignment crosses urban environment, the construction methodology should be such as to avoid prolonged disturbance to existing traffic.

7.5 Hydrology

All the structures shall have adequate waterway, which shall in any case be not less than that of existing bridge (except when such waterways can be reduced in cases like clogging or silting of spans, etc.). The design discharge shall be evaluated for flood of 100-year return period. Navigational clearance (horizontal and vertical) wherever required shall be specified in Schedule 'B' of Concession Agreement.

7.6 Sub-Soil Investigations

7.6.1 The Concessionaire shall carry out independent sub-soil investigations to establish the soil parameters required for detailed design of each foundation separately, in accordance with relevant provisions of IRC:78 and MORTH Specifications.

7.6.2 For single span structures (bridges, over passes, ROBs etc.), bores shall be taken at each of the abutment locations. For structures having more than one span, at least one bore shall be taken at each of the foundation locations. However, for structures having smaller spans the spacing between two bore holes may be kept as 10-12 m.

7.7 Culverts and Bridges using Pipes

- i) Reinforced concrete pipes for culverts and bridge structures shall be of Non Pressure (NP) - 4 type conforming to the requirements of IS: 458.
- ii) Minimum diameter of pipes for new pipe culverts shall be 1200 mm.
- iii) Existing culverts of diameter 900 mm and above, which are in sound condition and functioning satisfactorily, may be extended, using pipes of same diameter. All culverts having pipe of diameter less than 900 mm shall be replaced with pipes of minimum 1200 mm diameter. Minimum depth of earth cushion over pipe excluding road crust shall not be less than 600 mm for new/reconstructed/retained culverts.

In case the cushion is insufficient, encasing of pipe in concrete shall be ensured. Floor protection shall be as specified in the relevant IRC Codes and Specifications.

7.8 Temporary Works

7.8.1 Form Work

The Concessionaire shall be responsible for the safe, workable design and methodology for all temporary or permanent forms, staging and centering required for supporting and forming the concrete of shape, dimensions and surface finish as shown on the drawings (refer IRC:87). Adequate foundation for the staging shall be ensured. Redundancy in support system shall also be ensured by providing diagonals and additional members. The following guidelines shall be adopted:

- i) Form work shall be of steel, marine ply or laminated plywood.
- ii) Only such shuttering oil (release agent) shall be used, which permits easy removal of shutters without leaving stains or other marks on the surface of the concrete. Requirements given under Clause 3.5 of IRC:87 shall also be complied with.
- iii) In case of tubular staging of heights more than 10 m, special attention shall be paid to the structural adequacy of the system, efficacy of the connections (clamps etc), and foundations. Foundation blocks of adequate thickness in M15 cement concrete shall be provided under the base plates to prevent differential settlements. All bent tubular props shall be straightened before re-use and the member with deviation from straightness more than 1 in 600 of its length shall not be re-used. For re-used props, suitable reduction in the permissible loads shall be made depending upon their condition in accordance with recommendations of the manufacturer and as reviewed by the IE.

- iv) In case of pre-stressed concrete members, the side forms shall be removed as early as possible and the soffit forms shall permit movement of member without restraint; when pre-stress is applied. Form supports and forms for cast-in-situ members shall not be removed until sufficient pre-stress has been applied to carry all anticipated loads during construction stage.
- v) Adequate foundations for form work shall be ensured.

7.8.2 *Special Temporary and Enabling Works*

Designs, drawings and methodology proposed by the Concessionaire in the use of special temporary and enabling works like Launching Girders, Cantilever Construction Equipment, Tall Form work, Shoring for Earth Retention, Lifting and Handling Equipment and the like shall be submitted to the Independent Engineer (IE) for his review and comments if any. The Concessionaire shall be fully responsible for the design and structural adequacy of all temporary and enabling works. Review by IE shall not relieve the Concessionaire of this responsibility

7.8.3 The construction methodology adopted by the Concessionaire should ensure speedy and safe construction including safety of workers.

7.9 **Foundations and Sub-structures**

7.9.1 *The Design of Foundations and Sub-Structures shall Conform to IRC:78.*

7.9.2 *Open Foundations*

The design of open foundations shall conform to IRC:78. Floor protection shall be provided as per Section 2500 of MORTH Specifications.

7.9.3 *Pile Foundations*

The design of pile foundations shall be done as per IRC:78. Initial load test shall invariably be done on at least two piles for each structure before starting piling work. However for structures of length less than 60 m length the initial load test may be done on at least one pile.

7.9.4 *Well Foundations*

The design of well foundations shall be done as per IRC:78.

7.10 **Approach Slabs**

Approach slabs shall be provided for all bridges and grade separated structures as per Clause 217 of IRC:6 and Section 2700 of MORTH Specifications

7.11 **Superstructures**

7.11.1 The design of reinforced and pre-stressed concrete super structures shall be as per IRC:112. The design of steel and steel-concrete composite super structures shall conform to IRC:24 and IRC:22 respectively.

7.11.2 The Concessionaire shall submit the Method Statement to Independent Engineer for review and comments, if any, indicating *inter-alia* the following:

- i) Sources of materials,
- ii) Design, erection and removal of form work,
- iii) Layout of casting yard together with necessary details,
- iv) Production, transportation, laying, compacting and curing of concrete,
- v) Sequence of concreting in cast-in-situ construction, side shifting of girders, if applicable and placing of girders on the bearings,
- vi) Details of construction joints,
- vii) Pre-stressing system, if required,
- viii) Methodology and equipment for side shifting and launching of pre-cast girders,
- ix) Key personnel for execution and supervision,
- x) Testing and sampling procedure,
- xi) Equipment details.

7.12 Bearings

7.12.1 All bearings shall be easily accessible for inspection, maintenance and replacement. Suitable permanent arrangements shall be made for inspection of bearings from bridge deck. Design and specifications of bearings shall be as per IRC:83 (Part I, II, III and IV). The drawing of bearings shall include the layout plan showing exact location on top of pier and abutment cap and the type of bearings i.e. fixed/free/rotational at each location along with notes for proper installation. The bearing should cater for movement in both longitudinal and lateral direction.

7.12.2 The Concessionaire shall procure bearings only from the manufacturers approved by MORTH.

7.12.3 The Concessionaire shall submit detailed specifications, designs and drawings including installation drawings and maintenance manual incorporating the replacement procedure to the Independent Engineer for review and comments, if any.

7.12.4 The Concessionaire shall obtain a complete Quality Assurance Programme (QAP) from the manufacturer for the review and comments, if any, by Independent Engineer. The QAP shall give full details of the process of quality control, raw material testing, various stages of manufacture, testing on bearing components as well as testing on complete bearing in conformity with relevant part of IRC:83 prior to the commencement of manufacture of the bearings.

7.12.5 In addition to the routine testing of the materials and bearings at the manufacturer's premises, the Concessionaire shall arrange testing of random samples of one percent (minimum one number of each type) of bearings from independent agency approved by Independent Engineer.

7.12.6 The Concessionaire shall submit a certificate of confirmation regarding quality control measures taken during manufacture of the bearings and the material conforming to the prescribed standards and specifications. Full lot of bearings of the sample found to have inferior specifications to those certified by the manufacturer or to have a major discrepancy in material specifications or fail to meet the acceptance criteria, shall be rejected.

7.13 Expansion Joints

- i) Structures shall have minimum number of expansion joints. This may be achieved by adopting longer spans, making the superstructure continuous or by adopting integrated structures. Expansion joints shall conform to IRC:SP:69. The Concessionaire shall furnish guarantee/proprietary indemnity bonds from the manufacturers/suppliers of expansion joints for a period of 10 years.
- ii) For existing bridges all expansion joints, which are older than 15 years shall be replaced.
- iii) The Concessionaire shall procure expansion joints only from manufacturers approved by MORTH.

7.14 Wearing Coat

- i) The wearing coat may be either bituminous or cement concrete type. The wearing coat shall be in conformity with Section 2700 of MORTH Specifications.
- ii) Wearing coat older than 15 years or in damaged/distressed condition shall be replaced.

7.15 Reinforced Earth Retaining Structures

7.15.1 The design of reinforced earth retaining structures shall be as per IRC:SP:102. Reinforced earth retaining structures should be given special attention in design, construction, ground improvement where necessary, maintenance and selection of System/System design. Local and global stability of the structure shall be ensured. However, such structures shall not be provided near water bodies. The specifications of RE structures shall conform to section 3100 of MORTH specifications.

7.15.2 Design Accreditation and warranty for life of the structure from the approved supplier/manufacturer shall be obtained and furnished. A qualified and experienced technical representative of the approved supplier/manufacturer shall be present on site throughout during the casting and erection phases to ensure that the quality of the works executed by the Concessionaire is in accordance with good industry practice.

7.15.3 *The Concessionaire shall Submit Relevant Information on the System Covering Inter-Alia the Following:*

- i) General features of the system along with specifications and standards;
- ii) Authenticated copies of license/agreement, if any;

- iii) Details of plant and equipment to be used along with the names of manufacturers and name of process/system;
- iv) Details of projects where the process/system has been successfully used;
- v) Limitations, if any;
- vi) Acceptance tests and criteria;
- vii) Installation and maintenance procedure and schedule; and
- viii) Performance warranty.

7.15.4 The Concessionaire shall submit a method statement including the following:

- i) Design assumptions calculations and drawings;
- ii) Construction Procedure;
- iii) Tests to be conducted including frequency and the formats for reporting the test results.

7.15.5 The packaging of reinforcing elements shall clearly indicate the name of the manufacturer/supplier and brand name, date of production, expiry, if any and batch identification number along with the manufacturers test certificates.

7.16 River Training and Protective Works

River training and protective works shall be provided wherever required for ensuring the safety of bridges and their approaches on either side. Design of various types of river training and protective works shall be in accordance with IRC:89. The construction of river training works shall conform to MORTH Specifications.

7.17 Safety Barriers

- i) For bridges without foot paths, concrete crash barriers shall be provided at the edge of the carriageway on all new bridges.
- ii) The type design for the crash barriers may be adopted as per IRC:5. The design loading for the crash barriers shall be as per IRC:6.
- iii) For bridges with foot paths, pedestrian railing shall be provided on the outer side of foot path.
- iv) On the existing bridges which are to be retained with or without widening crash barriers on the inside and pedestrian railings on the outer sides of the footpaths shall be provided unless otherwise specified in Schedule-D of the Concession Agreement.
- v) Parapets/Railings of the existing bridges/culverts to be repaired/replaced shall be specified in Schedule-B of the Concession Agreement.

7.18 Rail-Road Bridges

7.18.1 ROB/RUB to be provided shall be as specified in this Manual. Any deviation to these provisions shall be specified in Schedule 'D'.

7.18.2 Road Over Bridge (Road Over Railway Line)

- i) In case a 2-lane bridge having minimum carriageway of 7.5 m exists over the railway tracks, the same may be retained if it is in sound condition, otherwise it shall be reconstructed/widened as per typical cross section at **Fig. 7.8**.
- ii) In case the bridge is to be provided over an existing level crossing, twin 2-lane bridges shall be constructed with overall width as per typical cross section at **Fig.7.9**, unless specified otherwise in Schedule D.. If the alignment of road at the existing railway crossing has skew angle more than 45 degrees, the alignment of road or of pier/abutment shall be suitably designed to reduce skew angle up to 45 degrees.
- iii) The horizontal and vertical clearances to be provided shall be as per requirement of the Railway authorities.
- iv) The Concessionaire shall be required to obtain approvals of all designs and drawings from the concerned Railway authorities.
- v) The construction of ROB within the railway boundary shall be under the supervision of Railway authorities.
- vi) The approach gradient shall not be steeper than 1 in 40.

7.18.3 Road under Bridges (Road under Railway Line)

- i) Full roadway width as in the approaches shall pass below the bridge structure. The service roads shall be continued in the bridge portion also.
- ii) The vertical and lateral clearances shall be as per guidelines given in Section 2 of this Manual.
- iii) These structures shall be designed to carry railway loads. The Concessionaire shall be required to obtain approvals of all designs and drawings from the concerned railway authorities. The design of structure shall be in accordance with relevant Railway codes.
- iv) The construction of RUB and its approaches shall be undertaken in conformity with the terms specified in the approval granted by the Railway authorities.

7.18.4 In cases of ROB, the service road on both the sides shall be provided and joined through one of the viaducts of ROB. This arrangement shall be on either side of the railway crossing.

7.19 Grade Separated Road Structures

7.19.1 The location and type of grade separated road structures to be provided on the Project Highway shall be as specified in Schedule-‘B’ of the Concession Agreement.

7.19.2 The vertical and lateral clearances shall be as per requirements given in Section 2 of this Manual. Design of structures shall conform to the requirements specified in this Manual. Typical cross sections of grade separated structures/elevated sections shall be as given below:-

- i) Typical cross section of grade separated structure for open country, all terrain where Project Highway is of 2-lane width - **Fig. 7.10.**
- ii) Typical cross section of grade separated structure for built up area, all terrain where Project Highway is of 2-lane dual carriageway - **Fig. 7.11.**
- iii) Typical cross section of grade separated structure for all locations, all terrain where 4-lane bypass is provided - **Fig. 7.12.**

7.20 Drainage

An effective drainage system for the bridge deck structure shall be planned, designed and installed so as to ensure that water from the deck is taken down to ground level/drainage courses by adequate size of drainage spouts and pipes.

7.21 Structures in Marine Environment

Necessary measures/treatments for protecting structures in marine environment shall be as specified in Schedule-‘B’ of the Concession Agreement.

7.22 Repairs and Strengthening

- i) Structures requiring repairs and strengthening of shall be specified in Schedule-B of the Concession Agreement. This shall be based on detailed condition survey of existing structures and shall bring out the nature and extent of repairs to be carried out, covering the following in addition to other specific requirements:-
 - a) Repair/replacement of damage drainings, parapets and crash barriers,
 - b) Replacement of wearing coat (old wearing coat shall be removed and replaced by bituminous wearing coat),
 - c) Replacement of expansion joints,
 - d) Replacement of bearings,
 - e) Structural repairs to substructure/superstructure, including strengthening of substructure/superstructure, if required
 - f) Repair to flooring and protection works.
- ii) The Concessionaire shall submit repairs and strengthening plan for structures in para (i) above to Independent Engineer for review and comments, if any. For all other structures with minor deficiencies, not affecting structural inadequacies, integrity appropriate repair measures may be proposed and submitted to Independent Engineer for review and comments, if any.
- iii) Strengthening/rehabilitation work shall be carried out in accordance with relevant IRC Codes and Guidelines.
- iv) The Concessionaire shall take up repair and widening of existing bridge at a particular site only after making all arrangements for diversion of traffic to ensure that a smooth flow of traffic is maintained. Before taking up the

works of repair and widening of the existing bridge, the Concessionaire shall make all arrangements to ensure that both way traffic can use the diversion and smooth flow of traffic is maintained. The Concessionaire shall take all precautions to guard against any traffic accident due to such diversion and shall use all necessary road signs, traffic management measures etc. for the purpose. After completion of repair and widening of the existing bridge temporary works carried out for such diversion shall be made good by the Concessionaire.

7.23 Design Report

The Concessionaire shall furnish the design report including the following to the Independent Engineer for his review and comments, if any.

- i) Sub soil exploration report as per IRC:78 as specified in para 7.6 above.
- ii) Hydrological investigation report including design discharge calculation for the bridges, incase of any change in the proposed water way of any bridge as specified in para 7.5 above.
- iii) Design and drawings of temporary works, foundations, sub structure and super structure of structures.
- iv) Detailed report regarding the bridges whose width is less than the roadway width and the proposal for their improvement.
- v) Any other information relevant to the design report.

7.24 Responsibility for Design and Structural Adequacy

The Concessionaire shall be fully responsible for the design, structural adequacy and detailing of bridge and culvert structures. Review by IE shall not relieve the Concessionaire of this responsibility.

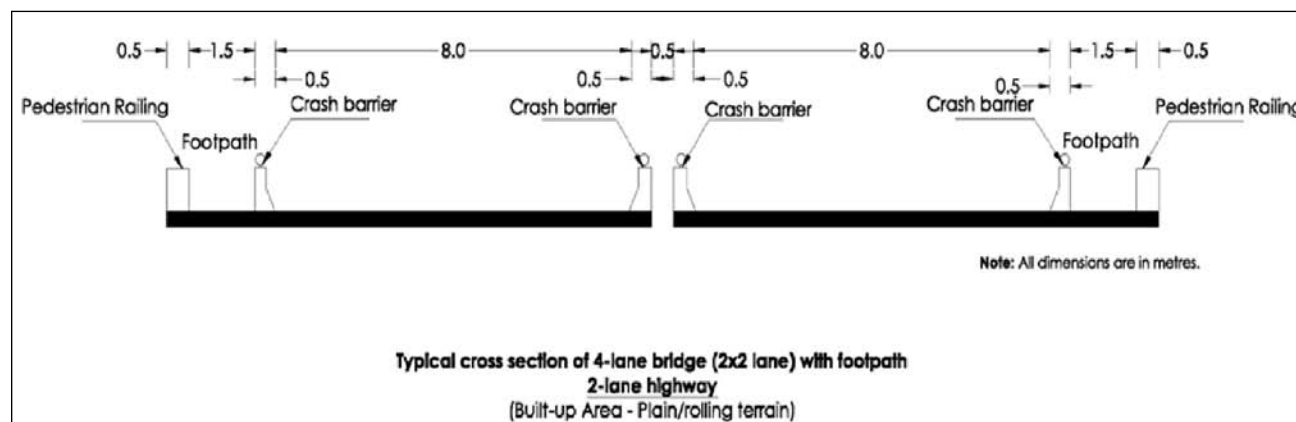


Fig. 7.8

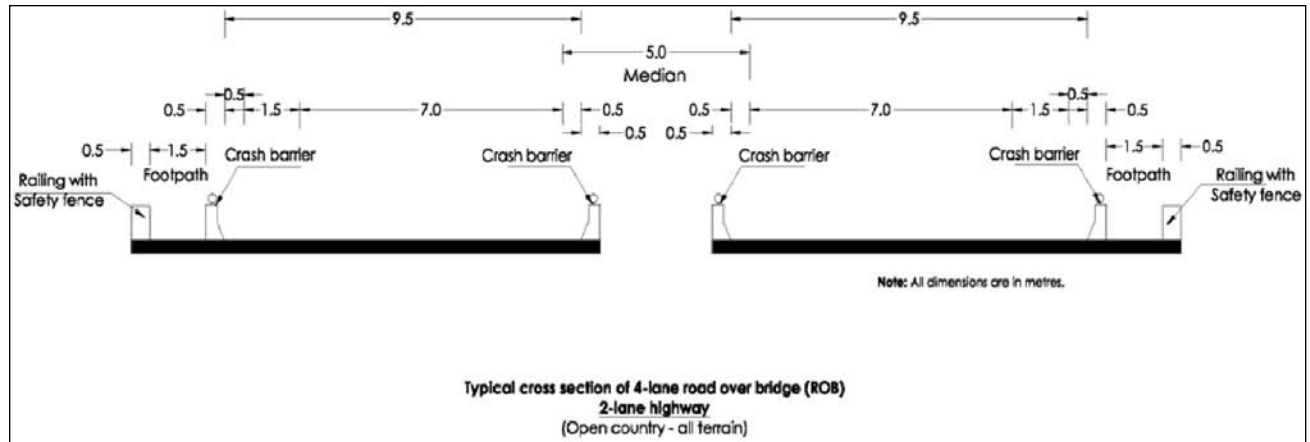


Fig. 7.9

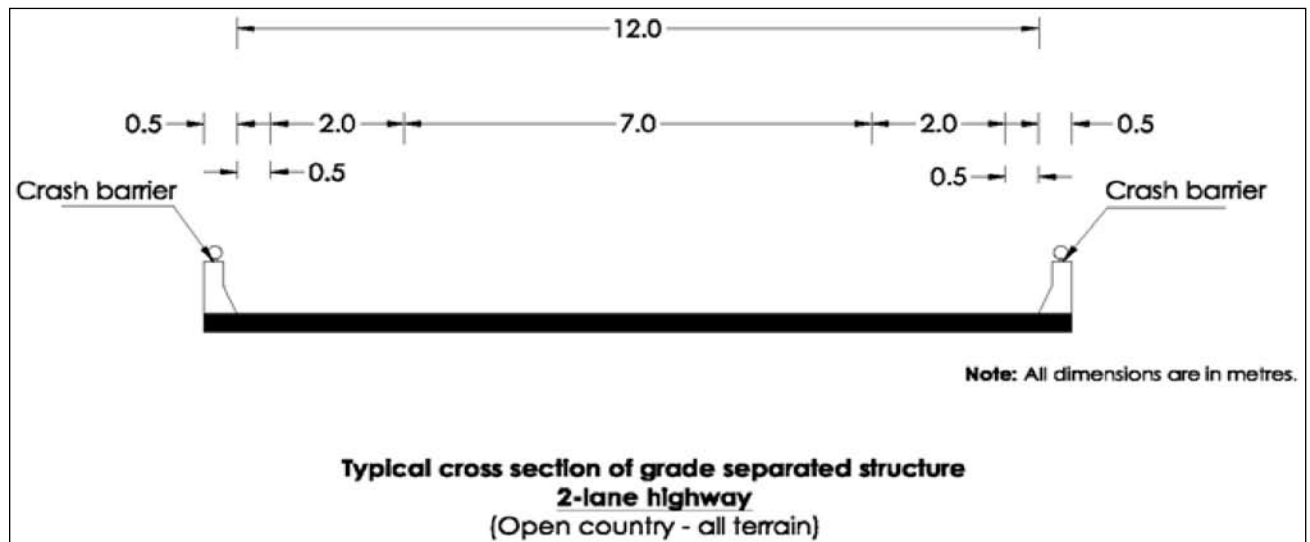


Fig. 7.10

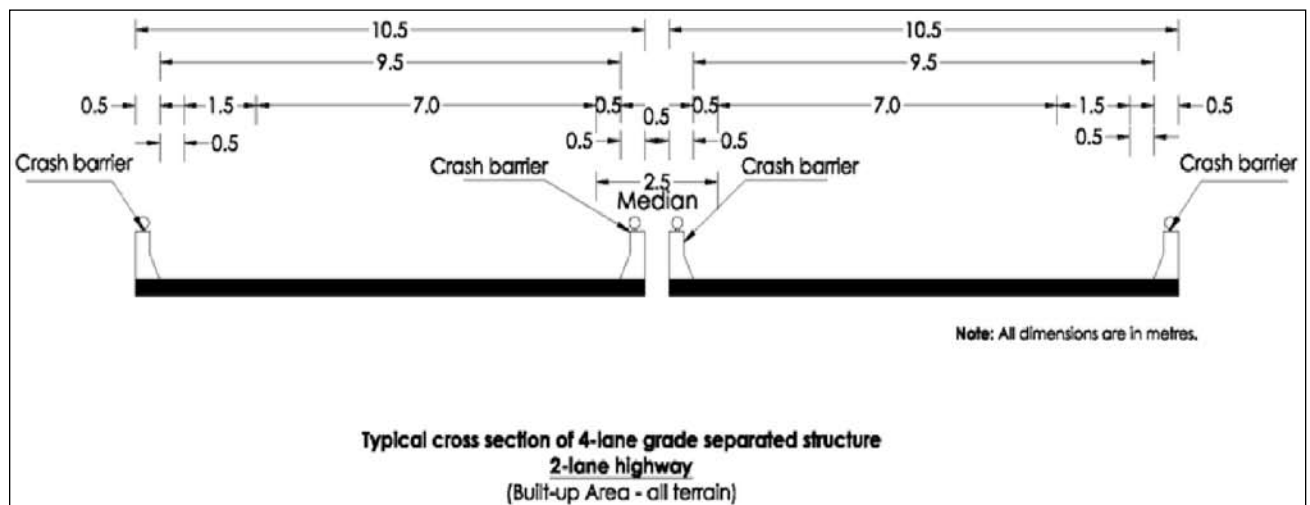


Fig. 7.11

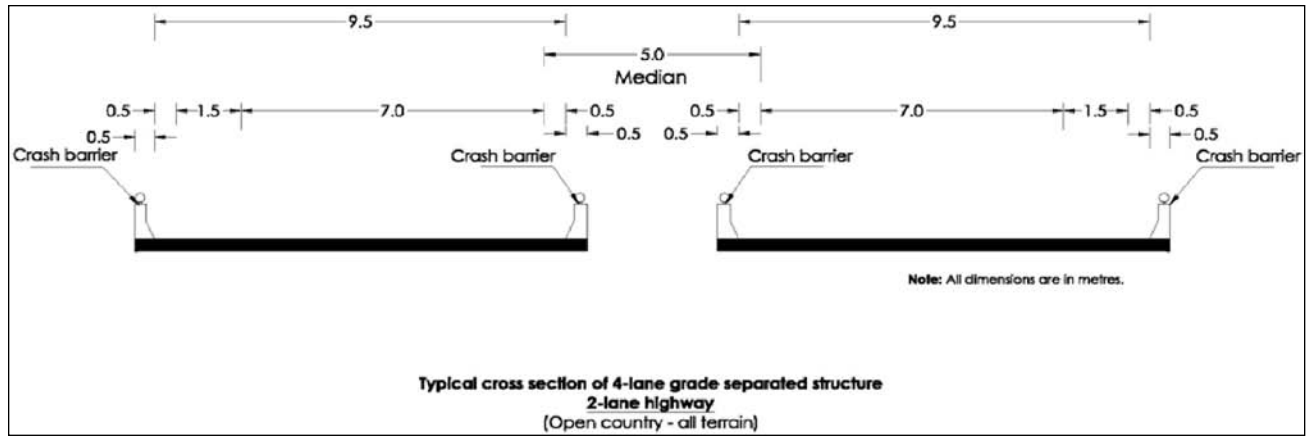


Fig. 7.12

SECTION - 8

MATERIALS AND SPECIFICATIONS FOR STRUCTURES

8.1 General

All materials to be used in works shall be in conformity with the requirements laid down for relevant item in MORTH Specifications. If the Concessionaire proposes to use any material, which is not covered in MORTH Specifications, it shall conform to IRC or relevant Indian Standards, if there are any, or to the International Standards. Proprietary products proposed to be used shall be proven by use in comparable international road and bridge projects, and shall be supported with authenticated licensing arrangement with the manufacturer.

SECTION - 9

TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS

9.1 General

The multi-lane highways being built under various road development programmes are adopting the geometric standards specifications, signage, road markings etc. as per the provisions contained in the codes of practice and the standards of the Indian Roads Congress supported by the Ministry's specifications. However, accident data demonstrates that motorists leave the roadway for numerous reasons including errors of judgment. To ensure long term road safety on these highways, the following suitable engineering measure are considered essential for adoption so as to help in improving road safety leading to reduction of accidents

Traffic Control Devices, Road Safety Devices and Road Side Furniture shall comprise of road signs, road markings, object markers, hazard markers, studs, delineators, attenuators, safety barriers, pedestrian guard rails, boundary stones, km stones, etc. Guidelines given in IRC:8, IRC:25, IRC:26, IRC:35, IRC:67, IRC:79, IRC:103 and Section 800 of MORTH Specifications shall be used for providing these items unless otherwise specified in this Section.

9.2 Road Signs

The three types of road signs viz., mandatory/regulatory signs, cautionary/warning signs and informatory signs shall be provided as given in IRC:67 and Section 800 of MORTH Specifications. Proper signs shall be provided for main carriageways, service and slip roads, toll plaza and other project highway facilities. Clustering and proliferation of road signs shall be avoided for enhancing their effectiveness.

9.2.1 There shall be corresponding road markings with stop signs, give way signs, merging or diverging traffic signs, lane closed signs, road narrowing signs, slip roads/diversion signs, compulsory keep left/right signs, or any other signs as per IRC:67.

9.2.2 The Specifications and Standards of road signs, which are not covered by IRC:67 would be as per International Standards.

9.2.3 All road signs shall be of Prismatic Grade Sheeting corresponding to Class C Sheeting described in IRC:67 and any of the sheeting types VIII, IX or XI as per ASTM D 4956-09 fixed over Aluminium or Aluminium Composite Material. The sheeting for different type of signs can be chosen based on the selection guidance provided in IRC:67 depending upon the situation encountered by road users in viewing the signs. Sheeting with high coefficient of retro reflection at small observation angle are for a road sign to be viewed by a driver from a long distance, whereas the sheeting with wide observation angle for better performance at short distance viewing. The Type XI sheeting will have better performance at short and medium distances. Micro prismatic sheeting is preferred for gantry mounted overhead signs. Type IV micro prismatic sheeting can be used for delineator posts.

9.2.4 Shoulder mounted signs shall be supported on GI pipes. Overhead signs shall be placed on a structurally sound gantry or cantilever structure made of GI pipes. Its height,

lateral and vertical clearance for installation shall be as per the guidance provided in IRC:67 and also as per MORTH Specifications.

9.2.5 Locations of overhead traffic signs shall be specified in Schedule 'C' of the Concession Agreement. The following conditions may be considered while deciding about the locations of overhead signs:

- i) Present and future traffic volume,
- ii) Restricted sight distance,
- iii) Built up stretches,
- iv) Insufficient space for placing ground mounted signs and also where road features and roadside activities obscure the ground mounted signs
- v) Distances of important places and routes at suitable intervals.
- vi) Before major intersections of considerable traffic bifurcation and on approaches to interchanges/flyovers/VUPs.

The overall size of gantry mounted signs shall be evolved based on design of sign boards given in IRC:67.

9.2.6 The road sign, traffic signal or any other device erected for traffic control, traffic guidance and or traffic information shall not obscure other traffic sign. Further, the signs and signals shall not carry any advertisement.

9.2.7 Wherever the Project Highway alignment is on a curve, there shall be advance cautionary signs for sharp curves (depending on whether it is on left or right) and chevron signs (rectangular in shape with yellow background and black arrow) at the outer edge of the curve. The sign for the curve ahead particularly in mountainous and steep terrain shall always be accompanied with chevron signs at the outer edge of the curve and appropriate delineation. Following guidance shall be adopted while installing curve signs:

- i) The curves with radii upto 450 m shall be provided with curves warning sign in advance of hazard and single Chevrons on outer edge of curve. Chevron signs shall be always placed on outer edge of the curve and spaced uniformly for the length covering transition length and the straight portion as given in IRC:67. Due to any reason if there is any curve with radius less than 450 m, the safe negotiating speed for the particular curve shall be placed along with curve warning sign at both approaches. Generally if the difference between the approach speed and permissible negotiating speed of any curve is more than 15 kmph, the curve warning and speed limit sign shall be placed on both sides. All signs shall be installed on both approaches.
- ii) The curves with radii 451 m to 750 m shall be installed with single Chevrons on outer edge of curve at 75 m spacing
- iii) The curves with radii 751 m to 1200 m with deflection angle greater than 20 degree shall be provided with single Chevron signs
- iv) For curves with radii 751 m to 1200 m with deflection angle less than 20 degree and also curves with radii from 1201 to 2000 m shall be provided

with forgiving type delineator posts at 40 m spacing on outer edge of curves.

Fig 9.1 presents the positioning of Chevron signs and also the Object Hazard Markers with respect to traffic movement.

9.2.8 Each exit ramp/slip road shall have ground mounted flag type direction sign indicating the name of the place and the important roads it would lead to.

9.2.9 *Direction Information Sign*

Gantry and shoulder mounted Advance Direction Sign shall be provided in advance of an interchange/ Flyover/VUP or any urban reach. Flag type direction information sign shall be installed at the start of deceleration length or gorge indicating the destinations of the side roads. **Fig 9.2** gives the typical placement of direction information signs.

9.2.10 *At-Grade Junctions*

Stack type advance direction sign and flag type direction signs shall be provided for at-grade junctions. The junction control shall be established either with “STOP” sign or “GIVEWAY” sign based on visibility funnel given in IRC:67 and IRC:35. The “STOP” and “GIVEWAY” sign shall not be installed on Project Highway, but shall be always on side road only. For junction with substantial turning traffic, the roundabout or traffic signal shall be the traffic control, for which the signs mentioned in IRC:67 shall be adopted. The tip of all splitter and triangular islands shall be installed with the direction regulatory sign of appropriate size along with Object Hazard Markers. Though both signs can be installed in one post, but while installing them the minimum clearance between vertical faces of signs and kerb specified in IRC:67 shall be ensured. **Fig. 9.2** gives the typical placement of direction information signs for three armed major junction.

9.2.11 The approach arm to roundabout shall be provided with GIVEWAY sign and central island with turn left sign and double chevron signs as given in IRC:67. Relatively insignificant minor road approaches shall be provided with STOP sign and also a speed breaker at 8 m to 12 m away from edge line, whereas a side road warning sign shall be placed on Project Highway.

9.2.12 *Facility Information*

Roadside facility information sign shall be provided wherever necessary like for Eating place, Filling station, Police station and Hospitals

9.2.13 *Prohibitory Signs*

Required prohibitory sign shall be placed prohibiting the entry of certain movements like Bullocks carts into Project Highway and also parking prohibitory sign in junction influence area of Project Highway.

9.2.14 *Pedestrian Signs*

Pedestrians guide rails shall be provided to streamline them into safe zebra crossing locations. Pedestrian guard rail shall be forgiving type. The zebra crossing shall be provided

with warning sign and also informatory sign. On approach to school, warning sign shall be provided and zone shall be provided with footways and speed limit sign. If required, grade separated pedestrians crossing facility shall be provided.

9.3 Road Markings

Road markings shall be of hot applied thermoplastic materials with glass reflectorizing beads and design and specifications shall be as per IRC:35. The quality of thermoplastic application shall be ensured by testing actual samples by random selection during application time to avoid any possible deception in the quality of materials used. Since the readability of Project Highway hinges on road markings, the minimum performance level indicated in relevant code and specification for road marking shall be ensured and any shortage shall invite reapplication of road marking.

9.3.1 Longitudinal Markings

The centre line upto 450 m radii shall be no overtaking either with single or double and where space permitted with hatch marking as given in IRC:35. The no-overtaking centre line shall always followed by warning line as given in in **Fig. 9.3**. The Longitudinal marking at extremely vulnerable reaches can be zig-zag marking as shown in **Fig. 9.4**, where various measures to create effect are also shown.

9.3.2 Diagonal and Chevron Markings

Chevron marking shall be provided for all entry/exit and shall be in continuation of shoulder edge line. Diagonal marking shall be provided in case of opposite stream of traffic.

9.3.3 Bus and Truck Lane Marking

Bus and truck lane marking shall be provided with adequate chevron marking at diverging/merging locations with main carriageway. The continuity of shoulder edge line shall be maintained while making chevron markings.

9.3.4 Stop Line and give Way Marking

Stop line and Give way marking shall be provided for side road, which shall also be in the continuity of shoulder side edge line

9.3.5 Pedestrian Crossing Marking

The pedestrian crossing in mid-block section shall be provided with a platform with kerb as given in **Fig. 9.21** so that pedestrians can wait comfortably without being directly exposed to motorised vehicular movement.

9.3.6 Hatch Marking and Ghost Islands

To avoid the accidents by hitting raised islands, hatch marking shall be provided to confine the drivers within the required space. In a junction, where physical island cannot be installed, wide open area effect can be avoided by providing Ghost Island so as to streamline the traffic movement. The typical hatch marking and ghost island marking is given in **Fig. 9.5**.

9.3.7 *Longitudinal Marking to Toll Booths*

The traffic lane marking running through the four lane shall be continued till the toll booth, in such a way that traffic from each lane of project highway is guided to discharge uniformly to different toll booths. Toll booth shall be provided with chevron marking and hazard markers. There shall be transverse bar marking to alert the traffic about the approaching toll booth.

9.3.8 *Parking Restriction Markings*

In order to establish extent marking the edge line and kerb can be marked yellow colour as shown in **Fig 9.6**.

9.3.9 *Object Markings*

To streamline the traffic through the defined pathway and also to discourage zigzag vehicular movements, the paved surfaced between edge line and the adjacent raised islands/separators/barriers shall be provided with diagonal markings. Typical application on approaches to bridge where bituminous surface is narrowing is shown in **Fig. 9.7**. Similar diagonal markings along with carriageway edge line can be applied in junctions and in truck/bus lay-by.

9.3.10 *Speed Reduction Measures*

At locations where vulnerable road users are exposed high speed traffic movement, the speed can be physically curtailed by speed breakers. The speed breakers of varying passing speed by providing breakers of different chord length are given **Fig. 9.8**. If at all only psychological effect has to be created, it can be gained by bar marking as shown in **Fig. 9.9**. Gateway effect by speed breaker or bar marking should be provided when project highway passes through highway vulnerable reaches as shown in **Fig. 9.4**.

9.4 **Road Delineators**

These are roadway Indicators, hazard markers and object markers as given in IRC:79.

9.4.1 *Roadway Indicators*

Circular Iron Posts of 1.0 m height or concrete or any manufactures product with retro-reflective reflector of at least Type IV sheeting as per criteria, placement and spacing given in IRC:79 shall be provided. This will include embankments of 2-3 m height and curves having radii up to 750 m where crash barriers are not provided.

9.4.2 Hazard Markers shall be provided as given in IRC:67. In addition, the objects close to the road shall be painted with black and yellow stripes using the paint conforming to IS:164.

9.4.3 Object Markers shall be provided as given in IRC:79 and IRC:67. All physical objects projects above the Finished Road Level (FRL) that are falling within 3 m from the carriageway edge line shall be illuminated with Object Hazard Markers (OHM). The objects shall include foot path or utility poles or parapet or concrete barrier of Major bridge, Minor bridge, Culverts, RE wall start of Underpass or flyovers. The Object Hazard Marker shall be either left OHM or right OHM or Two way Hazard Marker with respect to position of object to

the traffic as shown in **Fig. 9.1**. In addition the kerbs in the medians/traffic islands shall be painted with black and white stripes using the paint conforming to IS:164. The objects within traffic way or protruding into bituminous surface either in carriageway or paved shoulder or in edge strip shall be painted with alternate yellow and black painting whereas the object that are not in the traffic way yet adjacent to traffic way shall be painted alternate black and white as depicted in IRC:35.

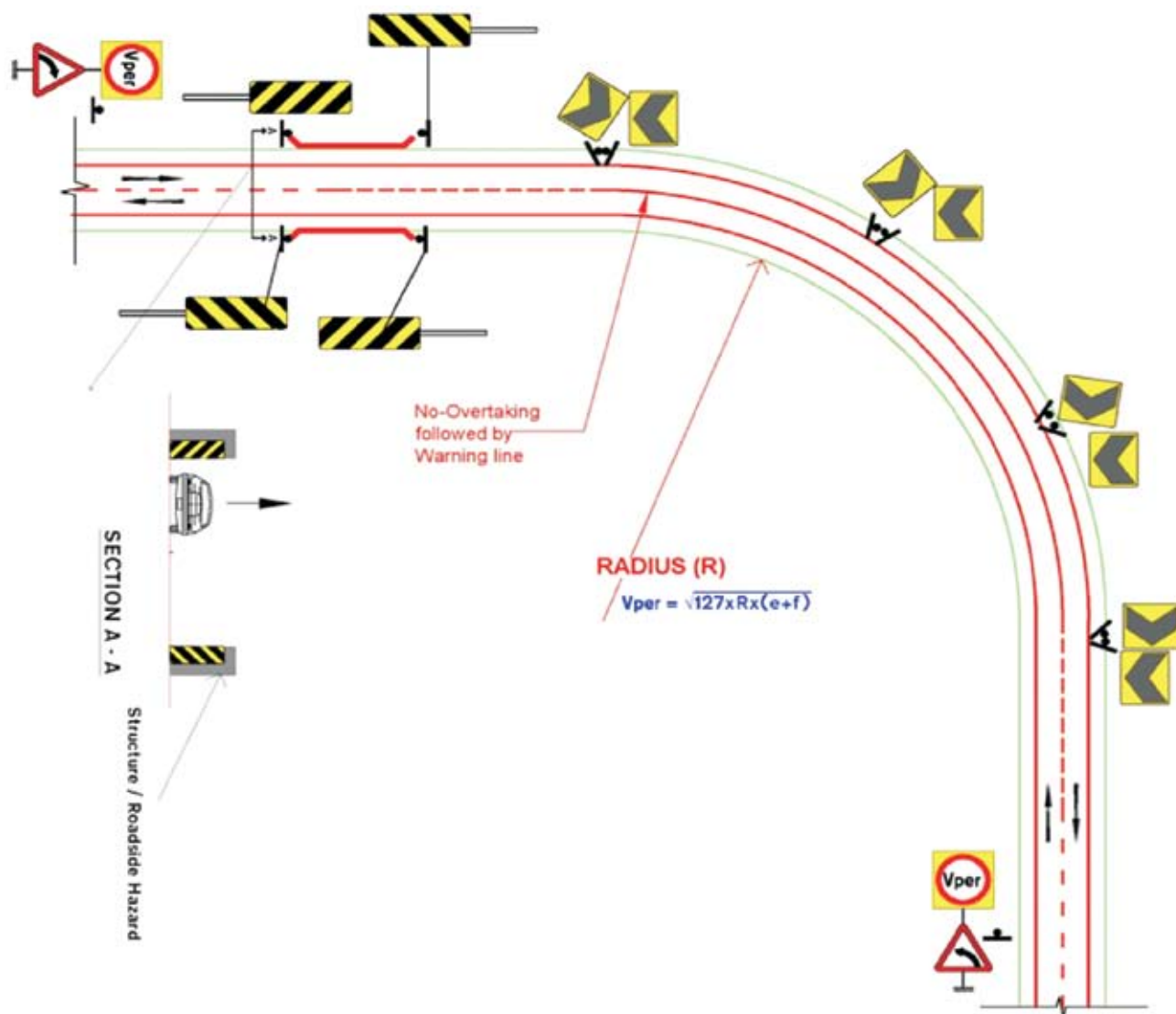


Fig. 9.1 Curve Delineation for Two Lane Road

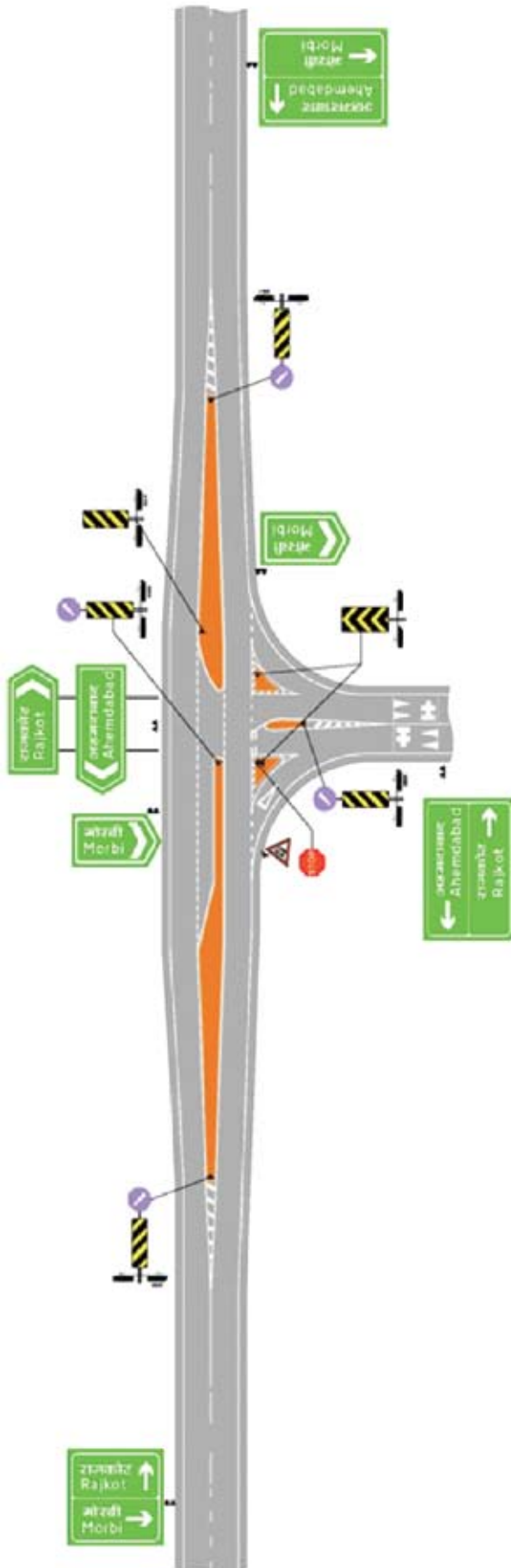


Fig. 9.2 Directional Information Sign for a Junction

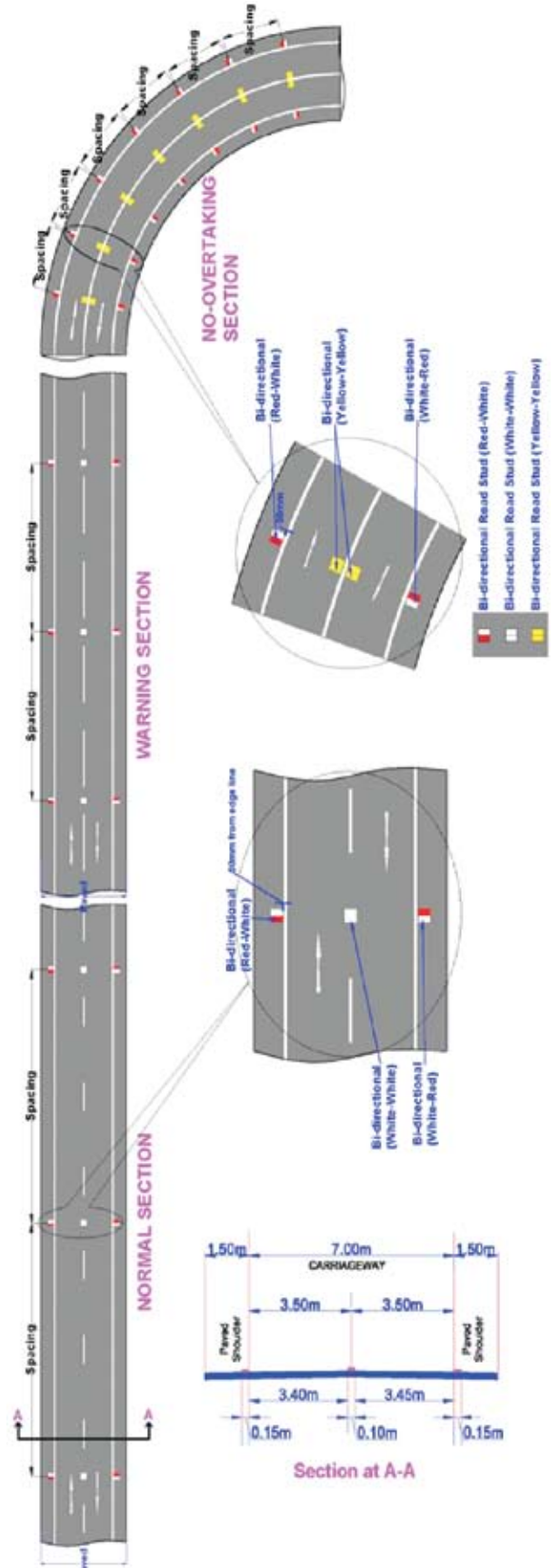


Fig. 9.3 Longitudinal Marking & Roads Studs for a Two Lane Road

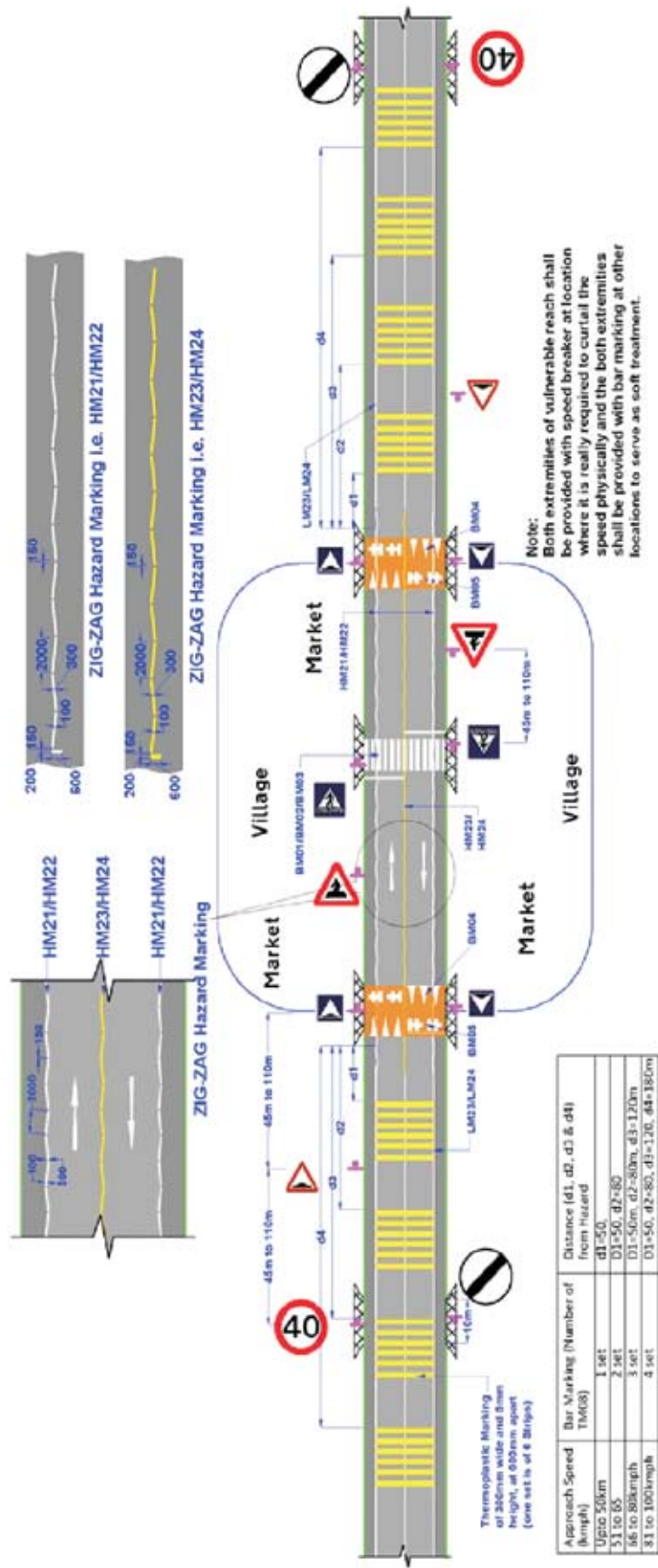


Fig. 9.4 Measures in Highly Vulnerable Reach (Special Treatment)

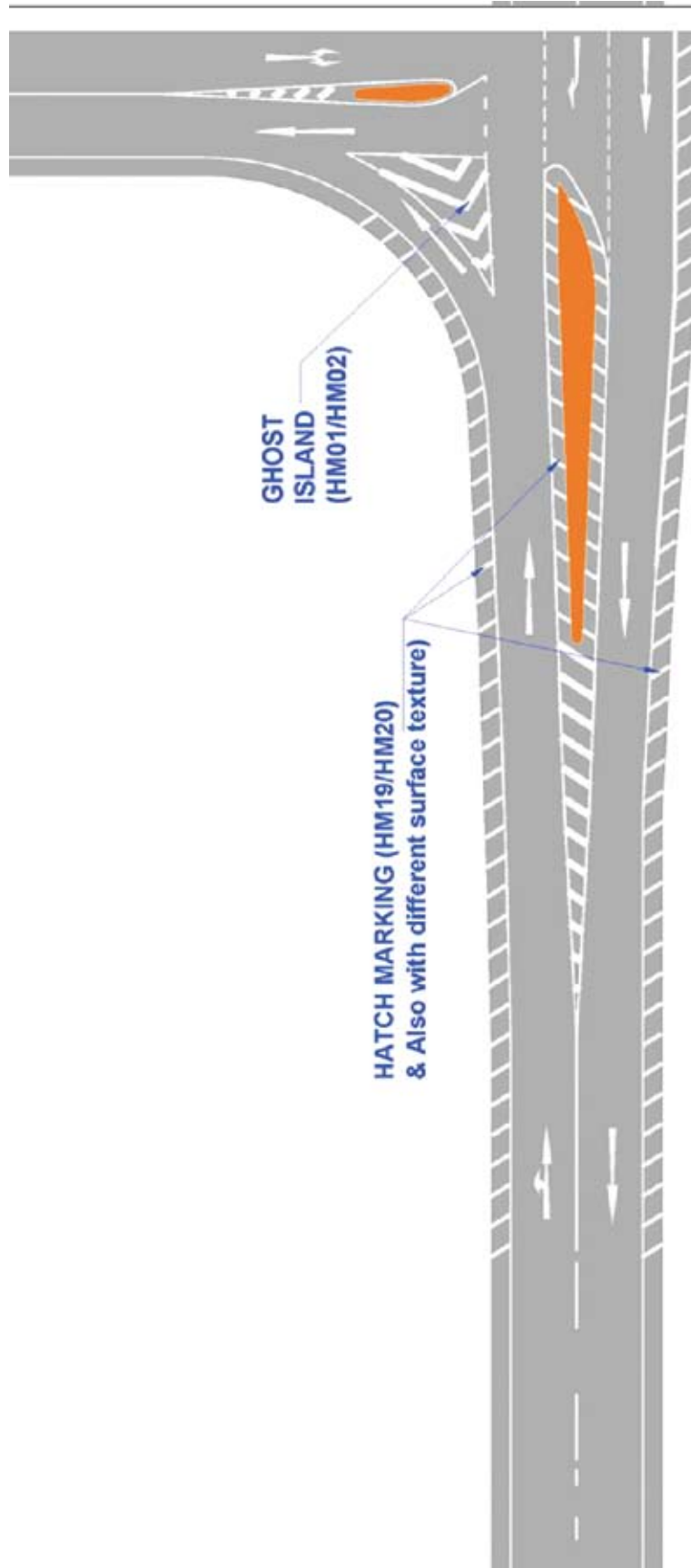


Fig. 9.5 Hatch Marking and Ghost Island

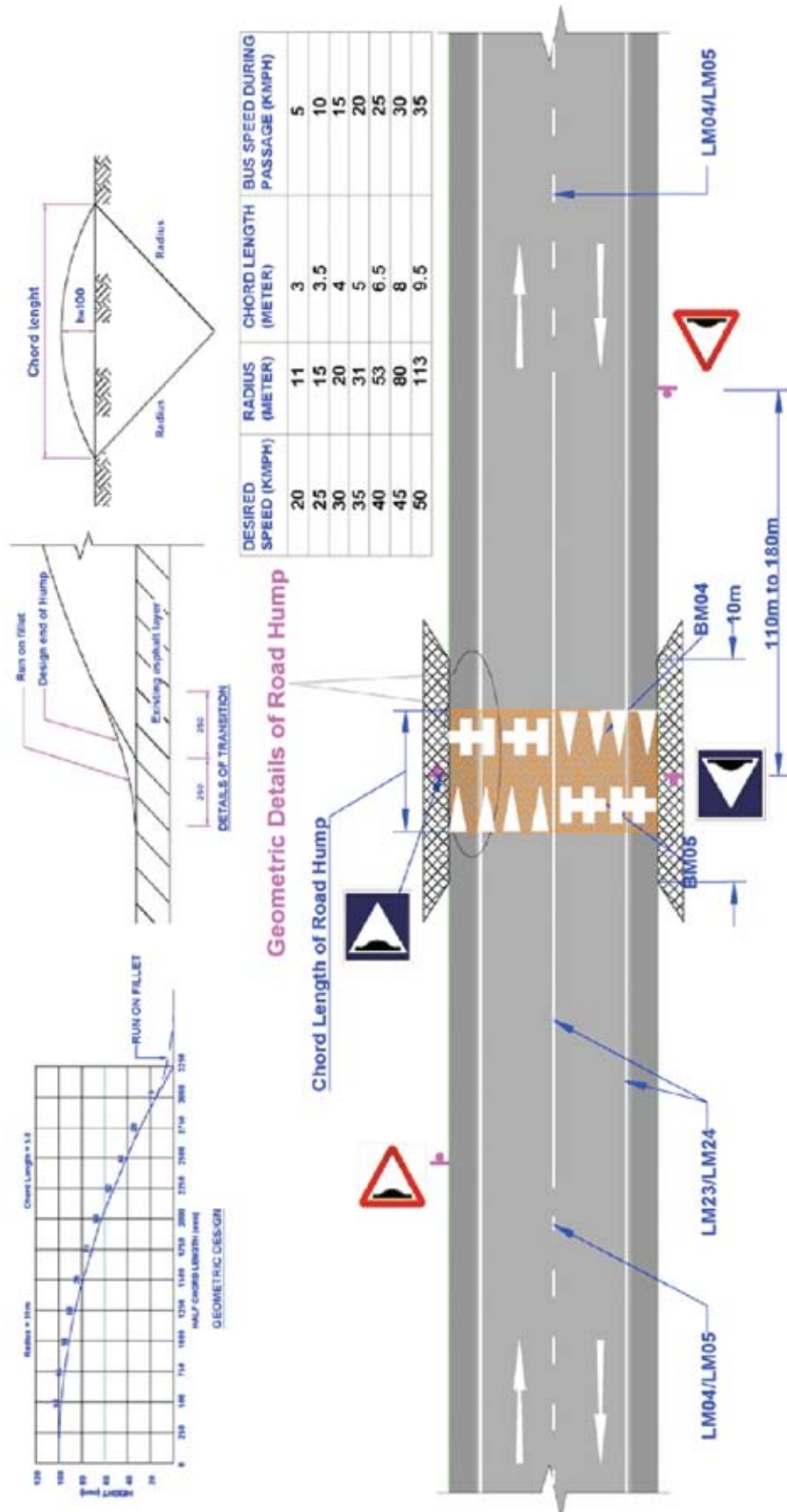


Fig. 9.8 Speed Breaker for Varying Passing Speed

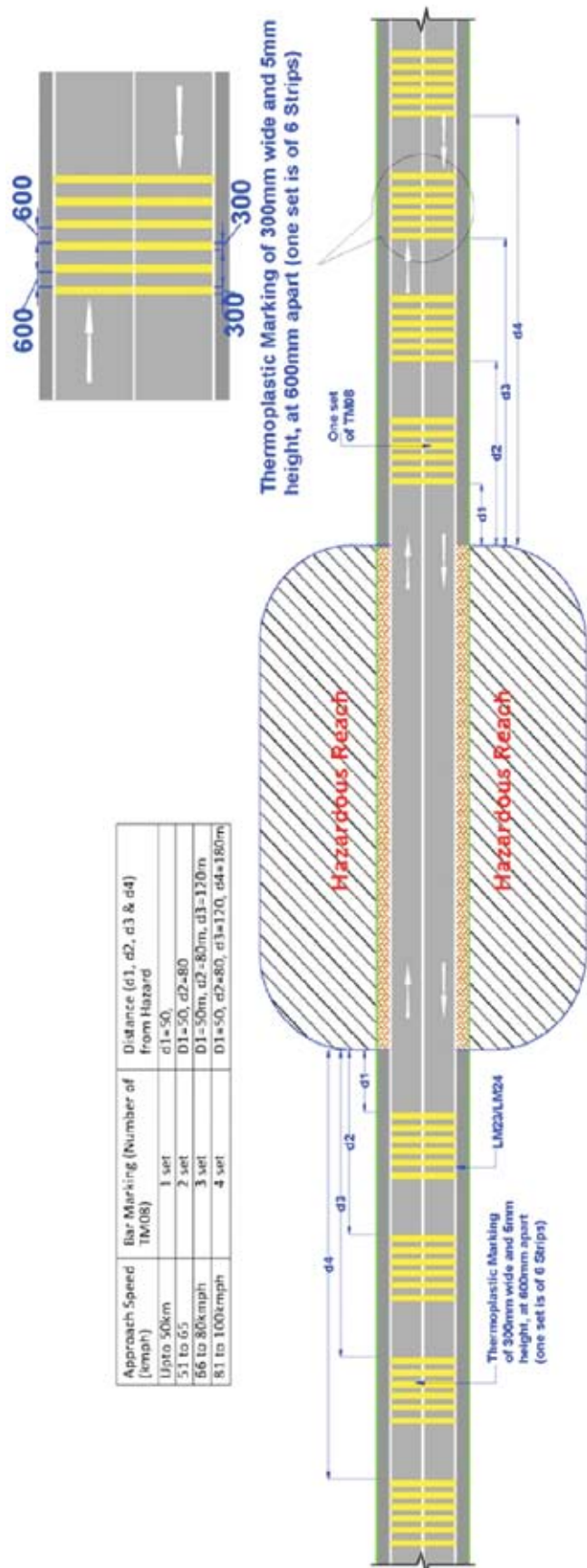


Fig. 9.9 Bar Marking for Different Approach Speed

9.5 Reflective Pavement Markers (Road Studs)

The Reflective Pavement Markers (RRPM) i.e. road studs shall be provided to improve the visibility in night time and wet weather conditions. These shall be prismatic retro reflective type conforming to ASTM D 4280. The **Table 9.1** presents the warrants for providing Road studs in two lane highway and the priorities to be followed along with placement details shall be as per IRC:35. The colour pattern of road studs for edge line and centre line with respect traffic movement is depicted in **Fig. 9.3**.

Table 9.1 Warrants for Road Studs

S. No.	Description of section		Length	Spacing	Location & Colour
1.	All sections of Project Highway having horizontal curves	Curve radii upto 450	Curve length including transition with 20 m on either side.	6 m	Red-White Bi-directional on shoulder side & Yellow-Yellow Bi-directional on Centre line of No overtaking portions and White-White Bidirectional for center line of other reaches
2.		Curve radii 451 to 750		9 m	
3.		Curve radii 751 to 2000 m and critical section		18 m	
4.	All sections of Project Highway having horizontal curves	Length of highway where vertical gradient is 2.5% and above and its vertical curves	Length including vertical grade and curves and adjoining 180 m portion on either side	9 m	
5.	All sections of Project Highway where overtaking prohibited	Sections where overtaking prohibited	Length of no overtaking zone.	6 m	
6.	All Major/Minor Bridge, ROB and all structures (Interchange/Flyover/VUP)	Structure	Structure portion and adjoining 180 m on either side	9 m	Red-White Bi-directional on shoulder side & Yellow-Yellow Bi-directional on Centre line of No overtaking portions and White-White Bi-directional for center line of other reaches
7.		Approaches	Approach length including the length of acceleration/deceleration length if any and 180 m adjoining on either side.	18 m	
8.	Built-up areas	Built-up area/settlement/villages	Length of built up from the start to end	9 m	
9.	All entry/exit slip roads/ramps and its acceleration/deceleration lanes	Entry/exit slip roads and ramps	Length of both side edge lines of slip roads/ramp+edge line of acceleration/deceleration lane	9 m	Red colour on edge lines
10.			Chevron/diagonal markings on gorge	6 m	Red Colour for Chevrons/diagonal markings

S. No.	Description of section		Length	Spacing	Location & Colour
11.		Continuity line for acceleration/deceleration lane for entry/exit of slip	Length of crossable continuity line for lane changing of entry/exit slip roads	8 m	Green Colour for crossable continuity line
12.	All junctions and median openings	Storage lane and acceleration/ deceleration lanes including 180 m on either side	Length of Shoulder and median edge lines	9 m	Red colour on Shoulder side and Yellow Colour for median sides
13.			Chevron/diagonal markings	6 m	Red Colour for Chevrons/diagonal markings
14.		Across the carriage-way	At the start of acceleration lane	3 rows at 1 m apart	Green Color
15.	Pedestrian Crossing	For zebra crossing marking	At four corners of all block of Zebra crossing markings	2 rows & at 0.5 m spacing	Yellow Color

Alternatively, Solar Powered Road Markers are more effective and draw attention of drivers and shall be provided at locations like at Sl. 6 & 8 and also other locations where performance of normal road studs are not that effective due to street lightings and other roadside activities.

9.6 Traffic Impact Attenuators

Attenuators shall be provided at hazardous locations and gorge areas so as to act as energy absorber. The attenuators or crash cushions shall be composed of 'W'-beam fender panels supported by diaphragm with trigger mechanism or composed of sand barrels as per Clause 814 the MoRTH and the contractor/supplier shall furnish the certificate that the system to be installed has been tested in accordance with the United States of America's National Cooperative Highway Research Program (NCHRP) Report 350, and performs effectively at design speeds up to 100 kmph. The space requirement to shield a fixed object should be considered while designing and constructing the attenuators. **Fig. 9.10** shows the area that should be made available for crash attenuators installations. The design and size of attenuators shall be as per International Standards. Following are the general criteria for providing crash attenuators:

- The location where there is a history of more than average number of accidents involving vehicles impacting obstruction
- The 85th percentile speed of traffic plying through the carriageway adjacent to obstruction in diverge area is greater than 70 kmph
- At location where the lane changing manoeuvring of vehicles are substantial.
- Traffic is required to travel in close proximity to the potential obstruction where it is not feasible to install safety barrier in front of it

- e) The obstruction with high value and if damaged by vehicle impact will have serious consequences
- f) The gorge areas of all diverging which are one level above ground

The specific location shall be identified following the criteria given above and the type of crash attenuators will be based on severity of the situation and shall be indicated in Schedule “B”.

9.7 Roadside and Median Safety Barriers

There are two types of safety barriers viz., roadside safety barriers and median safety barriers.

9.7.1 Road Side Safety Barriers

- i) Warrants: The longitudinal roadside barriers are basically meant to shield two types of roadside hazards i.e. embankments and roadside obstacles and also for preventing the vehicles veering off the sharp curves. Therefore, all embankments with height 3 m or more shall have safety barriers at the edge of formation, with delineating reflectors fitted on them. W beam barrier shall be provided along all curves having radii upto 450 m for complete length of curves including transitions and 20 m further before and after the curve.

Normally on shoulder side the lateral distance of at least 0.75 to 1.0 m width from edge of paved portion (i.e. carriageway + paved shoulder) should be available without any obstacles. Wherever a permanent object cannot be removed for some reasons, provision of tandems viz. W-beam metal crash barriers and hazard markers with reflectors must be made. Further, frangible lighting columns and sign posts need to be used for minimizing the severity in case of collision.

Irrespective of type of barrier being used, the slope in front of W-beam or wire rope or rigid barrier shall be near to flat gradient so that safety barrier perform best when impacted by a vehicle and the slope of ground in front of barrier shall not be steeper than 10:1.

Some of the commonly encountered roadside obstacles are bridge piers, abutments and railing ends, roadside rock mass, culverts, pipes and head walls, cut slopes, retaining walls, lighting supports, traffic signs and signal supports, trees and utility poles.

9.7.1.1 Types of roadside safety barriers

There are three types of longitudinal roadside safety barriers viz:

- a) Semi-rigid type like
 - “W” beam type steel barrier
 - Thrie beam type steel barrier

- b) Rigid type (like concrete crash barriers)
- c) Flexible type (like wire rope fencing)

The steel barriers with strong post type usually remain functional after moderate collisions, thereby eliminating the need for immediate repair. If damaged by a vehicle collision, both posts and rails of W-beam are to be repaired. Lack in maintenance can cause the W-beam rails to protrude into traffic way creating highly unsafe situation. The wire rope though technically complicated, can be repaired with minimum costs. Though initial installation cost is relatively high for concrete rigid barrier compared to W-beam and wire rope safety barriers, the repair and maintenance issues can be minimized greatly in concrete rigid barrier. The psychological shyness of drivers to keep away from the safety barrier will be the least in rigid concrete barrier compared to other types. Since rigid barriers will not yield under any vehicle impact, it shall be provided for bridges and ROBs and also to shield roadside objects/hazards where the required set back distance cannot be retained with wire rope and W-Beam (due to any site condition), as they are deflative in nature.

Invariably W-beam and wire rope barrier shall not be installed upon a structure. For a median upon a structure, it shall be concrete rigid barrier. Wire Rope Safety Barrier shall not be used over major or minor bridges

9.7.2 *Road Side Steel Barriers*

- a) **Design aspects:** The "W" beam type safety barrier consists of steel posts and a 3 mm thick "W" beam rail. There shall be a steel spacer block between the post and the beam to prevent the vehicle from snagging on the post, as the snagging can cause the vehicle to spin round. The steel posts and the blocking out spacer shall both be channel section of 75 mm x 150 mm size and 5 mm thick. The posts shall be spaced 2 m center to center. **Fig. 9.11** gives the typical details of 'W' beam rail and splices and shall be procured and installed from a reputed manufacturer.

The Thrie beam safety barrier shall have posts and spacers similar to the ones mentioned above for "W" beam type. The rail and splices design details for typical Thrie beam are shown in **Fig. 9.12** and shall be from a reputed manufacturer. This barrier has higher initial cost than the "W" beam type but is less prone to damages to vehicle collisions especially for shallow angle impacts.

The "W" beam, the Thrie beam and the posts spacers and fasteners for steel barriers shall be galvanized by hot dip process and design elements and installations shall be as per the details shown for crash barrier in this manual so as to achieve the performance characteristics intended for 'W' beam. For any structural elements and details missing in this Manual for 'W' beam and its various end treatments, the details from international guidelines/manuals on 'W'-beam which would conform to EN 1317 Part-2 can be adopted.

- b) **End treatment for steel barrier:** If hit, an untreated end of the roadside barrier can be hazardous, because the barrier beam can penetrate the passenger compartment and cause the impact vehicle to stop abruptly. End treatments should, therefore, form an integral part of safety barriers and the end treatment should not spear vault or roll a vehicle for head on or angled impacts. The end treatment on approach shall be Modified Eccentric Loader Terminal (MELT) arrangement as shown in **Fig 9.13** and departure sides it shall be Trailing Terminal (TT) arrangement as shown in **Fig 9.14**. The international practices shall be adopted for those details which are not available in this Manual for MELT and TT arrangements for the end treatment of 'W' beam.

The 'W' Beam to concrete transition shall be carried out by decreasing the post spacing, nesting one rail behind another and using steel section behind the 'W' Beam. The transition between 'W' beam and concrete barrier is detailed in **Fig. 9.15**.

- c) **Placement:** Placement recommendations determine the exact layout of the barrier and shall be made by the design engineer keeping in view the lateral offset of the barrier and flare rate. The final layout shall be as site-specific combination of these factors. The barriers shall be as far away from the traffic as possible and shall preferably have uniform clearance between the traffic and the hazard. As far as possible, the safety barrier shall be placed beyond 2.5 m of the travelled way. For long and continuous stretches, this offset is not critical. The distance between the barrier and the hazard shall not be less than the deflection of the barrier by an impact of a full sized vehicle. In case of embankments, a minimum distance of 600 mm shall be maintained between the barrier and the start of embankment slope of a hazard to prevent the wheels from dropping over the edge.

The 'W' beam and thrie beam perform well on the outside of curves and even those of relatively small radius. When a kerb exists on the edge of road and on to close proximity traffic way whether on shoulder or median edge lines, a distance of 100 mm shall be maintained between vertical face of kerb and 'W' beam or thrie beam face to ensure that impacting vehicle do not vault over safety barrier and at the same time reduces the nuisance hit. The steel barrier shall be placed in such a way so as to be collided by vehicle directly.

9.7.3 Road Side Concrete Barriers

- a) **Design aspects:** Roadside concrete safety barriers are rigid barriers having a sloped front face and a vertical back face. For uniformity New Jersey type concrete barriers should be used where necessary. Rigid crash barriers may however be required only in constrained urban location between main carriageway and service road. The concrete barrier may be pre-cast in

lengths of up to 6 m depending upon the feasibility of transport and lifting arrangements. Concrete grade for the barriers shall not be leaner than M 30. The minimum thickness of foundations shall be 25 mm thick cement concrete or hot mix asphalt placed at the base of barrier to provide lateral restraint. Where more than 75 mm thick over lay on the road pavement is anticipated, the foundation step may be increased to 125 mm. However, longitudinal roadside concrete barrier should have elaborate footing design which is structurally safe unless sufficient earth support is available.

Suggested flare rates depending upon the design speed are given in **Table 9.2**.

Design Speed in km Per Hour	Flare Rates
100	17:1
80	14:1
60	11:1
40	8:1

- b) **End treatment:** Safety barrier shall be provided with an end treatment, which shall be obtained by tapering the height of terminating end of the median barrier within a length of 8 m to 9 m.
- c) **Placement:** Placement recommendations for roadside steel barriers, mentioned in Para 9.7.2 (c) are applicable to roadside concrete barriers as well.

9.7.4 Wire Rope Safety Barrier

- a) **Design aspects:** The wire rope barriers/systems are suitable for either shoulder and/or median side application, provided there is adequate clearance to account for their deflection, as per manufactures system design specification and standards. The slope of surface between traffic way and wire rope safety barrier shall always be flatter than 10:1 and there shall not any object or raised kerb in between so to enable the cables to readily dis-engage from posts during impact and thereby minimizing snagging and ensuring that the vehicle is smoothly redirected.

Wire rope barrier can be repaired quickly and only damaged posts are to be replaced. High tension 3 rope or 4 rope wire system confirming the requirements of EN 1317-2 for higher containment Level of H2 shall be used. Typical details of wire rope barrier are given in **Fig. 9.16** and wire rope barrier with ropes interwoven are also presented in **Fig 9.17**. The wire rope barrier shall be the proprietary product of an approved manufacture . The material and design of wire rope shall be as per the MORTH Specification.

- b) **End treatment:** The end treatment shall be as per the manufactures details conforming to EN 1317 Part 2. The wire rope to 'W' beam transition shall be done Modified Eccentric Loader Terminal (MELT) arrangement as shown in **Fig. 9.18**. The termination of wire rope to a rigid or concrete barrier or a parapet shall be avoided and there shall be a transition from wire rope to W-beam in-turn to concrete barrier as shown in **Fig. 9.19**.
- c) **Placement:** The placement of the Wire Rope Safety Barrier shall be determined by the design engineer and shall be a combination of the deflection ratios of the barrier and the site-specific conditions. The barrier shall be placed as far away from the traffic as possible and shall preferably have uniform clearance. The lateral slope of surface between traffic way and wire rope safety shall always be flatter than 10:1 so that vehicle bumper trajectory will not change before an errant vehicle hit the wire rope.

When Wire Rope Safety Barrier is provided in front of a hazard, it shall be so located caters to the deflection specified by the manufacture. The barrier shall be extended at full height not less than 30 m in advance of the hazard on the approach side, and shall continue at full height for 7.5 m beyond the hazard on the departure side. The minimum length of fence shall be no less than 50 m. If there is a hazard present in the deflection area of the barrier, then the distance between fence and the hazard shall not be less than that deflection values described by the manufacture and will depend upon the post spacing.

There shall be at least 1 m setback distance between wire rope safety barrier and the start of drop or embankment slope. While installing wire rope on a highway carrying two/three-wheelers and other small vehicles, the deflection as specified by the manufacturer shall be maintained as set back distance from the start of drop or embankment. The deflection can be reduced by closer post spacing, however the minimum setback distance shall be ensured. Wire rope can be installed for curves radii more than 450 m only.

The Wire Rope Safety Barrier shall not be permitted in following situations:

- Where a hazard is present within the deflection area of the fence.
- Where total fence length is less than 50 m
- On a horizontal curves of radius 450 m or less.
- On vertical sag curves of radius less than 3 km.
- Where rate of change in setback is steeper than 1 in 10.

9.7.5 *Barriers on Median/Raised Footpath*

9.7.5.1 At locations where project is passing through 4-lane or 6 lane configurations having a narrow median and at locations where barriers have to be install on footpath or raised platform, the provisions and warrants given in IRC:84 shall govern.

9.7.5.2 The lateral placement of 'W' beam or wire rope barrier on raised platform of footpath having raised kerb and on embankment sides are pictorially presented in **Fig. 9.20**.

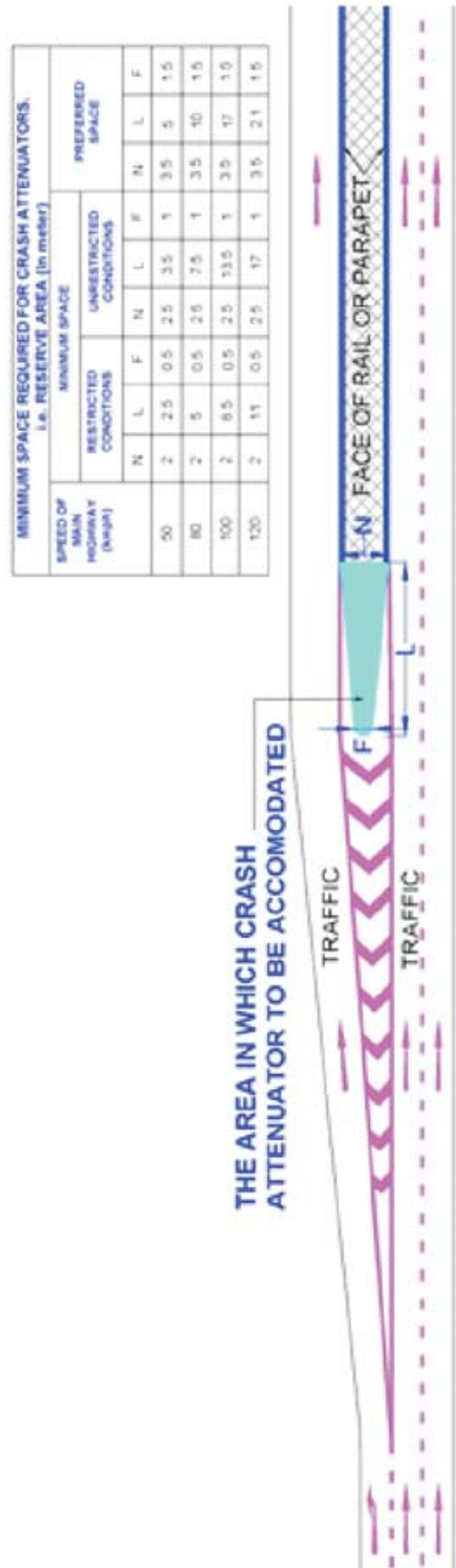
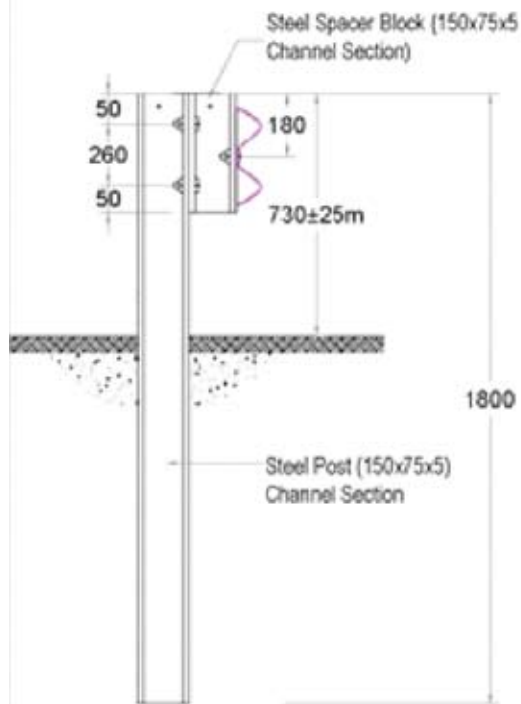
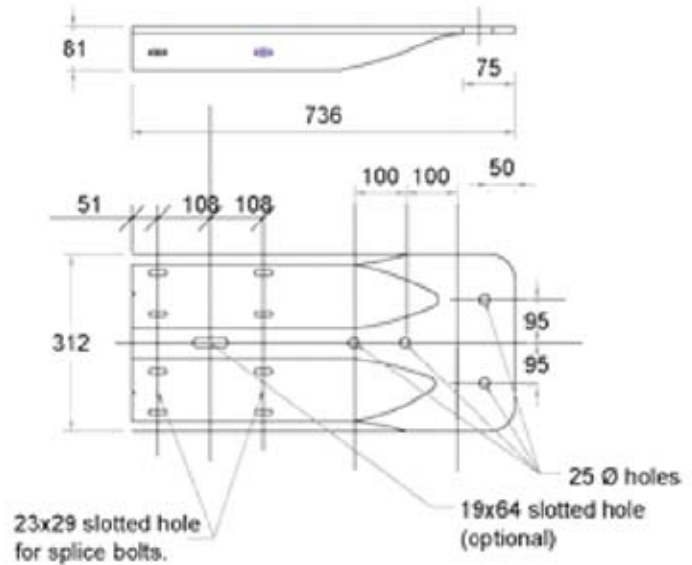
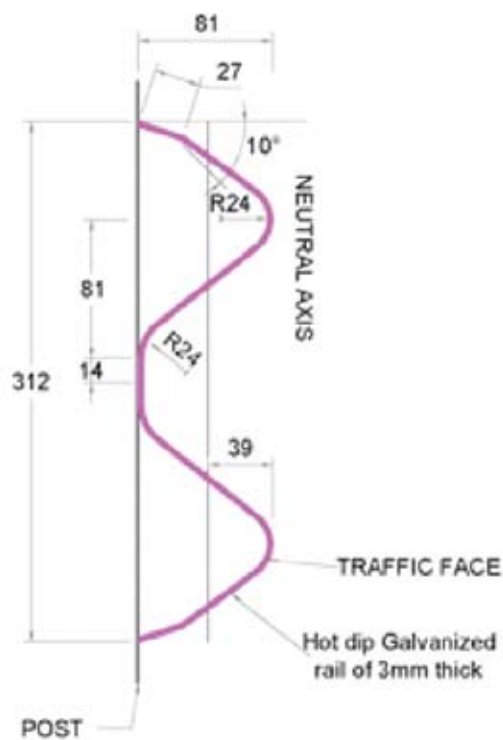


Fig. 9.10 Space Required to Place Crash Attenuators

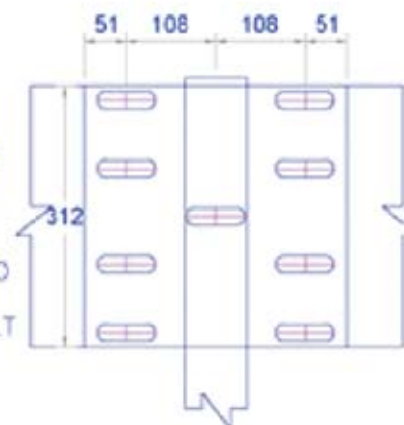


W BEAM TERMINAL CONNECTOR



BEAMS ARE OVERLAPPED AT EACH SPLICE BY 318mm AND CONNECTED TOGETHER BY 8 BUTTON HEAD 16mmØ BOLTS

BEAMS ARE CONNECTED TO SPACER BLOCK BY ONE BUTTON HEAD 16mmØ BOLT



RAIL SPLICE

Note: All dimensions are in millimeter(mm)

Fig. 9.11 Typical Details of W Beam Structural Elements

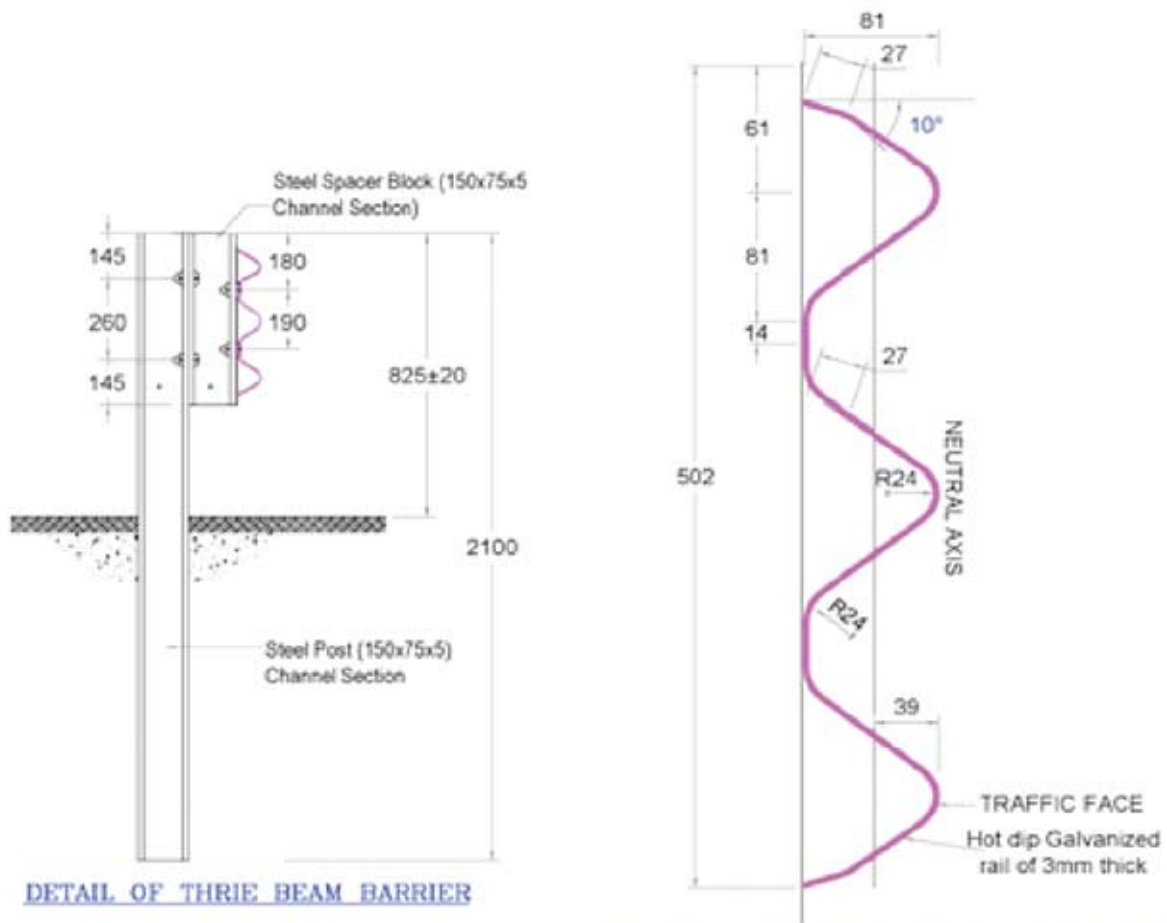
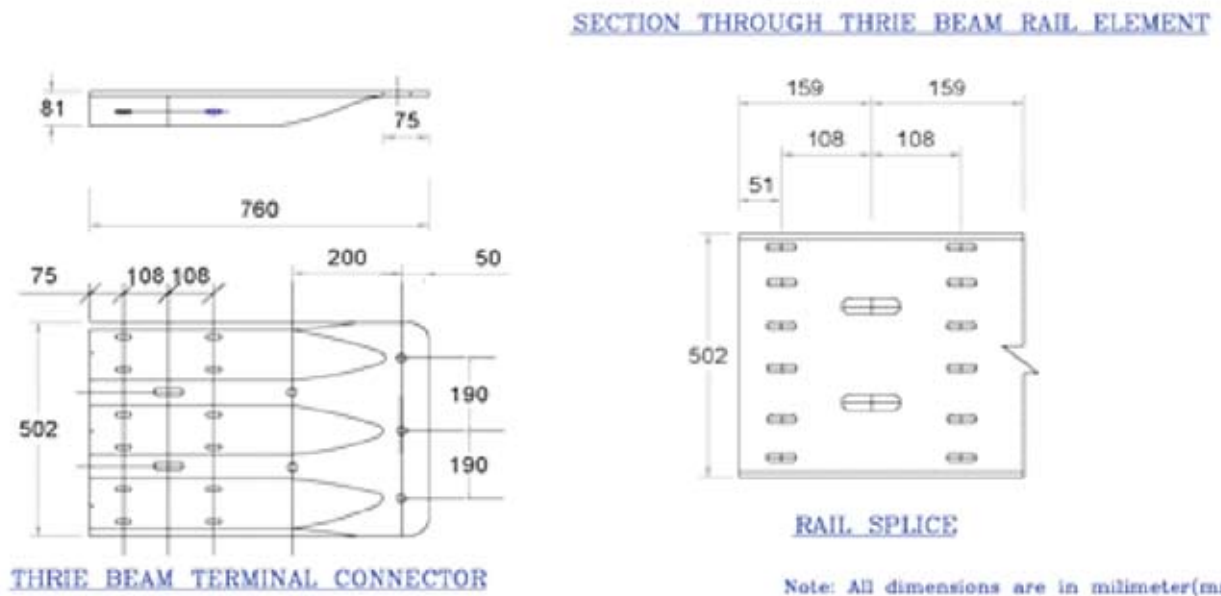


Fig. 9.12 Typical Details of Thrie Beam Structural Elements

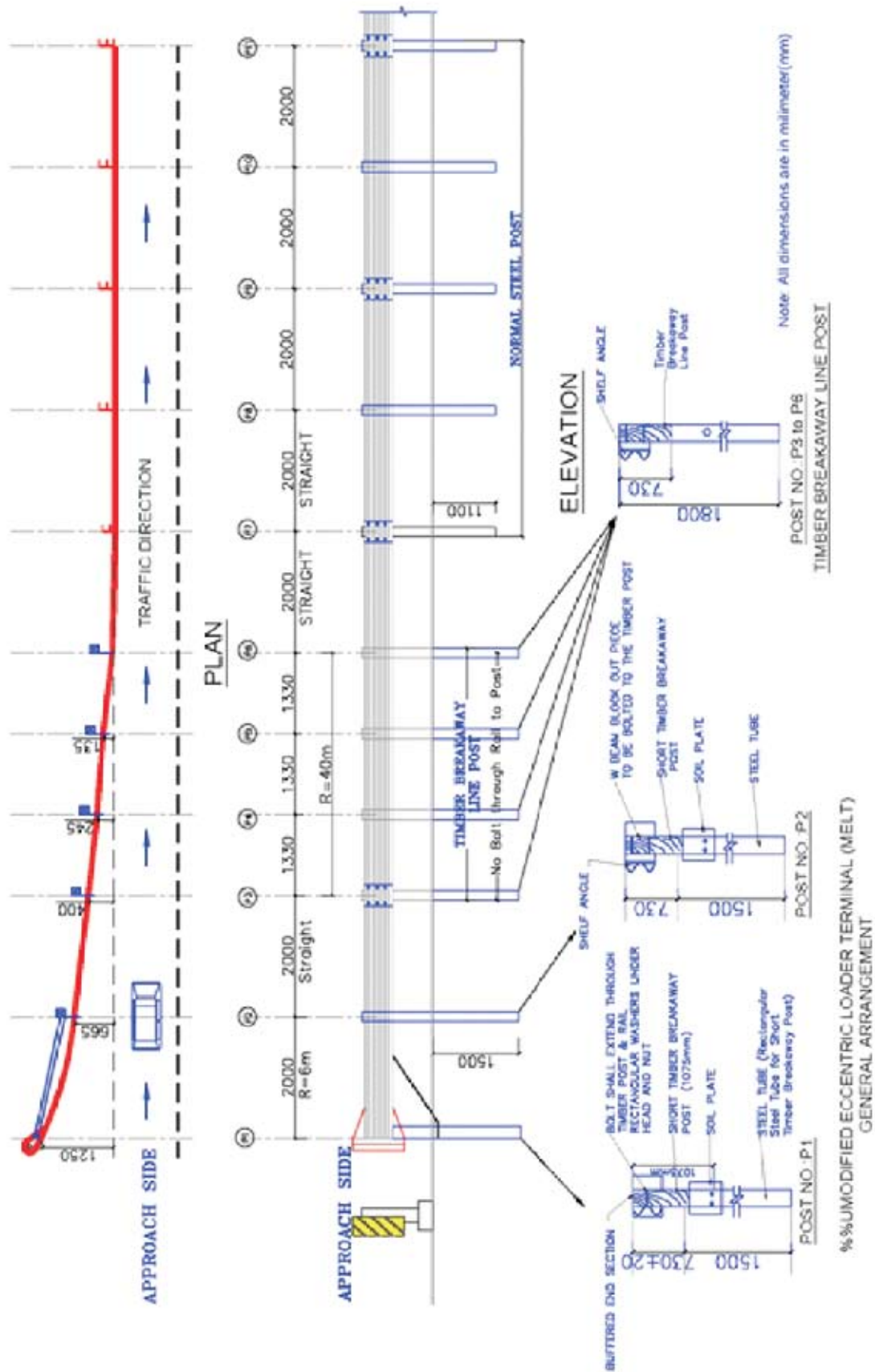


Fig. 9.13 Modified Eccentric Loader Terminal (MELT) Arrangement W Beam Treatment on Approach Side

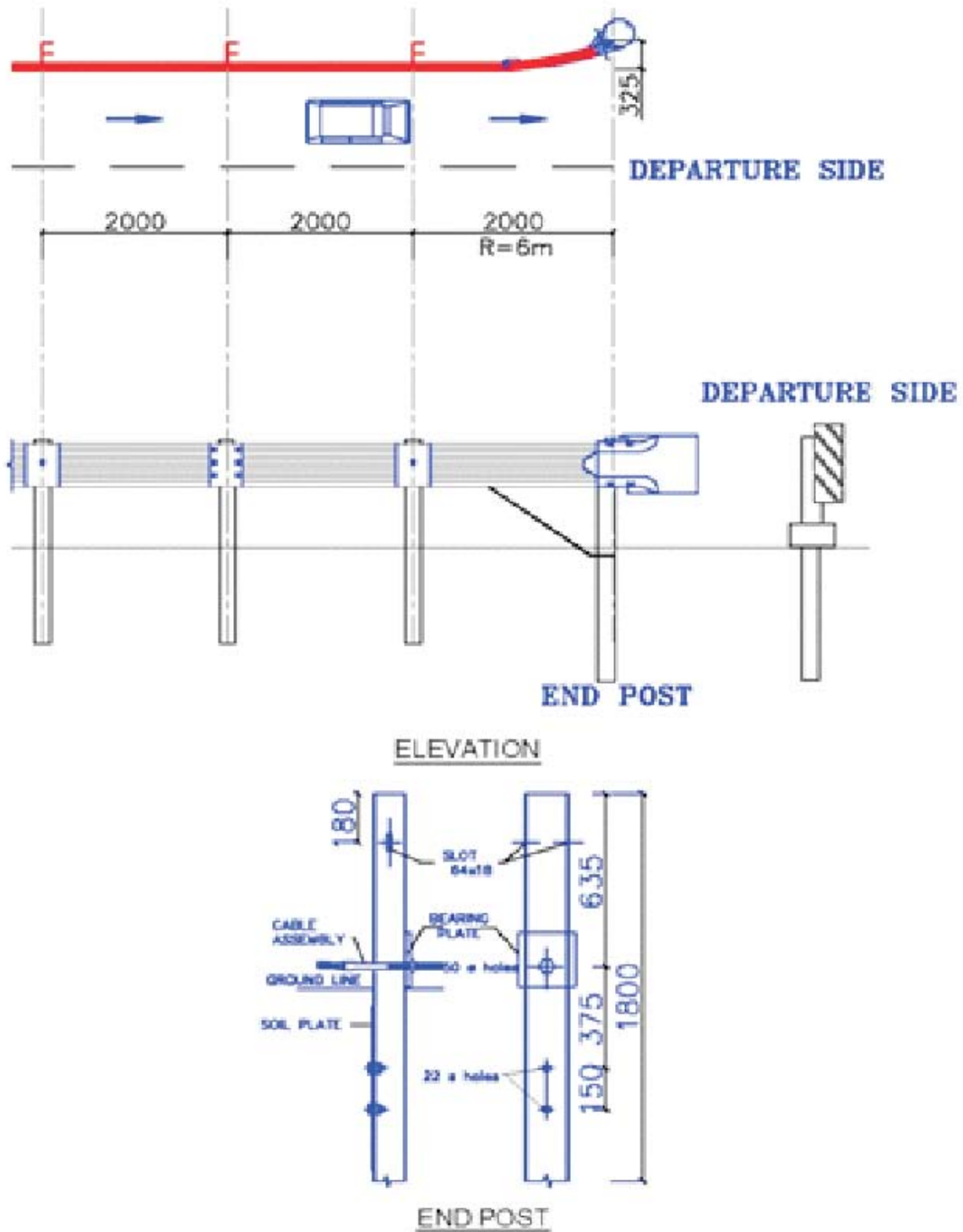


Fig. 9.14 Trailing Terminal (TT) Arrangement - W Beam Treatment on Departure Side

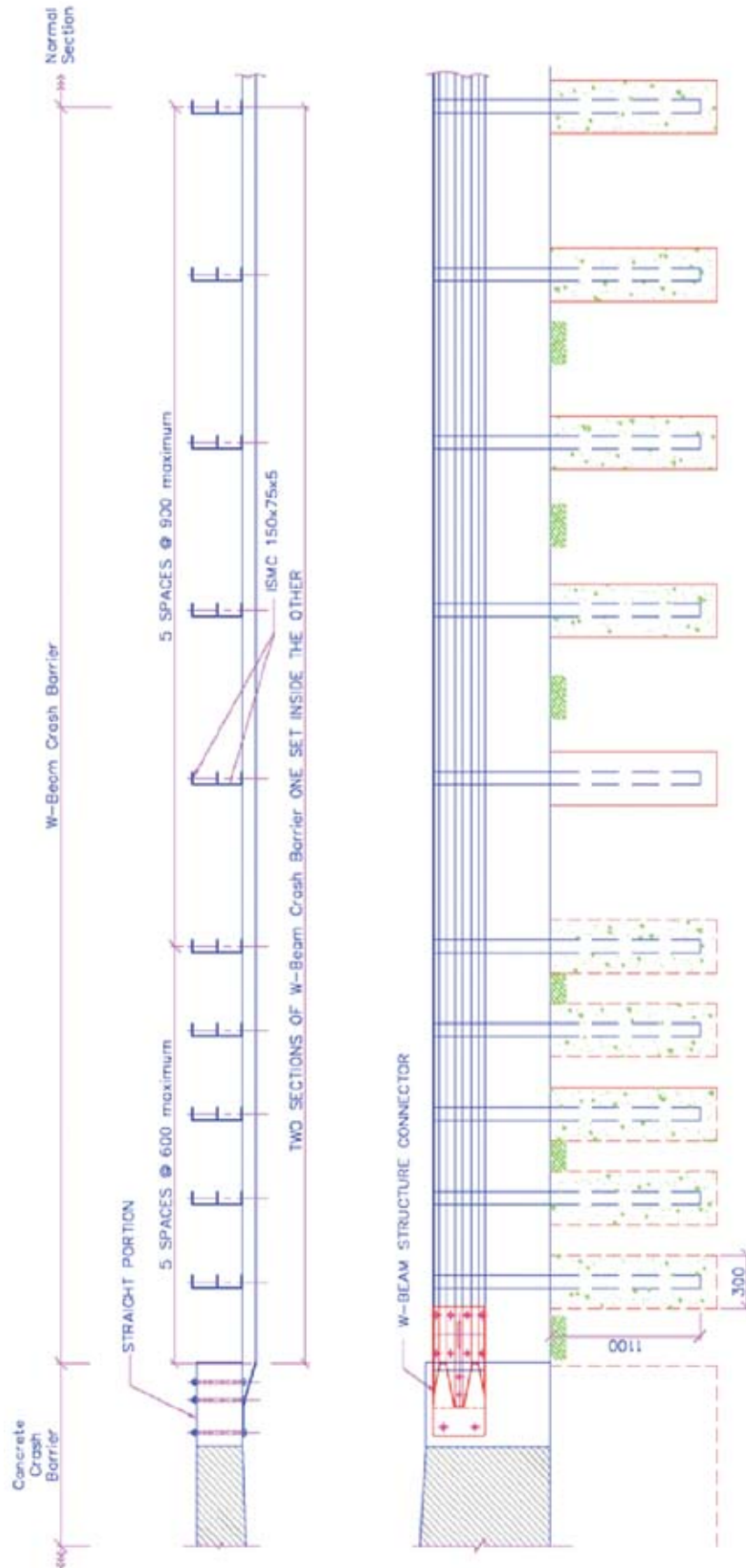


Fig. 9.15 W Beam to Concrete Connection Details

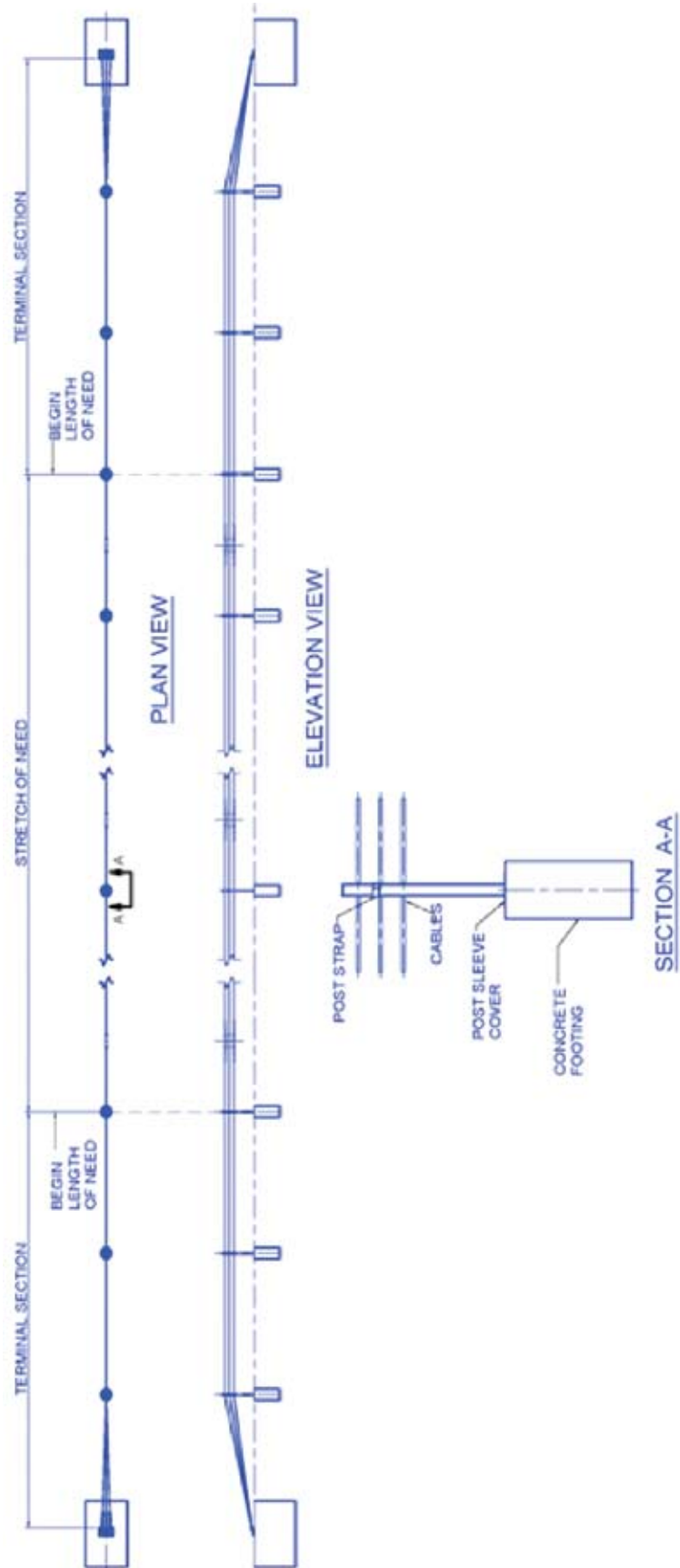


Fig. 9.16 Typical Details of Wire Rope Safety Barrier

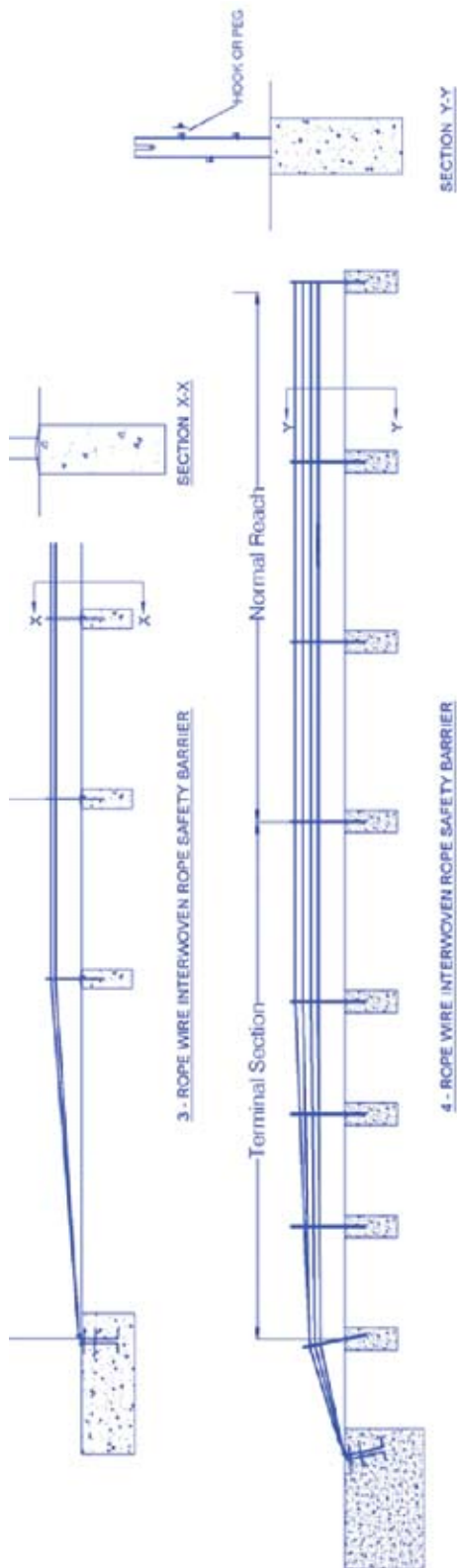


Fig. 9.17 Typical Details of Interwoven Wire Rope Safety Barrier

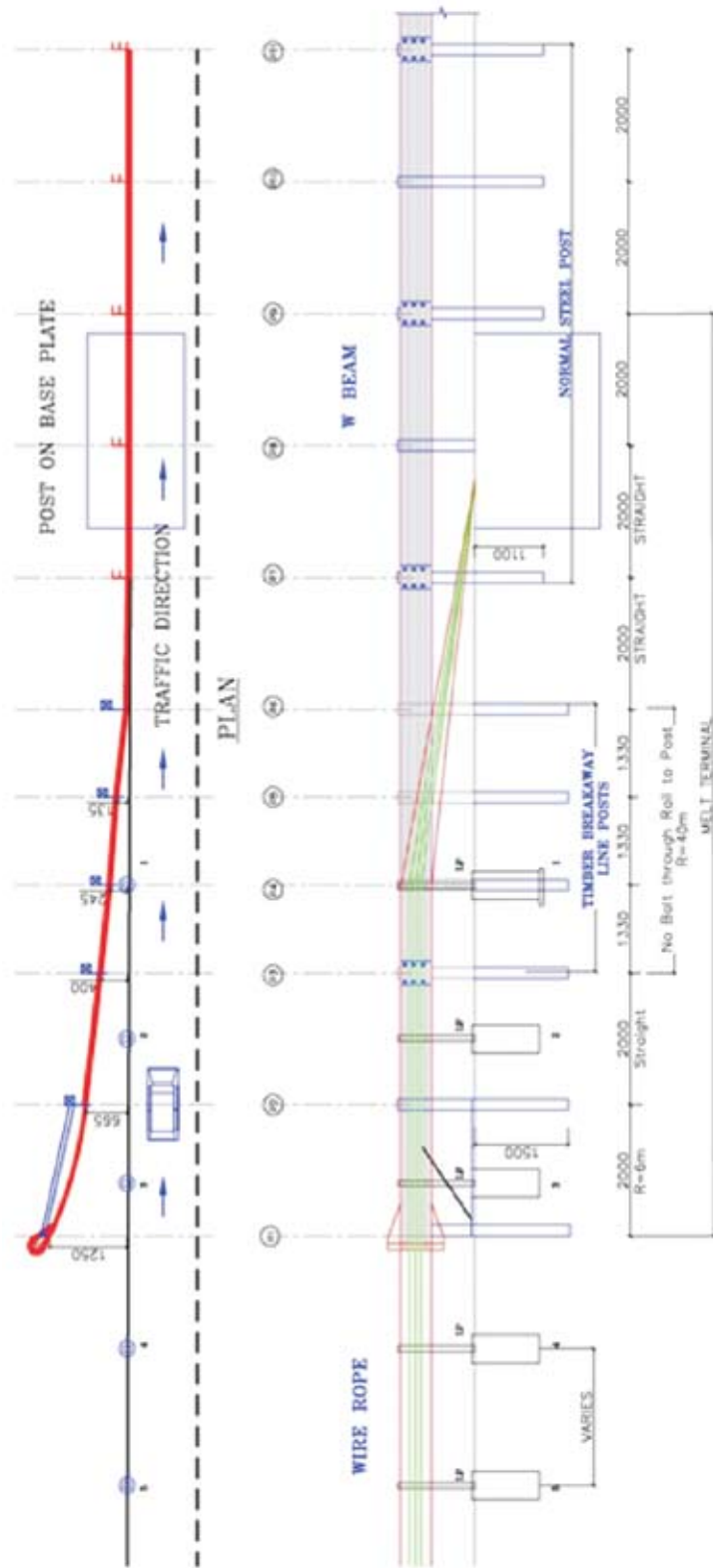


Fig. 9.18 Typical Details on Wire Rope to W Beam Barrier

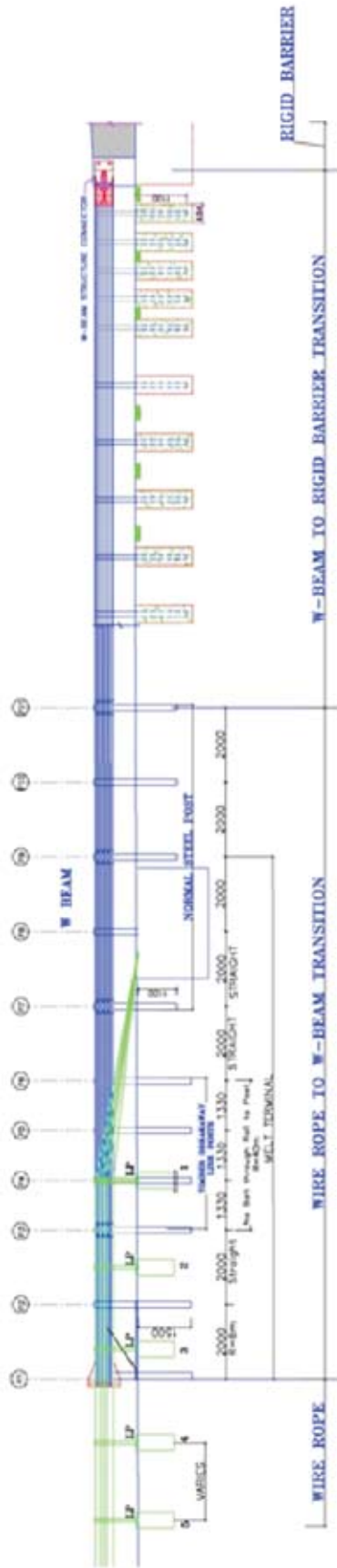


Fig. 9.19 Typical Details on Wire Rope to Rigid Barrier

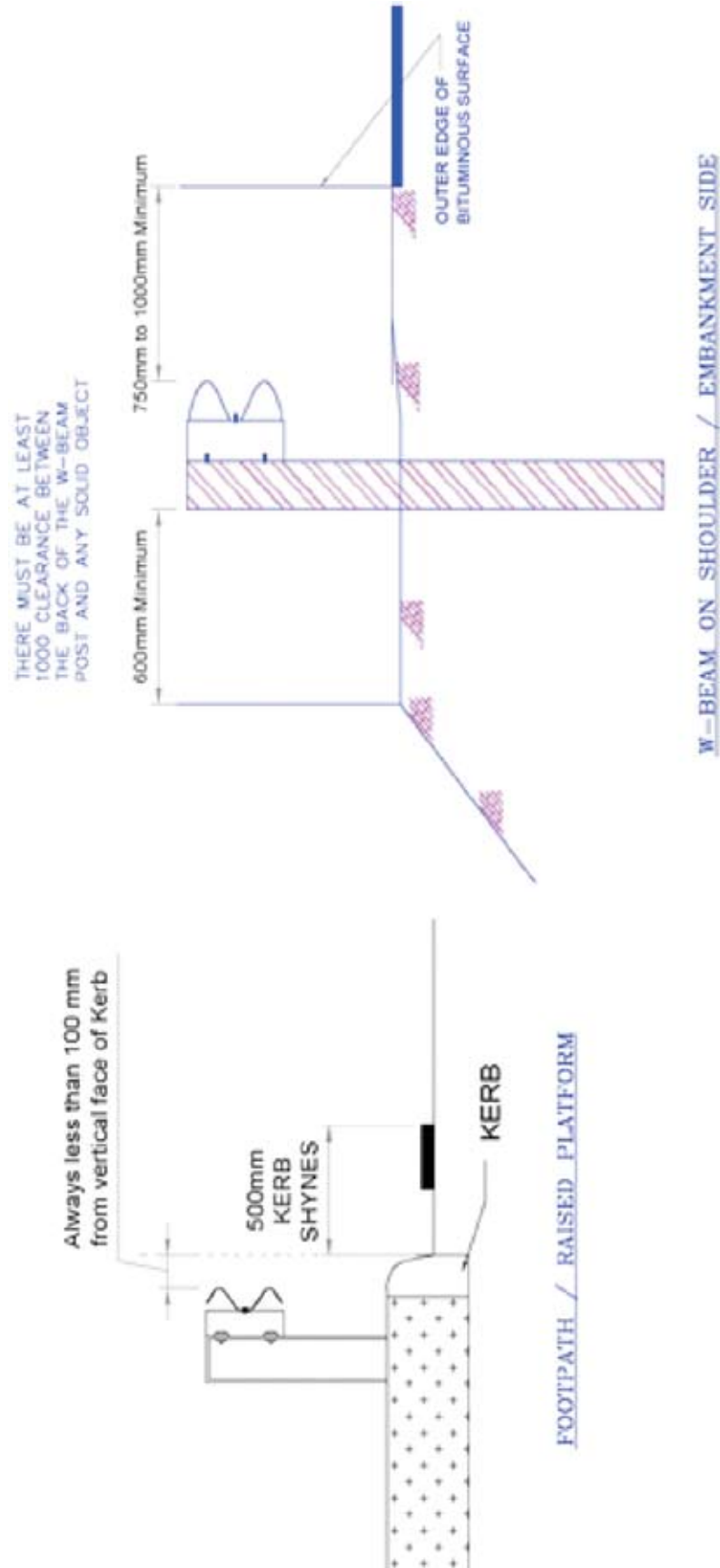


Fig. 9.20 Lateral Clearance

9.7.6 General

Raised kerbs or drains shall not be provided between the traveled way and the barriers. These destabilize the vehicle balance and disturb its equilibrium before it strikes the barrier, thus defeating the essential purpose of safety and redirection of the impacting vehicle. Steel barriers shall be provided in non-built-up sections whereas concrete barriers shall be provided in built-up sections. In addition to the warrants given in paras 9.7.1 (i) and 9.7.5 (ii), the safety barriers shall also be provided at the following locations:

- a) Where embankment is retained by a retaining structure (concrete).
- b) On valley side of highway in mountainous and steep terrain (concrete).
- c) Between main carriageway and footpath in bridges (concrete).
- d) At hazardous locations identified in Schedule 'C' or through safety audit (concrete/steel as specified in Schedule 'B' or Safety Audit Report).

The requirements of Safety Barriers for structures are given in para 7.17 of this Manual.

9.8 Pedestrian Facilities

9.8.1 General

Pedestrians are vulnerable to being involved in accidents. Therefore, adequate consideration shall be given to their safety through provision of facilities. The facilities for pedestrians given in this Section shall be provided on the Project Highway.

9.8.2 Footpath (Sidewalk)

- i) The foot paths shall be provided in the built-up sections, on both sides, as given in para 2.14 of this Manual.
- ii) The width of side walks depend sup on the expected pedestrian flow and shall be fixed subject to land availability, but shall not be less than 1.5 m.

9.8.3 Pedestrian Guardrails

- i) Pedestrian guardrails are an important design element to prevent indiscriminate crossing and spilling over of pedestrians on to the carriageway. Their judicious use can help to ensure that pedestrians cross the highway at predetermined and safe locations. As the guardrails would confine the movement of pedestrians to the footpath, it is obligatory that sufficient width of footpath be made available for the use of pedestrians.
- ii) **Design:** The design shall be such that the guardrails are neat and simple in appearance. The height of guardrail shall be 1.2 m from foot path level. The visibility of the approaching vehicles by the pedestrians as well as the visibility of the pedestrians by the drivers of the approaching vehicles shall be adequate. The railings shall not have any thick horizontal member, other than the baluster to achieve the desired objective. Pedestrian guardrails may be of reinforced cement concrete, iron tubes, steel channeled sections and pipes, or steel sections appropriate for the environment. Refer to IRC:103.

- iii) **Application:** Pedestrian guardrails shall be provided at the following locations/ situations:
 - a) **Hazardous locations on straight stretches:** In particularly busy reaches, where the road is congested and vehicles move at a fast pace, guardrails shall be provided on both sides of the carriage way so as to channelize the pedestrians on to the planned crossing locations.
 - b) **At Junctions/Intersections:** Railing barriers shall be provided to prevent people from crossing the junctions diagonally at signalized inter sections. The barriers shall open only at planned crossing facility (at the Zebra Crossing). At unsignalized junctions they shall be provided for sufficient length to guide the pedestrians to the nearest planned pedestrian crossing.
 - c) **Schools:** Provision of guardrails near schools, where children would otherwise go unstraight in to the road, is essential. If there is a pedestrian crossing or a school crossing patrol nearby, the guardrails shall be extended up to it.
 - d) **Bus Stops, Railway Stations, etc.:** Guardrails shall be provided along side walks with suitable access at bus stops, railway stations and other areas of heavy pedestrian activity such as cinema houses, stadia, etc. for guiding pedestrians safely in such areas.
 - e) **Overpass, Subway, etc.:** Guardrails shall be provided at these locations in order to compel the pedestrians to use the facilities provided for them.
 - f) **Central Reserves:** Where there is a central reserve or a median, guardrails shall be erected within it to deter the pedestrians from attempting a crossing.
- iv) **Gaps/Set back Distance:** The guardrails shall be setback from edge of the carriageway by at least 150 mm

9.8.4 *Pedestrian Crossing*

- i) Where complete segregation of pedestrians from vehicular traffic is not provided, some form of planned road sharing principle shall be applied. Pedestrian crossings shall be provided where they will be well used. Pedestrian crossings shall be suitably integrated with the overall design of the inter section.
- ii) The following criteria shall be followed regarding selection of pedestrian crossing:
 - a) **At-grade Pedestrian Crossing (pedestrian cross walk):** Pedestrian cross walks shall be provided at important inter sections and such other locations where substantial conflict exists between vehicular and

pedestrian movements. Wherever possible, the cross walks shall be at right angles to the carriageway and properly marked so that the pedestrians are subjected to minimum inconvenience. Cross walks shall not substantially increase the walk distance of pedestrians. Adequate visibility, freedom from obstructions and sufficient space for waiting are the other important requirements for location of cross walks.

At-grade pedestrian crossings can be uncontrolled or controlled. Uncontrolled pedestrian crossings shall be provided only where the intersection itself is left uncontrolled because of low volumes of both vehicular and pedestrian traffic even during peak hours and where accident records do not indicate any need to segregate vehicular traffic from cross pedestrian traffic. Uncontrolled pedestrian cross walk shall be marked by studs or paint line.

Controlled form of crossing shall be achieved through provision of Zebra Crossings, whether at a non-signalized or signalized intersection.

Fig. 9.21 gives a typical layout of pedestrian cross walk in an intersection.

- b) Zebra Crossing:** A zebra crossing shall not be sited within 150 m of another such crossing. The zebra crossing shall be somewhat set back from the carriageway line. However, the set back distance shall not be so much as to cause an appreciable increase in walking distance for the pedestrians. Pedestrian guard rails may be necessary where the set back distance is appreciable or at the skew crossings.

The width of the zebra crossing shall be adequate and shall generally lie within a range of 2.0 m to 4.0 m. The crossing shall, as far as possible, proceed uninterrupted through the median strip. In the event of the median strip being used as pedestrian refuge, adequate width of median shall be provided. In case of raised medians, such portion could be suitably depressed with kerb height not exceeding 150 mm.

In the vicinity of zebra crossing, guard rails of sufficient length shall be provided to deter pedestrians from crossing the road at any arbitrary point along the road. **Fig 9.22** gives a typical layout zebra crossing in a mid-block section.

9.9 Work Zone Traffic Management Plans (WTMPs)

The traffic diversion plan during construction shall be prepared as per IRC:SP:55 for the entire project highway. Separate traffic diversion plan shall be prepared for structures and CD works. Following suggested layouts presented in IRC:SP:55 are recommended for various construction scenarios. Suiting the specific site requirements, the application steps described therein shall be followed.

APPLICATION:

The layout shown is applicable when a two lane highway is upgraded to 2-lane with paved shoulder with eccentric widening. In the first stage, the traffic will continue to ply through the existing road. Layout of signs and barriers would be as shown.

APPLICATION

The layout shown is applicable when a single lane or intermediate or two lane carriageway is upgraded to standard two lanes with paved or earthen shoulder. In this stage, the work will be taken up adjacent to existing traffic movement with traffic control measures. Layout of signs and barriers would be as shown.

WTMP WHILE PREPARING SURFACE TO FACILITATE TEMPORARY TRAFFIC MOVEMENT: The layout shown is applicable (if at all required) to prepare additional width to achieve 5.5 m width to facilitate two directional traffic movement with the pavement composition and thickness which can withstand the temporarily diverted traffic for a length from transition zone to termination zone. Layout of signs and barriers would be as shown.
Fig. 9.25 Stage-2 of Single/Intermediate Lane Road into 2-lane with Shoulders

APPLICATION:

In the subsequent stage, the traffic will be diverted to the portion of carriageway and shoulder developed during the first stage. Layout of signs and barriers would be as shown.

APPLICATION:

The layout shown is applicable when a Cross Drainage structure has to be constructed and where a temporary diversion will need to be constructed for maintaining the traffic flow. The diversion in most cases would be on embankment; therefore, delineation is essential for both day and night time. Temporary diversion shall be developed and maintained to accommodate all type of vehicles likely to ply through the road. Layout of signs and barriers would be as shown.

APPLICATION:

The layout shown is applicable for short term maintenance activities at the center of a carriageway. Generally traffic cones are used that it can be placed and removed easily.

APPLICATION:

The layout shows the Stage-1 in flyover/VUP construction. In the first stage, the traffic will be diverted to a service road or temporary road. The turning movements would continue at the existing intersection and construction of piers/embankment/RE wall would be taken up in the cordoned portion. Carefully planned pedestrian markings on the roads and protected safe passage for crossing of pedestrians shall be provided through work area shall be provided through work area.

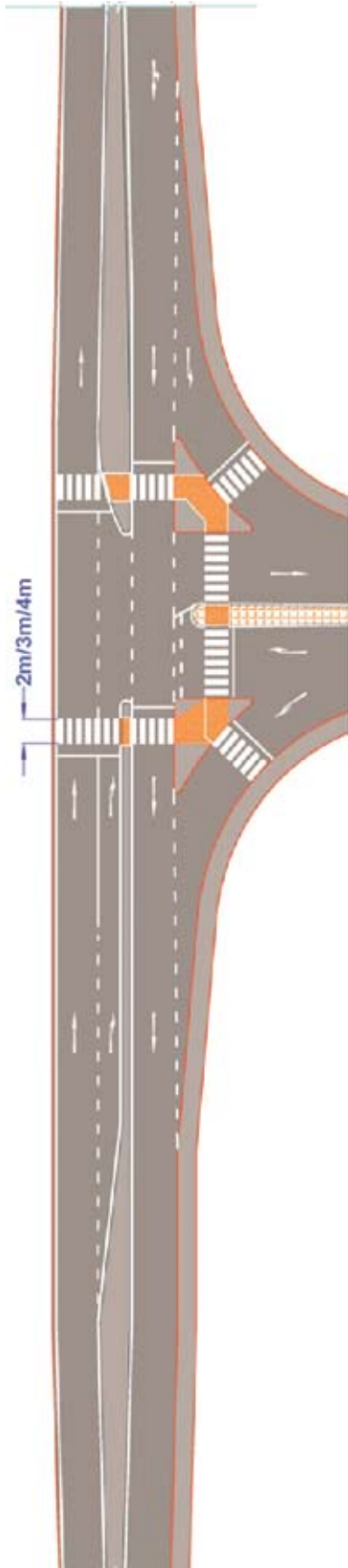
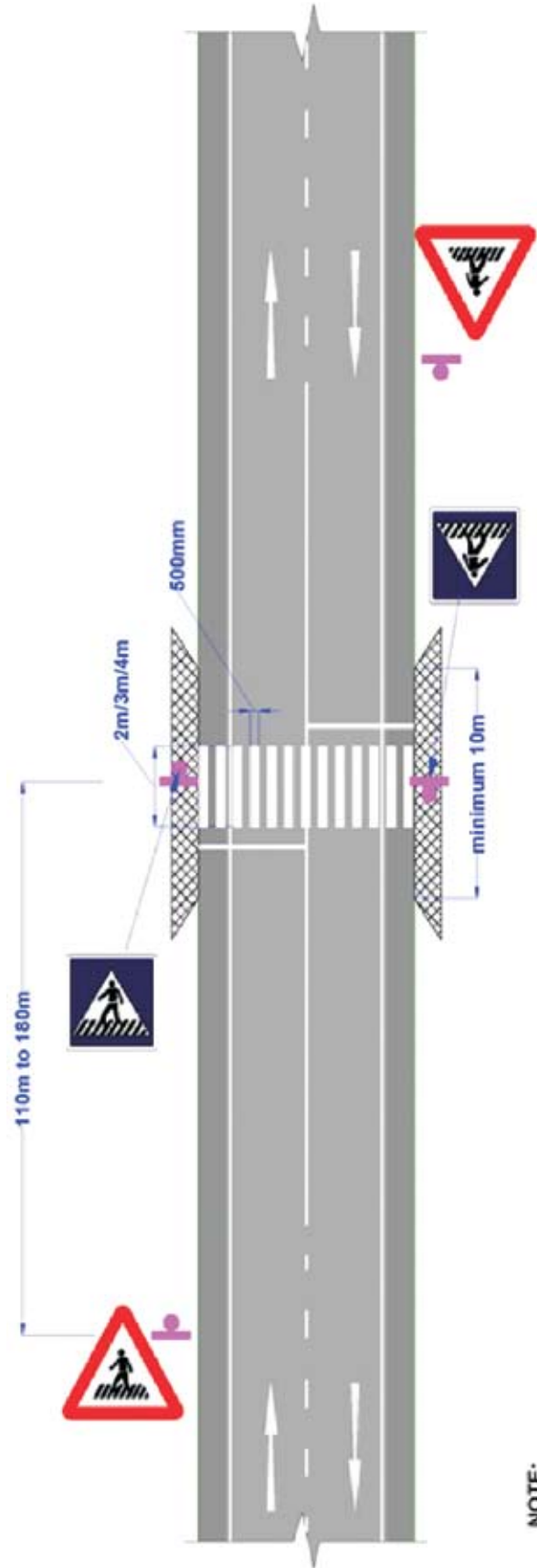


Fig. 9.21 Zebra Crossing at an Intersection (Typical)



NOTE:

- In an Un-Signalised crossing, pedestrian crossing marking shall be around 2 to 3 m from stop line.
- In a Signalised crossing, pedestrian Marking around 1 to 1.5 m in advance of a primary signal.

Fig. 9.22 Zebra Crossing in a Mid-Block Section

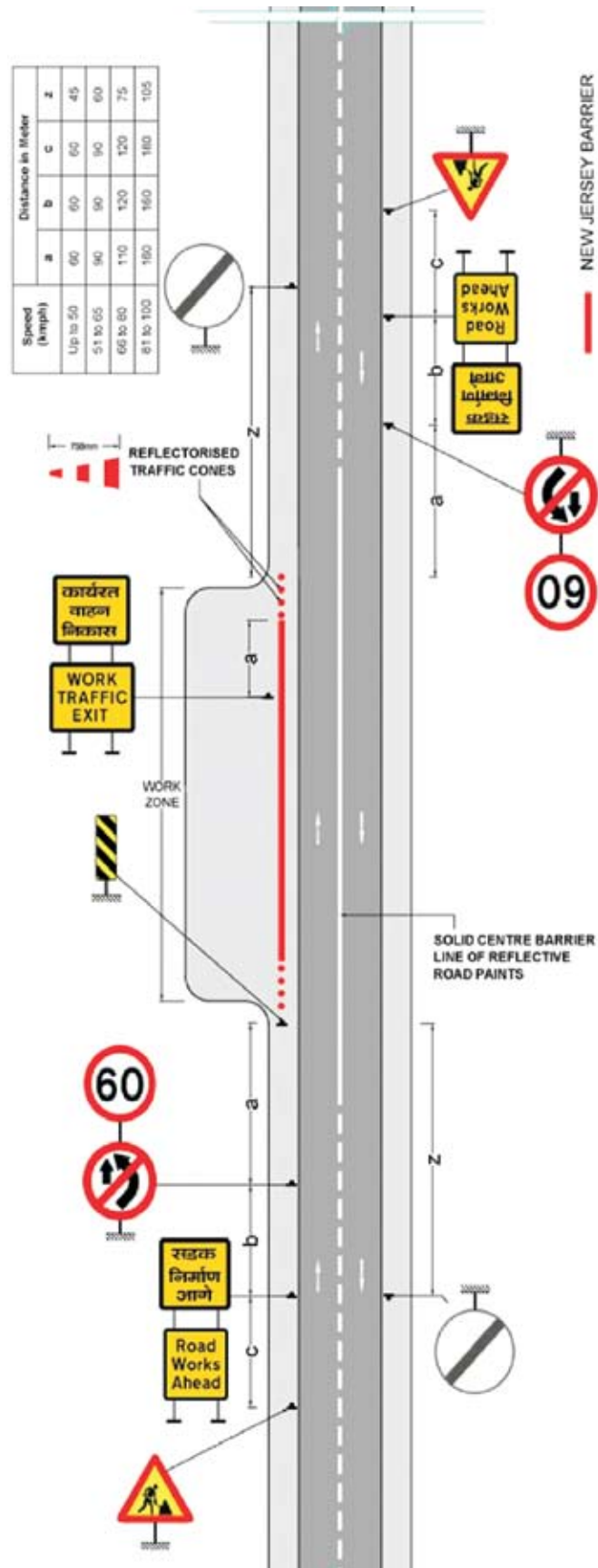


Fig. 9.23 Lateral Widening

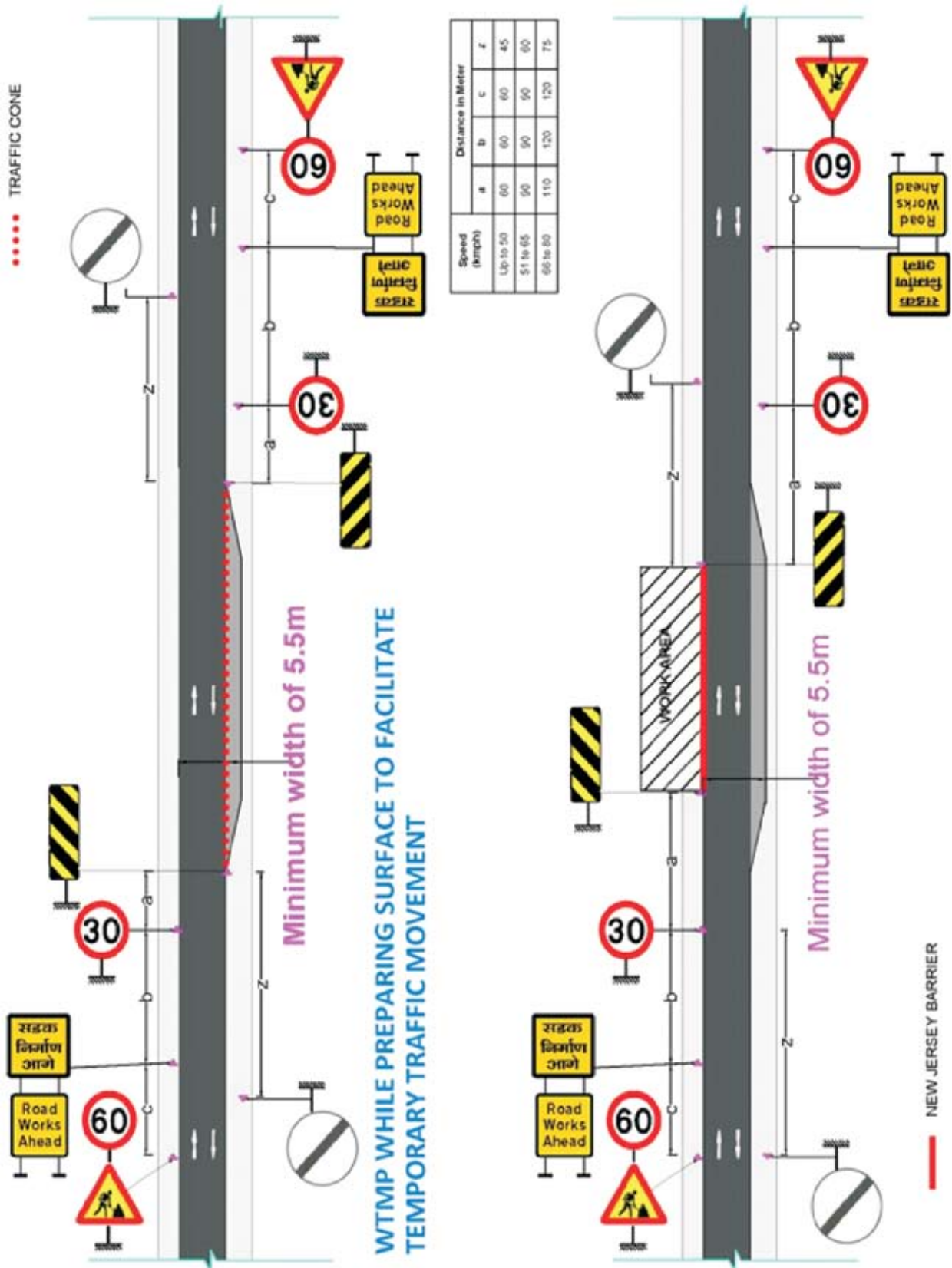


Fig. 9.24 Stage-1 Single/Intermediate Lane Road into 2-Lane with Shoulders

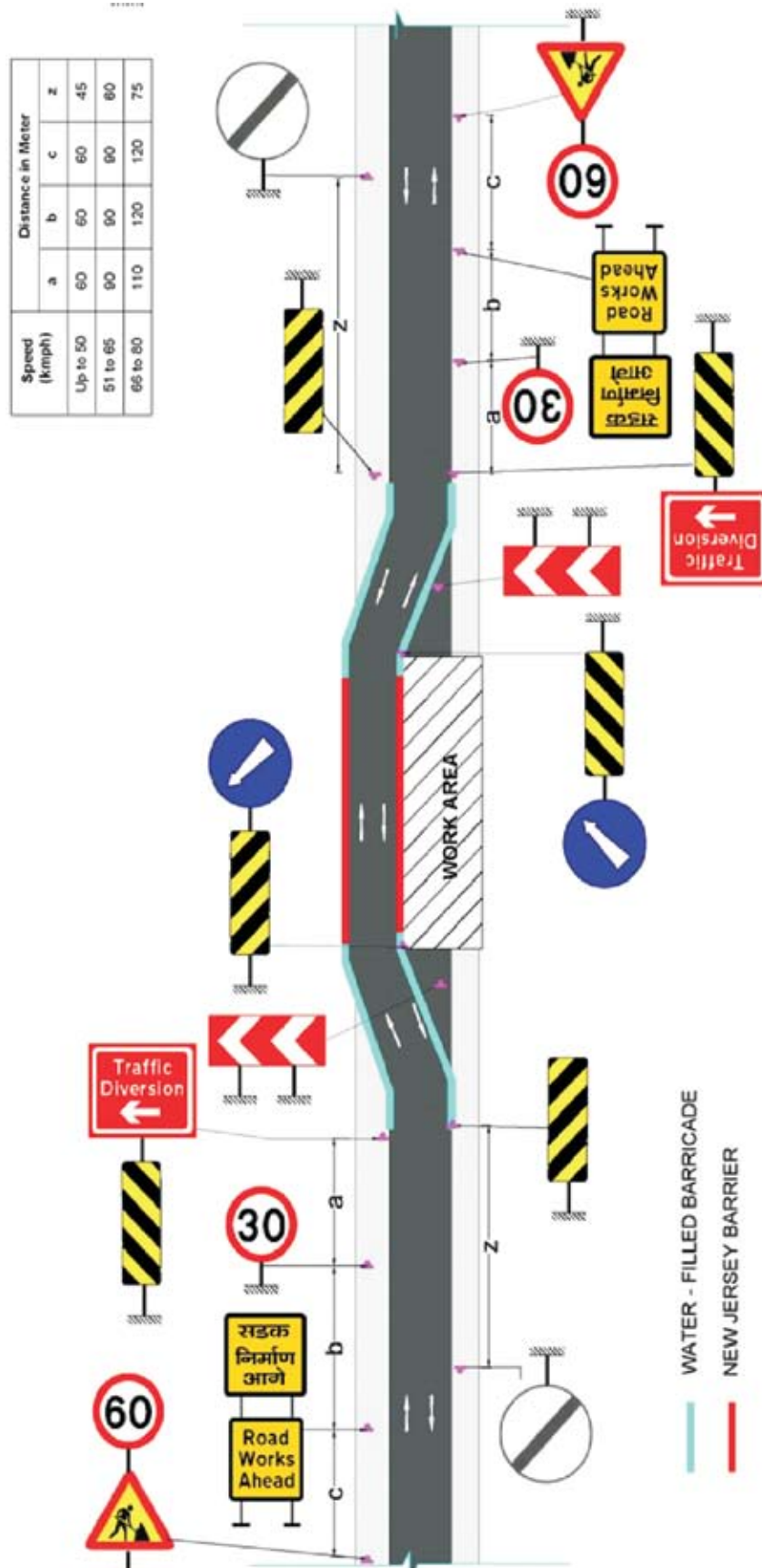


Fig. 9.25 Stage-2 of Single/Intermediate Lane Road into 2-Lane with Shoulders

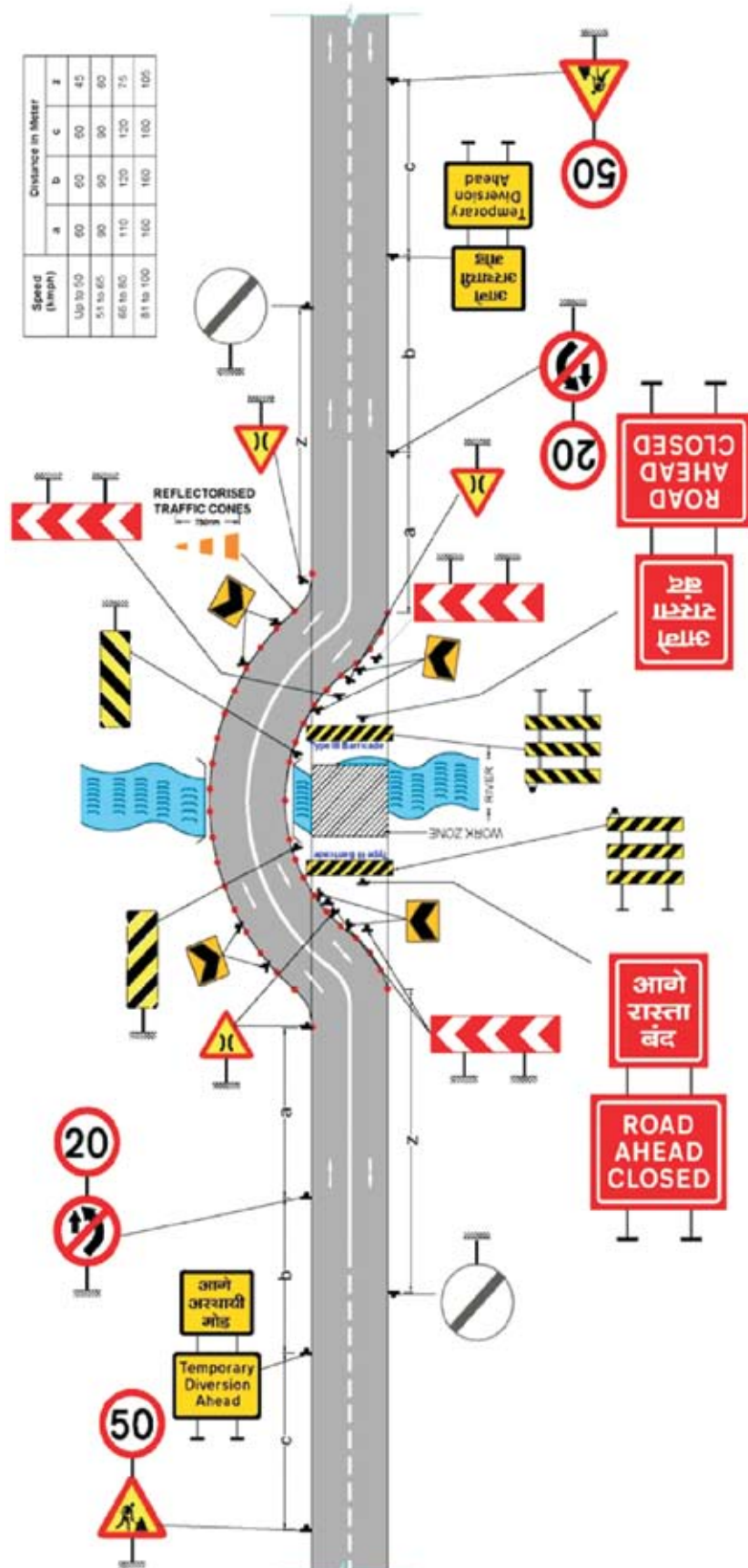


Fig. 9.26 Temporary Diversion for Reconstruction of CD Works

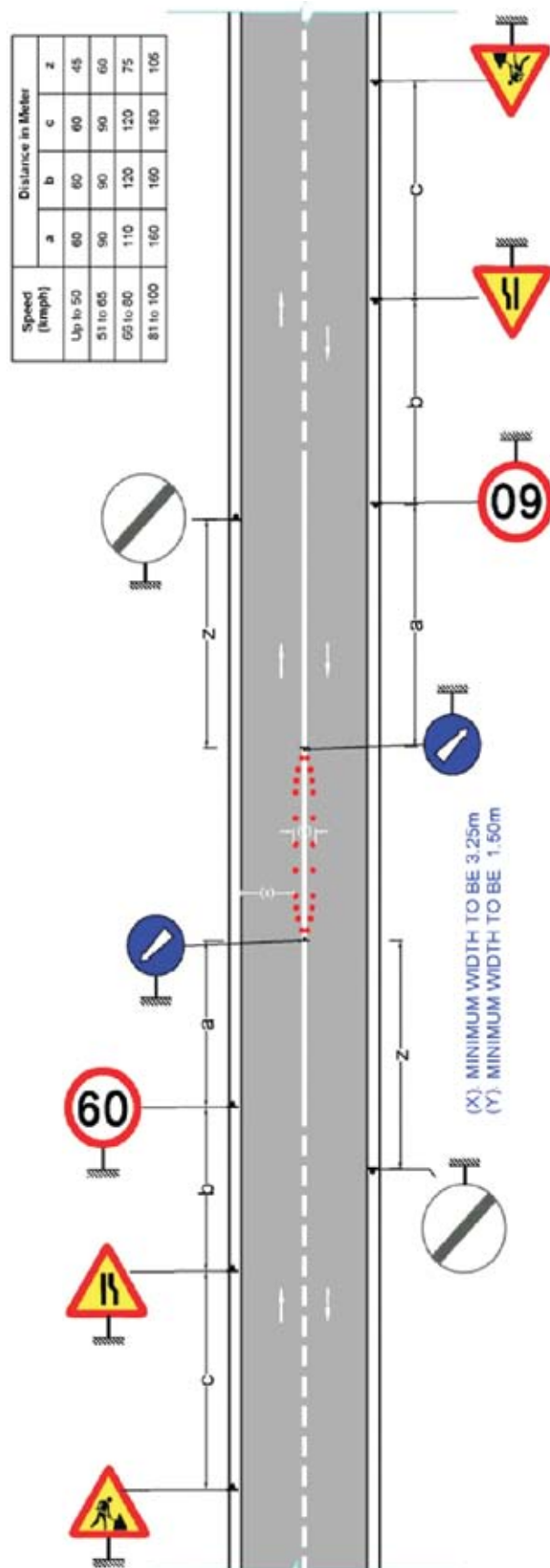


Fig. 9.27 Work at Center of Carriageway

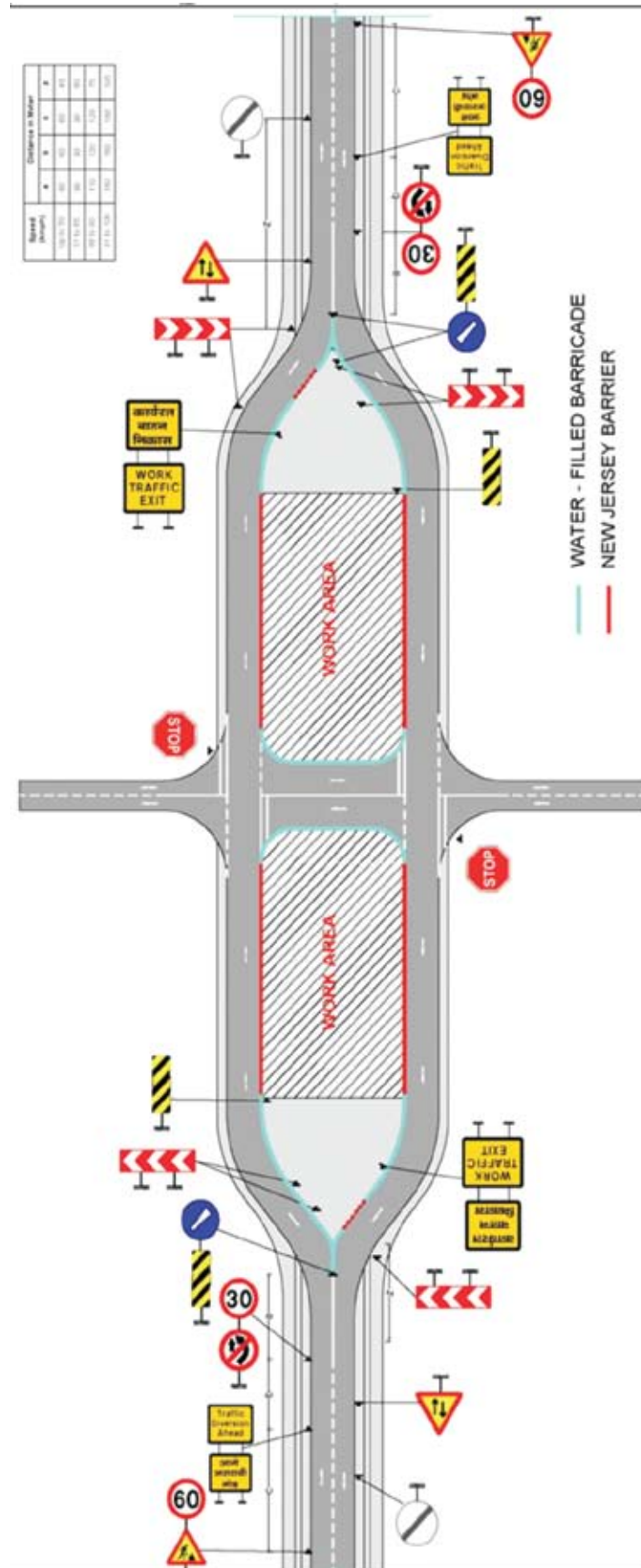


Fig. 9.28 Stage-1 of Flyover/VUP Construction

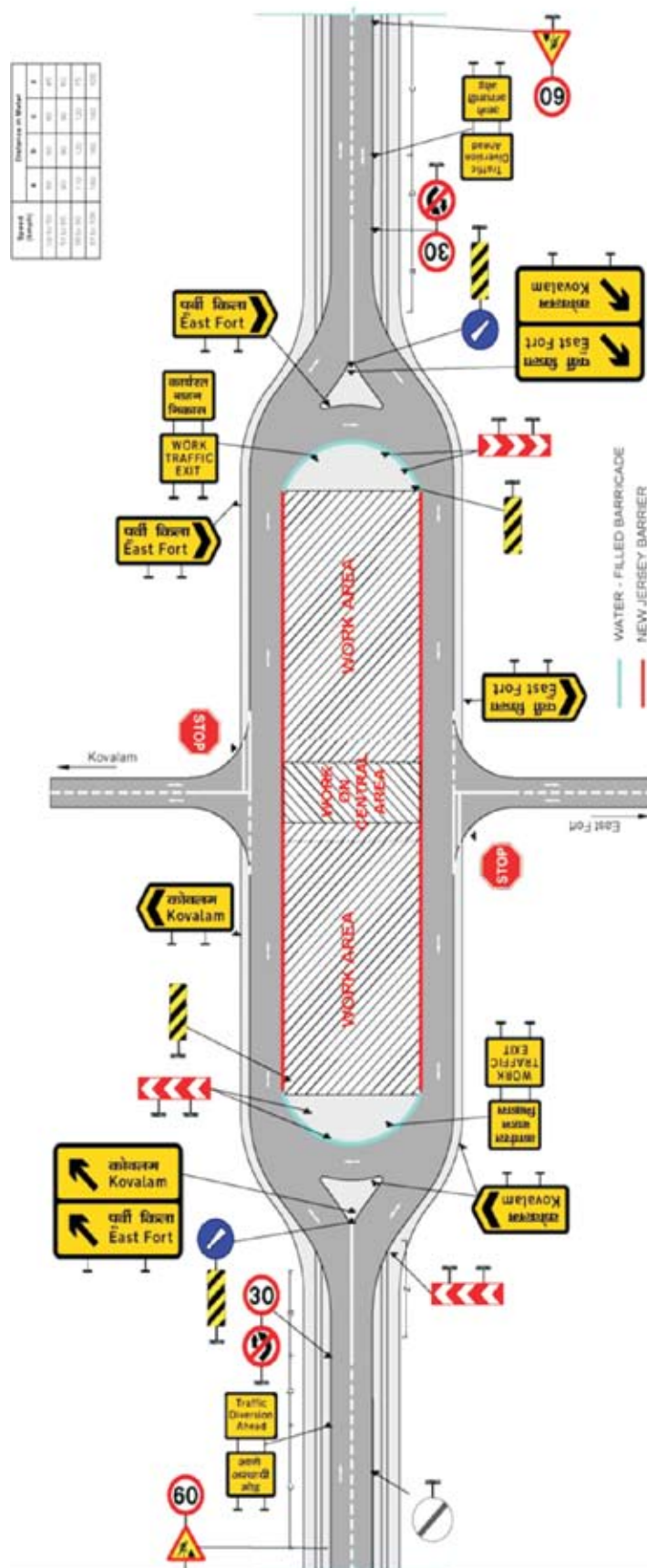


Fig. 9.29 Stage-2 of Flyover/VUP Construction

APPLICATION:

The layout shows Stage-2 of flyover/VUP construction. In the second stage, the central portion will be taken up and junction will be blocked for direct cross road movement. During this short period of time, cross road movement will be accommodated like a circulatory movement using U-turn, whereas the through traffic will continue to ply through service road/temporary road. Direction signs would be carefully planned and installed. Carefully planned pedestrian markings on the roads and protected safe passage for crossing of pedestrians shall be provided through work area.

SECTION - 10

TOLL PLAZAS

10.1 General

The Concessionaire shall provide the Toll Plazas at the locations specified in Schedule 'C' for collection of user fee as per the Concession Agreement. The fee collection system shall be speedy, efficient and user friendly. The design of the Toll Plazas should be such that they are aesthetically pleasing and efficient and the fee collection staff should be quick, courteous and adequately trained before deployment.

10.2 Location of Toll Plaza

The location of Toll Plaza shall be indicated in Schedule-‘C’ of the Concession Agreement. Their locations shall be decided keeping in view the following factors:

- i) Land availability,
- ii) Stream of traffic on Toll Plaza,
- iii) Visibility for the approaching traffic,
- iv) Reasonably away from road inter sections and/or rail crossings,
- v) Free from risk of flooding and submergence, etc.
- vi) Preferably on flat land and away from congested urban locations.

10.3 Land for Toll Plaza

Adequate land for Toll Plaza shall be acquired to permit the provision of toll lanes for a projected peak hour traffic of 20 years subject to a minimum number of 8 toll lanes including all other buildings and structures to be accommodated at the Toll Plaza location. Land shall be acquired as per provisions of the Concession Agreement.

10.4 Layout and design of Toll Plaza

10.4.1 Typical layout of a toll plaza is given in **Fig. 10.1**. The layout shall provide for future expansion of toll lanes. Stage construction of Toll Plaza in respect of number of toll lanes shall be allowed. However, other structures as envisaged in the Concession Agreement shall be provided at the initial stage itself.

10.4.2 *Width of Toll Lane*

The width of each toll lane shall be 3.2 m, except for the lane for over dimensioned vehicles, where it shall be 4.5 m.

10.4.3 *Traffic Islands at the Toll Plaza*

Between each toll lane of the toll plaza, traffic islands are required to accommodate toll booth. These islands shall be of minimum 25 m length and 1.9 m width. Protective barriers of reinforced concrete and traffic impact attenuators shall be placed at the front of each island

to prevent out of control approaching vehicles crashing into the toll booth. They would be painted with reflective chevron markings. For toll lane to be installed with weigh in motion system, the minimum length of islands shall be 35 m where 22.5 m on approach side.

10.4.4 *Toll Booths*

Toll booths may be provided of prefabricated materials or of masonry. The toll booths shall have adequate space for seating of toll collector, computer, printer, cash box, etc. It should have provision for light, fan and air conditioning. The typical details of traffic island with toll booth are given in **Fig. 10.2**. Toll booth shall be placed at The centre of each traffic island. The toll booth shall have large glass window to provide the toll collector with good visibility of approaching vehicles. The bottom of the toll window should be placed at such a height (0.9 m) above ground level so as to provide convenience of operation. The toll booths shall be ergonomically designed and vandal proof. There shall be CCTV camera installed at each booth.

10.4.5 *Tunnels*

For the movement between toll office and toll booth of each toll lane, an underground tunnel across all toll lanes shall be provided. Its dimension would be sufficient to accommodate the required wiring/cable system and for convenient movement of personnel. It should also be provided with lighting and ventilation system so that the movement is convenient. The tunnel shall be of minimum 3 m width and 2.5 m height or alternately suitable safe overhead system of cash transfer may be planned, if required, and same shall be specified in Schedule B.

10.4.6 *Transition*

A transition of 1 in 20 to 1 in 10 may be provided from two-lane section to the widened width at Toll Plaza on either side.

10.4.7 *Canopy*

All the toll lanes and toll booths shall be covered with a canopy. The canopy shall be wide enough to provide weather protection to toll operators, drivers and facilities. The canopy shall be of aesthetically pleasing design with cylindrical support columns located at traffic island so that there is no restriction on visibility and traffic movement. The vertical clearance shall be as prescribed in this Manual.

10.4.8 *Drainage*

The toll plaza shall be provided with surface and sub-surface drainage system so that all the storm water is drained off efficiently and no ponding or stagnation of water takes place at any area of the toll plaza.

10.4.9 *Equipment for Toll Lanes*

Each entry lane shall be equipped with a micro controller based Vehicle Counting-cum-Classifer Unit for counting the number of vehicles and their axle number and for identification of the category of vehicle. The semi-automatic toll collection system shall also have a ticket issuing machine for issue of the tickets for user fee at the press of a button on a touch panel

and entry lane controller for controlling the equipment of the entry lane and for sending the data to the data processing equipment at toll plaza office. Each toll lane shall have electronically operated boom barrier along with synchronized system for traffic lights.

10.4.10 *Electronic Toll Collection*

Two lanes in each direction of travel shall be provided with the system of payment through Electronic Toll Collection (ETC) out of which one lane shall be dedicated for ETC exclusively and the second lane shall be standby ETC lane. The standby ETC lane may be converted to dedicated ETC lane in case of failure/maintenance of first ETC lane.

The tag information shall be read and stored in the dedicated local server as per the data format given in **Appendix-1**. The ETC transaction data shall be stored securely to avoid any misuse/tampering by any unauthorized persons.

In future, if additional ETC lanes are required to accommodate increased number of tag users, the cash lanes shall be converted into dedicated ETC lanes depending upon the ETC usage.

The RFID transceivers and tags shall comply with the technical specifications given at **Appendix-1**.

Till the time legal provision to penalize ETC violations (e.g. non-tag or invalid tag vehicles entering dedicated ETC lane) is notified, provision of pre-screening of ETC tags approx. 50 – 70 meters prior to lane islands as per the layout plan shown in **Appendix-2** will be made. The objective of ETC pre-screening is to eject the Non-tag or Invalid tag vehicles from the ETC lanes to adjacent cash lanes. The ETC pre-screening arrangement would involve installation of RFID transceiver, a Boom Barrier and related signage.

Nation-wide ETC interoperability

- i) Till the time Central Clearing House (CCH) is commissioned by the service provider for nation-wide interoperable ETC system, the ETC system will be in a stand-alone mode.
- ii) Toll Plaza shall have necessary arrangements for issue, top-up and servicing the RFID tags complying with the technical specifications indicated in Appendix-I.
- iii) The road users who opt for RFID tags will get registered with the basic details like name, address, vehicle type, vehicle registration number, mobile number etc by paying a nominal fee towards cost of the tag. The tag users may be charged an initial prepaid amount in multiples of Rs.100/- at the time of registration. In case any tag holder wishes to discontinue ETC services at any point of time after registration, full balance amount shall be refunded to him.
- iv) When the Central Clearing House (CCH) is commissioned by the service provider for nation-wide ETC interoperability, the issuance of Tags shall be stopped by the Concessionaires. The entire database of ETC user account details shall be transferred to NHAI/ETC service provider along with the balance amount of ETC tag holders.

- v) Necessary support shall be provided to ETC service provider in migration of ETC accounts from the stand-alone plaza to the Central Clearing House (CCH) for national interoperability. Also, provide all necessary technical support for operation of ETC interoperability. During the interoperable ETC mode, shall support ETC Service Provider in establishing data network between toll plaza and Central Clearing House (CCH) and transfer of ETC data.

10.4.11 *Prevention of Overloading*

Toll plaza location shall also be provided with system for checking and preventing overloading of vehicles at toll plaza. For this purpose, weigh in motion systems at approaches to each toll lane are to be installed. Separate space for static weigh bridge and area to hold off-loaded goods from overloaded vehicles shall be provided after the toll barriers for each direction of travel.

10.4.12 The total number of toll booths and lanes shall be such as to ensure the service time of not more than 10 second per vehicle at peak flow regardless of methodology adopted for fee collection. For purpose of guidance following parameters are suggested as a capacity of individual toll lane for design purpose:

i)	Semi-automatic toll lane (Automatic vehicle identification but manual fee transaction)	240 veh/hour
ii)	Electronic Toll Collection (ETC lanes) (Toll collection through RFID tags and no stoppage of vehicles)	1200 veh/hour

Not less than 2 middle toll lanes shall be capable of being used as reversible lane to meet the demand of tidal flow.

Toll plazas shall be designed for projected peak hour traffic of 20 years. As mentioned in Para 10.4.1, the stage construction of toll plaza in respect of number of toll lanes shall be allowed. If at any time, the queue of vehicles becomes so large that the waiting time of the user exceeds three minutes, the number of toll lanes shall be increased so that the maximum waiting time is brought down to less than three minutes.

10.4.13 *Toll Collection System*

For smooth and efficient functioning of toll collection, the following arrangements/facilities shall be provided:

- i) The staff posted at the counters in the semi-automatic system of toll collection shall be provided with sufficient electronic equipment for the collection of toll and recording data, and small denomination notes/coins at the start of each shift.
- ii) Intercom facility shall be provided between booths and the office of the supervisors.
- iii) If the booth is closed for any reason, incoming traffic shall be guided into the adjoining working booth with the help of appropriate signs.
- iv) The entire fee collection complex shall be adequately guarded.

10.4.14 Pavement

Concrete pavement shall be provided in the toll plaza area including tapering zone, from durability and longtime serviceability consideration and to permit the provision of toll lanes initially for a projected peak hour traffic of 10 years. The concrete pavement may be widened to provide for future toll lanes required as per stage construction. The rigid pavement shall be designed as per IRC:58. For this work, use of paver shall not be insisted.

10.4.15 Traffic Signs

A well thought out strategy should be evolved for providing traffic signs and road markings in and around the toll plaza in accordance with IRC:67 and IRC:35. The concessionaire would design the configuration/placement of signs for toll plaza which are not given in IRC:67 and furnish to IE for review so as to ensure uniformity of signs in use on all the highways across the country.

Signs should be placed along the project highway, roadway of toll plaza to guide and render assistance to the drivers approaching the toll plaza. It is necessary to alert the driver about the existence of toll plaza one km ahead with a repeater sign 500 m ahead. Stop sign shall always be used in combination with certain road markings such as stop line and the word 'STOP' marked on the pavement.

The toll plaza sign should be supplemented by the sign advising the users of the notified toll rates (fees) for various types of vehicles and exempted categories of vehicles. **Fig. 10.3 to 10.5** give details of various Information signs in toll plaza.

Overhead Lane Signs (OHLS) shall be mounted on the leading edge of the canopy covering the toll lanes above the centre of the lane to indicate to the user. Lane applicable to specific category of vehicle, lane with ETC System, reversible lane, etc. It shall also indicate whether the toll lane is open or closed for the processing of vehicles. A red cross signal would indicate that the lane is closed, whilst a green arrow would indicate that the lane is open to traffic.

10.4.16 Road Markings

The road markings shall be used in accordance with Section 9 of this Manual. The road markings for the toll plaza area shall consist of lane markings, diagonals, chevron markings. Single centre line is provided at the centre of carriageway at toll gate to demarcate each service lane. Diagonal markings for central traffic island and chevron markings at side traffic island shall be provided to guide the approaching and separating traffic.

In order to check over speeding of the vehicle approaching toll booth, transverse bar markings can be provided. The typical lay out of plaza building, associate facilities and uploading platforms alongwith transverse and longitudinal markings are shown in **Fig. 10.6**.

10.4.17 Lighting

The toll plaza shall have lighting system to provide visibility to drivers for the use of facility especially to access the correct service lane and also to the toll collector. Indian Standard Code of Practice for Lighting of Public Thorough Fare IS:1944 shall be followed . This would be done by interior and exterior lighting as indicated below. Power supply shall be from public

power supply system, but standby generating set of the capacity to supply the required power shall be provided at toll plaza.

Interior Lighting: The toll booths and facility building office shall be illuminated adequately. Indoor lighting shall be with fluorescent lamps. Lighting should be provided in such a manner that glare is avoided or minimized. The level of illumination shall be average 200 to 300 lux as per IS:3646 part II.

Exterior Lighting: Lighting of the toll plaza is important for enhancing the night visibility. The lighting system shall consist of the following major components.

- i) High mast lighting
- ii) Lighting on both side approaches to the toll plaza
- iii) Canopy lighting of complex

High mast lighting: Normal low light poles are not able to give the required lighting conditions. It is, therefore, necessary to install high mast. A height of 30 m for the mast is considered suitable to have uniform spread of desired level of illumination in the toll plaza area for safe movement of vehicles. A minimum requirement of illumination on the road surface of average 40 lux shall be ensured.

Highway lighting: A minimum requirement of illumination on the road surface of average 40 lux shall be ensured. Lighting in minimum 500 m length on both side approaches of toll plaza (toll booth) shall be provided to enhance the safety at night on the Project Highway and to make the drivers conscious of their approaching the toll gate. These shall be provided on the mild steel welded tubular pole of 10 m height from road surface and with 2 m overhang. Sodium Vapour/LED lamp of 200-250 watts should be provided for these poles on both sides at 50 m staggered spacing. There should be provision for flashing signals for foggy weather conditions.

Canopy lighting: A higher level of illumination up to average 100 lux by providing 150 watt metal halide lamps shall be provided at the toll gate and at toll booth locations. 1000-watt halogen lamps shall be provided at the selected nodes of space frame of the canopy to ensure uniform illumination of the area.

10.4.18 *Water Supply*

Adequate water supply shall be provided. For working out water requirement and internal drainage system, reference may be made to IS:1172, IS:5339 and IS:1742.

10.4.19 *Fire Fighting System*

Toll plaza shall have fire fighting equipment, including smoke detectors and auto visual alarm system as per Section 4.17.1 of National Building Code, so that the personnel working in the complex and the office and the road users are protected against fire hazards.

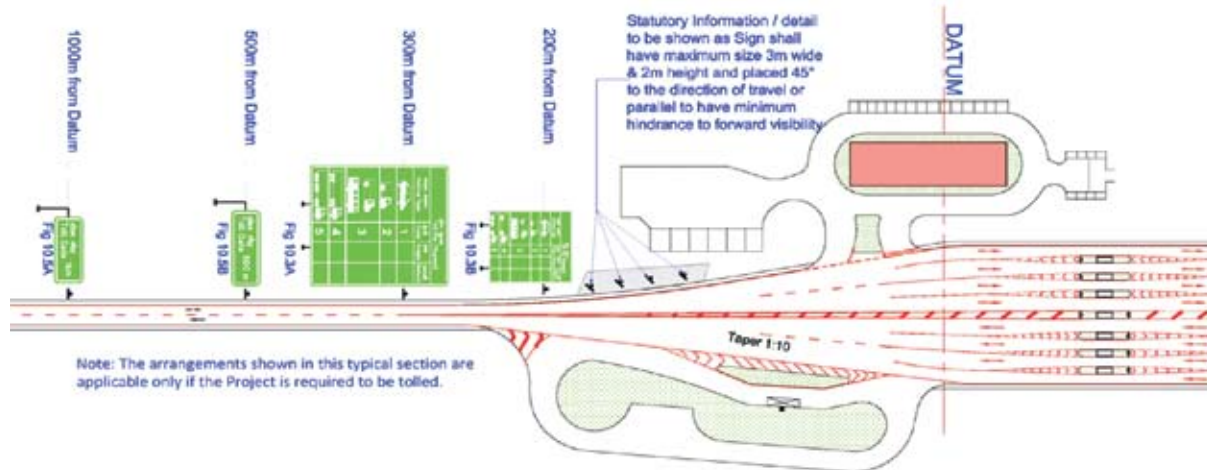


Fig. 10.1 Typical Layout of a Toll Plaza Information Signs

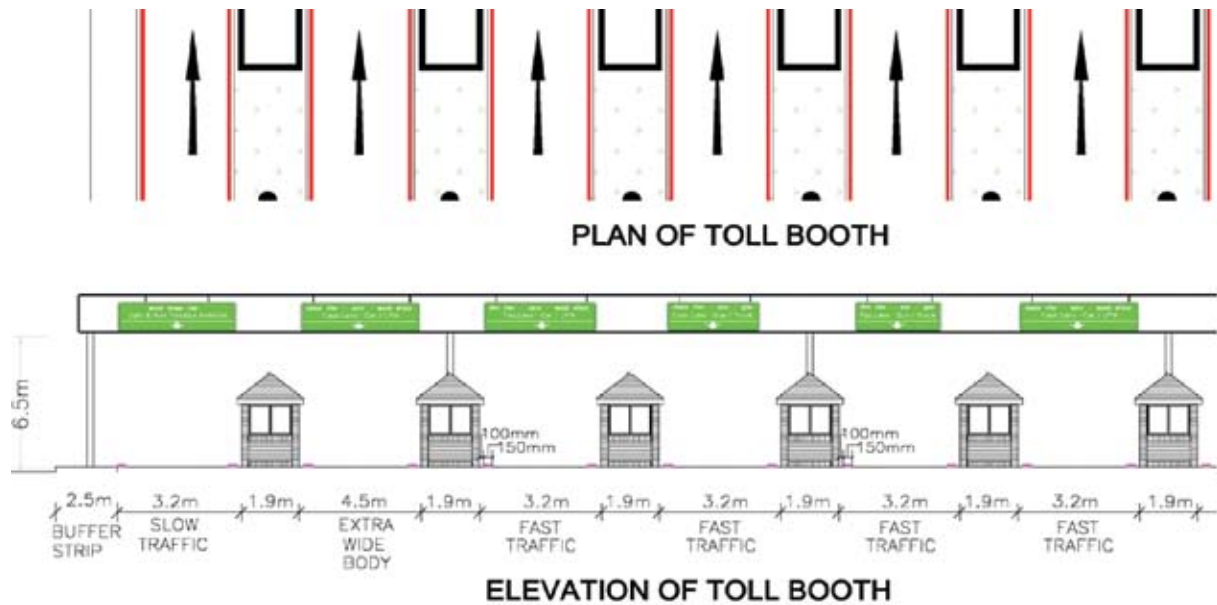


Fig. 10.2 Typical Details of Toll Lanes

4123

Toll Fee (Rupees)			
Vehicle Type	Class	Single	Return
	1		
	2		
	3		
	4		
	5		

4426

Fig. 10.3a Toll Rate (High Speed, Font Size - 100 mm)

2474

Toll Fee (Rupees)			
Vehicle Type	Class	Single	Return
	1		
	2		
	3		
	4		
	5		

2656

Fig. 10.3b Toll Rate (Low Speed, Font Size 60 mm)



Fig. 10.4a Cash Lane-Car/LMV



Fig. 10.4b Tag Lane-Car/LMV



Fig. 10.4c Cash Lane-Bus/Truck



Fig. 10.4d Tag Lane-Bus/Truck



Fig. 10.5a Information Sign



Fig. 10.5b Information Sign

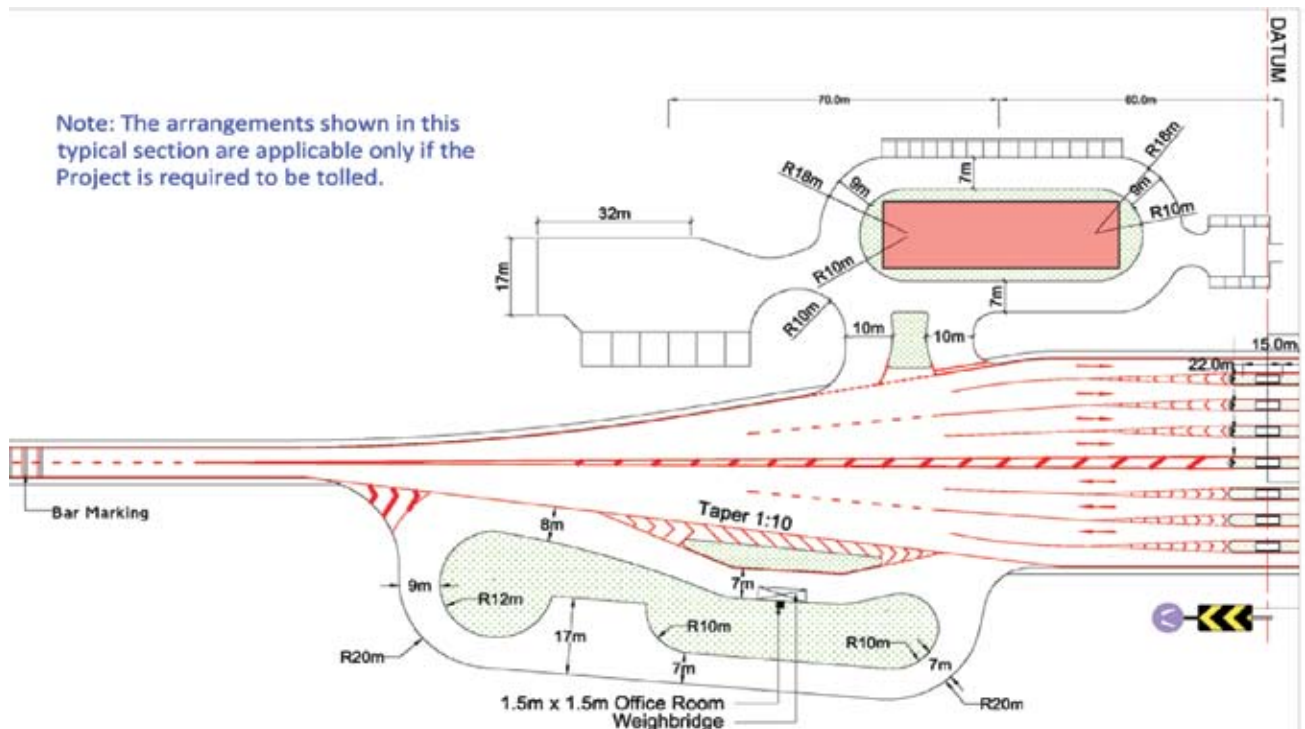


Fig. 10.6 Typical Layout Building and Associated Facilities and Pavement Markings

10.4.20 *Toll plaza complex*

Toll plaza shall have a separate office building so as to provide comfortable office space for manager, cashier and other staff. There shall be separate rooms for TV monitors, meetings, toilets, and for the sale of passes, smart cards, on board units and public interaction. The building shall have a strong room for keeping the cash and a garage to accommodate the security van (during operation of loading the collected revenue). There shall be parking space in the same campus for vehicles for the staff and workers and other vehicles engaged in the operation of the project highway.

The size of the office complex depends on the minimum requirement of above facilities.

Provision for future expansion: The office building shall be located taking into consideration of future expansion.

10.4.21 *Toll Audit*

The toll plaza shall have toll audit system and fraud protection measures. The operations for toll collection, supervision, auditing and cash handling shall be done through the qualified personnel with adequate number so that each operation is efficiently handled.

10.5 **Report to be Submitted**

The design and layout of toll Plaza complex including all facilities shall be submitted to the Independent Engineer for review and comments, if any.

SECTION - 11

LANDSCAPING AND TREE PLANTATION

11.1 General

The concessionaire shall plant trees and shrubs of required number and type at the appropriate locations within the Right of Way and in the land earmarked by the authority for afforestation keeping in view the IRC Guidelines on Landscaping and Tree Plantation. The authority shall specify the number of trees which are required to be planted by the concessionaire as compensatory afforestation or otherwise in Schedule 'C' of Concession Agreement. In case the number of trees to be provided is not specified in Schedule 'C' the concessionaire shall not be required to plant any tree. The concessionaire shall also maintain the trees and shrubs in good condition during the concession period as per the maintenance schedule. The guidelines given in this Section shall be followed in plantation of trees and shrubs.

11.2 Design Considerations in Various Locations

11.2.1 *Set-Back Distance of Trees and other Plantation*

Trees on the roadside shall be sufficiently away from the roadway so that they are not a hazard to road traffic or restrict the visibility. Most vulnerable locations in this regard are the inside of curves, junction corners and cut slopes. Trees shall be placed at a minimum distance of 10-11 m from the centre line of the extreme traffic lane to provide recovery area for the vehicle that runs off the road. A second row of trees 6 m further away will also be planted, wherever possible. Preferably, the first row of trees shall consist of species with thick shade and other rows of vertical type providing thin shade. Expansion of the project highway to 4-lanes shall be taken into consideration while locating the trees so that land is free of trees when further widening takes place. In case future widening is not to be considered the same shall be specified in Schedule 'D' of Concession Agreement. The distances for alternative rows of trees shall be reckoned from the nearest edge of the pavement. No plantation shall be allowed on the embankment slopes.

11.2.2 *Set-Back of Trees on Curves*

In plain terrain, as topping sight distance of 180 m corresponding to the design speed of 100 km per hour shall be ensured on all curved sections of project highways along the inner most lane. However, where there are site restrictions, their requirement may be reduced to 130 m corresponding to the design speed of 80 km per hour as a special case. The existing trees and vegetation on the sides have to be suitably thinned/trimmed or even removed, if necessary, and a regular programme of pruning of the offending trees shall be undertaken as part of the maintenance operations. In all cases, location of trees shall be checked to ensure that clear vision of all highway signs/signals is available at all times to the motorists. Also, the foliage or trees shall not come in the way of roadway lighting.

In urban/built-up sections of the Project Highway, trees can be planted on the raised footpaths, provided the distance between the edge of the kerbs and the nearest edge of tree is not less than 2 m.

11.2.3 *Vertical Clearance of Trees and other Plantations*

For safe traffic operation, the vertical clearance available across the roadway shall be minimum 5 m. From this angle, the probable size of all plants shall be anticipated in advance, at the time of initial planting. To allow for the effects of growth, wind and rain, trees shall be trimmed to 6 m and 6.5 m above the pavement in rural and urban areas respectively.

11.2.4 *Plantation in Medians*

In the sections of the project highway where median width is more than 2.5 m, shrubs shall be planted and maintained to cut off headlight glare from traffic in the opposite direction.

Flowering plants and shrubs are eminently suited for the purpose. These shall be planted either in continuous rows or in the form of baffles. The height of shrubs shall be maintained at 1.5 m to cut off the effect of traffic lights coming from the opposite direction.

In the sections, where the width of median is less than 2.5 m, shrubs or flowery plants may be planted in between crash barriers or other means like metal/plastic strips to cut off glare shall be provided.

The shape of shrubs and plants shall be suitably regulated so that there is no overgrowth either vertically or horizontally beyond the edge of the median.

In the vicinity of road intersections and median openings, median plantation shall be avoided or restricted to low-growing varieties to ensure adequate visibility.

11.2.5 *Spacing of Avenue Trees*

The spacing of avenue trees will depend on the type and growth characteristics of trees, requirement of maintenance, penetration of distant views, etc. A range of 10-15 m would meet the requirement for most varieties.

11.2.6 *Choice of Trees*

The following guidelines shall be kept in view while selecting the species of trees to be planted:

- i) Trees shall be selected with due regard to soil, rainfall, temperature and water level.
- ii) Trees which become very wide shall be avoided as their maintenance would cause interference with traffic flow.
- iii) The species must be capable of developing a straight and clean bole upto a height of 2.5 to 3.5 m from the ground level.
- iv) The selected trees shall, preferably, be fast growing and wind-firm. These shall not be thorny or drop too many leaves.
- v) The trees shall be deep rooted as shallow roots injure pavements.

- vi) In urban areas, the species selected shall be of less spreading type, so that these do not interfere with overhead services, clear view of signs/signals and efficiency of roadway lighting.

11.3 Landscape Treatment

A suitable landscape treatment with provision of foundations and coloured lighting so as to enhance the overall aesthetics duly designed by a qualified and experienced landscaping architect, shall be provided at grade separators, elevated sections, viaducts, traffic islands, toll plazas, bus bays, truck lay byes, rest areas, O&M centre, etc. The locations where landscape treatment is to be given shall be specified in Schedule 'C'. The landscape treatment shall also be provided for special areas as given in IRC:SP:21(para 8).

11.4 Report to be Submitted

The concessionaire shall submit scheme for plantation and maintenance of plants and trees to the Independent Engineer for review and comments, if any.

SECTION - 12

PROJECT FACILITIES

12.1 General

The requirement of the project facilities to be provided shall be indicated in Schedule-‘C’ of the Concession Agreement. This shall include information regarding location and size of the facilities. Land required for provision of facilities shall be acquired by the authority and the date of handing over of the land to the Concessionaire shall be indicated in the Concession Agreement.

12.2 Road Boundary Stones (RBS)

Road boundary stones shall be provided at the boundary on both sides of the right of way available under the control of the Authority. These shall be spaced at 200 m. The boundary stones shall be of Cement concrete as per Type Design given in IRC:25. The boundary stones shall be painted with cement primer and enamel paint and marked 'RBS' by paint.

12.3 Kilometre and 200 m Stones

- a) The km and 200 m stones shall be provided on one side of the project highway. The side of the road on which such stones will be provided, shall be decided by the authority.
- b) The design and specifications of kilometre stone shall conform to IRC:8. The matter to be written on various kilometre stones and the pattern thereof, shall be as specified in IRC:8.
- c) 200 m stones shall be provided at every 200 m distance. The design and specification of 200 m stone shall conform to IRC:26. The matter to be written on various 200 m stones shall be as specified in IRC:26.

12.4 Street Lighting

12.4.1 General

The concessionaire shall provide lighting at specified locations of the project highway, using appropriate system and source of electric power as per the requirements of this Section. Such locations shall be specified in Schedule ‘C’.

The concessionaire shall make suitable arrangements for procuring power supply to ensure uninterrupted lighting during night and when visibility is low, including provision of DG sets as stand by arrangements.

The concessionaire shall bear all costs of procurement, installation, running and operation cost of all lighting, including cost of energy consumption specified in this Section.

12.4.2 Specifications

- i) Unless stated otherwise in this Manual, the minimum level of illumination on the locations of the project highway where lighting is to be provided as per this section shall be 40 Lux.
- ii) The layout of the lighting system together with type of luminaries for different locations shall be prepared by the concessionaire in such a manner that the minimum illumination level prescribed in para 12.3.2(i) can be achieved and shall be submitted to the Independent Engineer for review and comments, if any, for compliance .by the concessionaire
- iii) Overhead electrical power and telecommunication lines erected within the ROW by the concessionaire shall be provided with adequate clearance so that safe use of the highway is not affected.
- iv) Vertical and horizontal clearances for electrical installations shall conform to IRC:32.
- v) All the fixtures, wires/cables, lights shall conform to relevant BIS specifications as a minimum. The Concessionaire with the prior review and comments of the Independent Engineer can use fixtures with better specifications.

12.4.3 Locations where Lighting is to be Provided

Unless specified otherwise in Schedule-C of the Concession Agreement and elsewhere in this Manual, the concessionaire shall provide lighting at the following locations of the Project Highway:

- i) Toll Plaza Area: The lighting in and around toll plaza, toll booths, office building, on the approach road, etc. shall be as per Section10 of this Manual.
- ii) Rest Areas as giver in para 12.6
- iii) Truck lay-bye: Lighting at the truck lay-bye shall be as per para 12.4.
- iv) Bus Bay & Bus Shelter Locations: Lighting shall be provided as per para 12.5.
- v) Grade Separated Structures, Interchanges, Flyovers, Underpasses (vehicular/pedestrian) and Overpasses: The top and underside of the grade separated structures and interchange area at the ground level upto 50 m beyond and point from where flaring of the main carriageway takes place shall be provided with lighting.
- vi) Built-up sections on the project highway both in the median of main carriageway and on the service roads on either side.

12.5 Truck Lay-by**12.5.2 General**

The Concessionaire shall construct and maintain adequate number and size of truck lay-bye for parking of trucks by the side of the project highway as indicated in Schedule 'C' of the

Concession Agreement. The guidelines, as given here, shall be followed in regard to location, size and facilities to be provided at the truck lay-byes. A typical lay out is given in **Fig. 12.1**.

12.5.3 *Location and Size*

Location and size: Truck lay-byes shall, in general, be located near check barriers, interstate borders, places of conventional stops of the truck operators, etc. The places be identified on the basis of field survey and shall have adequate space for facilities as specified in this section and future growth.

12.5.4 *Facilities*

The truck lay-byes shall have the following facilities:

- i) Paved parking,
- ii) Rest are as with toilets, drinking water,
- iii) Telephone.

12.5.5 *Lighting*

The truck lay-byes and 50 m length of the project highway on its either sides shall be illuminated at night to provide an minimum illumination of 40 Lux. Suitably designed electric poles having aesthetic appeal and energy saving bulbs maybe used to provide required illumination. Alternatively, photo voltaic lamps may be used.

12.6 **Bus Bays and Bus Shelters**

12.6.1 *General*

The buses shall be allowed to stop for dropping and picking up passengers only at the bus bays. The Authority will indicate in Schedule 'C' of the Concession Agreement, the number and broad location of bus bays to be provided by the concessionaire. The bus bays shall conform to the specifications and standards given in this Section. In case where bus stands are provided by the concerned State Government Transport Authority, the concessionaire shall provide only access road within the Right of Way.

12.6.2 *Location*

The location of the bus bays shall be fixed on the basis of following principles:

- i) The bus stops shall be sited away from bridges and other important structures and embankment sections more than 3 m high.
- ii) As far as possible, bus bays shall not be located on horizontal curves or at the summit of vertical curves.
- iii) The location shall have good visibility, not less than the safe stopping sight distance.
- iv) The bus bays shall not be located too close to the road inter sections. A gap of 30 m from the tangent point of inter sections to start/end of the bus bay shall be desirable. At minor inter sections (e.g. junctions with village roads),

distance of 60 m may be adopted. However, if a substantial volume of buses is to turn right at the inter section, it is necessary that the bus bay shall be located sufficiently ahead of the inter section so that the buses can be maneuvered easily from the pick-up stop on the left hand side to the extreme right lane for turning. The location of the bus bays may be fixed after due consultation with the local communities expected to use such facilities.

- v) At major four-way inter sections involving transfer of a substantial number of passengers from one pick-up stop to the other, it might be desirable to construct a single, composite bus stop of suitable design to cater to all the bus routes collectively.
- vi) In hilly areas, the bus bays shall be located, preferably, where the road is straight on both sides, gradients are flat and the visibility is reasonably good (usually not less than 50 m). Subject to these requirements, it will be advisable to choose locations where it is possible to widen the road way economically for accommodating bus bays.

12.6.3 *Layout and Design*

- i) For plain area, typical/layouts of bus bays given in **Fig. 12.2** shall be adopted. The length "L" shown in **Fig. 12.2** shall be 15 m. which shall be increased in multiples of 15 m if more than one bus is likely to halt at the bus bay at one time.
- ii) For hilly areas, where there is a general constraint on space, the layout indicated in **Fig. 12.3** may be adopted.
- iii) The channellizing island between the paved shoulder and bus-bay shall not be raised but it shall be paved with CC blocks. At certain situations, due to space constraints, it can be provided with Ghost island also given in **Fig. 12.2**.
- iv) Bus bays shall be provided on both sides of the project highway for each direction of travel independently, so that the buses do not have to cut across the road. Bus bays on opposite sides shall be staggered to a certain extent to avoid undue congestion on the highway. At intersections, the bus bays for up and down direction shall be located on farther sides of the intersection.
- v) Covered steps with rise not exceeding 150 mm (minimum 5 m wide) along with a ramp for use of disabled persons (1 m wide minimum) with railing on either side shall be provided for climbing up/down from bus shelter to underpass/overpass to carriageway and vice versa. The cover of the steps shall be aesthetically pleasing and protect the users from sun, wind and rain. The entire area used by the pedestrians shall be provided with granite stone cladding and flooring.
- vi) The bus bay shall be provided with a shelter for passengers. The shelter shall be structurally safe and aesthetic in appearance, while also being functional

so as to protect the waiting passengers adequately from sun, wind and rain. If the shelter is constructed on the hill side, slopes shall be properly dressed and suitably protected to avoid slips.

- vii) The bus bay and passenger shelter shall be designed to provide for safe and convenient use by physically challenged persons as well.

12.6.4 *Pavement*

The pavement in the bus bays shall have adequate crust with respect to the wheel loads expected. Also, the surfacing shall be strong enough to withstand forces due to frequent braking and acceleration by the buses.

12.6.5 *Drainage*

- i) The bus bays shall have proper cross slope to drain off the excess water. No water, which is likely to splash on the waiting passengers, shall be allowed to collect near the bus shelters.
- ii) Suitable kerb gutter section with requisite longitudinal slope and outlets at intervals to ensure quick disposal of water shall be provided.
- iii) Adequate drainage for the steps and pedestrian movement area shall be provided.

12.6.6 *Road Markings*

Pavement markings as specified in Section 9 of this Manual shall be provided at the bus stops as shown in **Figs. 12.2 and 12.3** with the word 'BUS' written prominently on the pavement. Pedestrian crossings shall be marked slightly behind the standing position of the buses in order to reduce pedestrian conflicts. The kerbs shall be marked with continuous yellow line to indicate "No Parking".

12.6.7 *Landscaping and Plantation*

The total area of ROW near the bus bay location shall be landscaped and planted with shady trees for giving pleasing appearance of the area.

12.6.8 *Lighting*

The entire bus bay area shall be provided with lighting (minimum illumination of 40 Lux)

12.7 **Cattle Crossings**

Facility for cattle crossings shall be provided as specified in para 2.14.3 of this Manual.

12.8 **Traffic Aid Posts**

Traffic Aid Posts shall be established at toll plaza locations in accordance with the provisions of the Concession Agreement.

12.9 **Medical Aid Posts**

Medical Aid Posts shall be established at toll plaza locations in accordance with the provisions of the Concession Agreement.

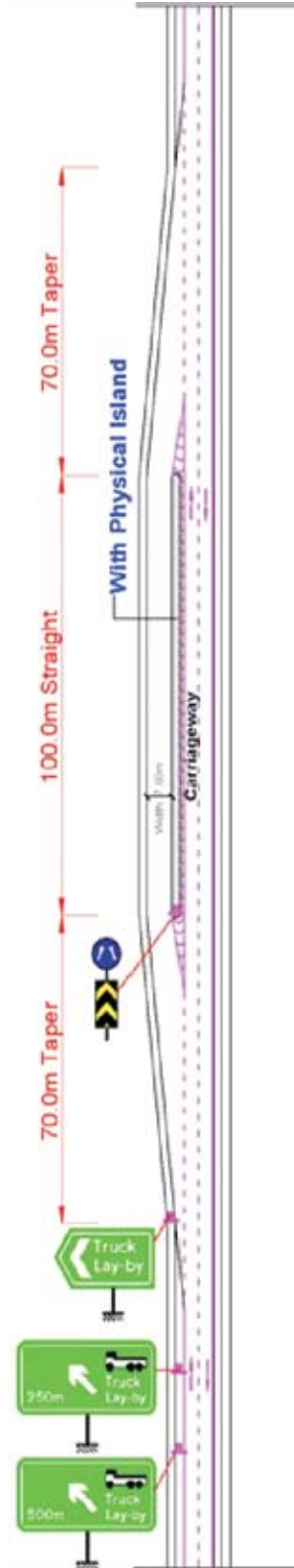


Fig. 12.1 Typical Layout of Truck Lay Bye

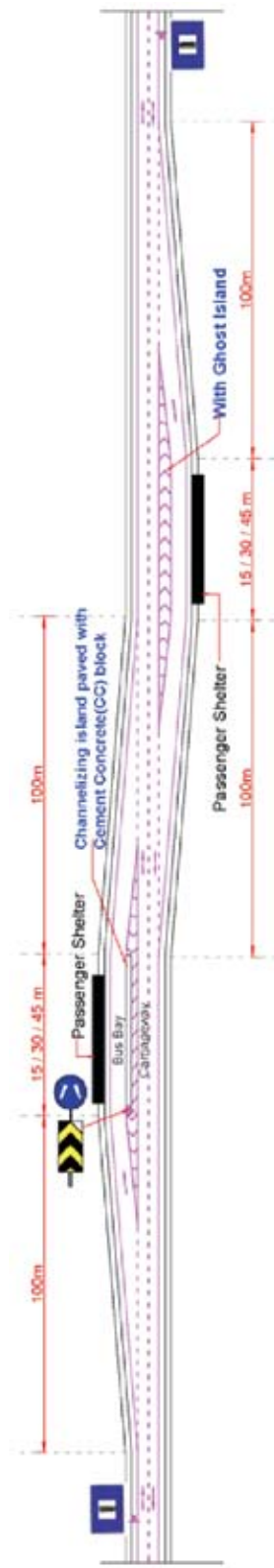


Fig. 12.2 Typical Layout of Bus Bay

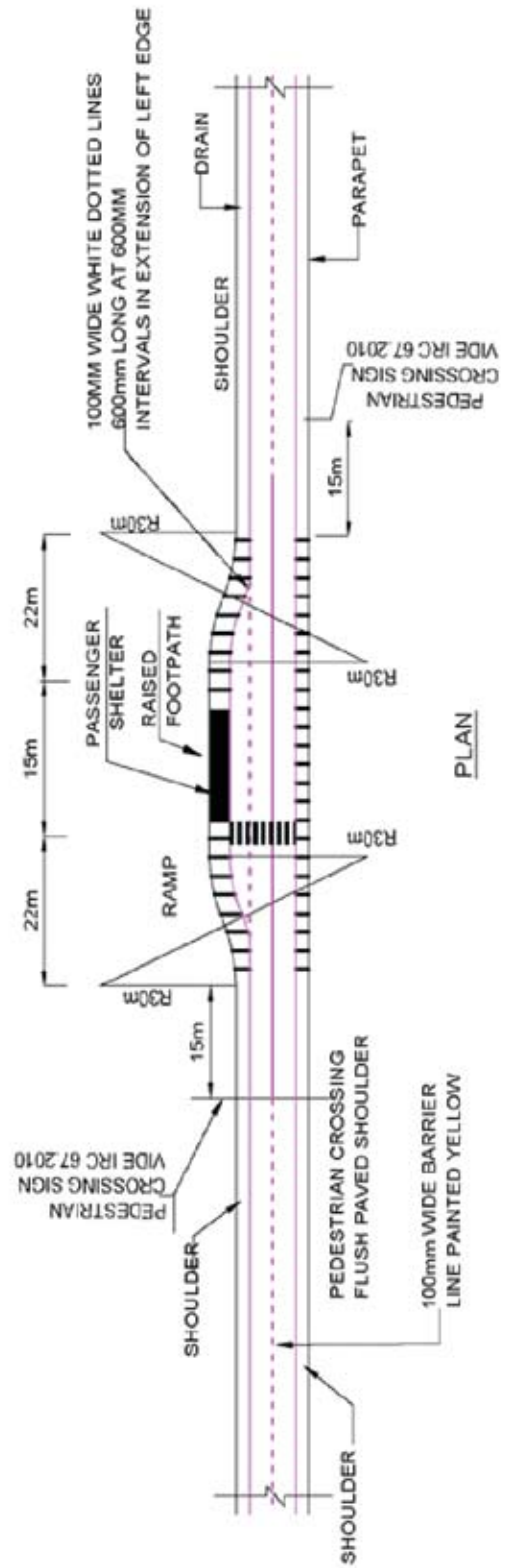


Fig. 12.3 Typical Layout of Pick up Bus Stop on Hilly Area

12.10 Rest Areas

12.10.1 The rest areas shall be provided at the locations given in Schedule 'C'. Rest areas shall be provided by the concessionaire on the lands included in the site and procured by the Authority. Within the areas so provided, the concessionaire shall construct and operate, or cause to be constructed and operated, facilities such as toilets, telephones, cafeteria, restaurant, parking for cars, buses and trucks, dormitory, rest rooms, shops for travel needs, fuel stations and garage, first aid, etc. In approximately 2 Hectares of land, the following minimum facilities shall be provided.

Cafeteria/Restaurant for seating 50 persons; Toilets (separate for ladies and gents) (WC - 5 nos.; Urinals - 10 Nos.); Dormitory with 20 beds; drinking water facility; parking for 100 trucks and 50 cars in addition to STD/ISD Telephone Facility, Shops and First Aid Facilities.

The facilities shall be provided keeping in view the expected peak hour traffic.

The whole area shall be elaborately landscaped to provide a pleasing environment.

12.10.2 *Lighting shall be Provided as given in Para 12.4.4.*

12.11 Highway Patrol Unit(s)

The concessionaire shall establish and operate Highway Patrol Unit(s) at the Toll Plaza Locations, which shall continuously patrol the highway in a stretch not exceeding 50 km and shall remain in contact with the control room on a real time basis. The patrol shall render assistance to users in distress and disabled vehicles through own intervention or by calling for assistance from control room, Crane operators or ambulance as required. The patrol shall promptly clear the road of any obstruction. Where the obstructions take time to be cleared, the section shall be cordoned off by placing traffic cones, which shall be illuminated during night. The patrol vehicle shall be large enough for seating atleast four personnel besides the driver and space to carry essential traffic and incidence management and safety tools. It Shall also have a light on its top and a siren on board. It shall also be filled with a GPS based Vehicle Tracking System to monitor its movement on 24 hrs x 7 days of a week basis.

Each Patrol Vehicle should carry the following equipment:

- a) Fire extinguisher (1 No.)
- b) Gas culler with protective glass (2 Nos.)
- c) Liquid container (2 Nos.), Water container with fresh water (1 No.) and Funnel.
- d) Rubber Gloves, Leather Gloves (1 pair each)
- e) Brooms one hard bristle, other soft (2 Nos.)
- f) Gum boot (4 pairs), Rain coat (4 pairs), Blanket (1 No.)
- g) Torch light (4 No.), Spare Batteries, Flashing light (1 Nos.)

- h) Hydraulic jack, towing chain, Animal hook, rope.
- i) Tool set (with standard set of spanners, pliers, hammers etc), shovels.
- j) Digital Camera, measuring tape.
- k) Paper pad, Forms, pens/pencils, folders.
- l) First Aid kit, Rain Coat, water proof sheets, stretchers (2 Nos.)
- m) List of Hospitals in the area.

Each vehicle should also carry the following Traffic Management Equipment, (used/worn out items shall be replaced forthwith with new ones)

- a) Sign boards - "Accident ahead" - 3 Nos., "Lane merging" - 3 Nos., "Direction Arrows" - 3 Nos., "Speed Limit" (80/60/40) - 3 Nos., "Keep left/right" - 2 Nos. (all signs 1200 mm size and of retro-reflective type (micro prismatic cube corner).
- b) Sign stand set (one for triangular and other for circular sign)-6 sets.
- c) Flags, whistle, reflective hand signal.
- d) Traffic cones 500 mm size with solar bulb mounted on top. 20 Nos.
- e) Barricades-4 Nos. reflective type (100 m), tape, stands, flags of 600 mm by 600 mm made of good red cloth secured to a staff at 1m length, paddles all east 600 mm wide and provided with rigid handle with markings SLOW, STOP.

Reflective jackets - 12 Nos.

As a minimum, each patrol vehicle should carry sufficient communication equipment to render its staff capable of direct communication with the Control Room.

Manpower:

The team which is to be deployed with each patrol vehicle, needs adequate training for their tasks, especially in first aid, vehicle maintenance and minor repairs. The Concessionaire must employ sufficient manpower to work in shifts for each patrol vehicle. Typical staffing shall be:

- a) Route Patrol Incharge
- b) Route Patrol Assistant
- c) Driver, with knowledge of vehicle repairs.

12.12 Emergency Medical Services

These services shall include setting up medical aid posts by the concessionaire. The Concessionaire shall provide ambulance(s) at the toll plaza location(s) manned by at least two trained and certified paramedics so that the response time is not more than 20 minutes

of call. Each ambulance shall be equipped with first aid, life saving medical services and support system implements for transporting the victims to the nearest trauma care hospitals, and providing emergency medical aid during transportation of victims from accident site to the nearest trauma care hospital. It shall also be fitted with a GPS based Vehicle Tracking System to monitor its movement on 24 hrs x 7 days of a week basis.

The vehicle shall be conform to AIS 125 : Constructional and Functional Requirement for Road Ambulances (National Ambulance Code) published by MORTH. The ambulance is required to have the following medicines and equipment and also the paramedical staff:

a) General Ambulance

Folding doctor seat with belt with adequate height in relation to the stretcher, antistatic, water proof ply board vinyl flooring, channel, locking system for rolling stretcher, High intensity blinkers/light bar siren/beacon, electronic siren with public addressing system, Internal lighting with three spot light embedded in ceiling, AC/DC connection and outlet points, wash basin with stainless steel tank, 58 trash bin cabinet integrated with interiors, Head racks and cupboard, attendant seat with seat belt to double as second stretcher for stable patients, provision for communication system where the location of ambulance can be located, provision for fog light on sides, cool/warm boxes, provision of fire extinguishers, handheld spotlight,

Inverter with the facility re-charging from 220V AC and Vehicle's alternative, oxygen delivery system comprising of cylinder trolley, pressure tubing with regulators, roof mounted air-conditioner with appropriate cooling capacity with additional blower for patient cabin, extrication equipment and good suspension to cater for smooth transportation.

b) Basic Life Support System

Automatic loading stretcher, scoop stretcher, folding stretcher, Spine board full, vacuum splint kit/foldable splints, c-collars, oxygen cylinder with accessories mounted/with manifold and pressure indicators, oxygen cylinder (aluminums portable), BP Instruments (wall mounted-aneroid), stethoscope, automatic defibrillator, resuscitation bag (ambo bag, laryngoscope, airways and masks of different size including pediatric). Manual foot operated suction pump. I. V. fluid and I.V. Sets, Tourniquet, First Aid Box (dressing material/ antiseptic lotion/analgesic etc), linen/blanket, laryngeal mask airway of all sizes.

c) The following paramedical staff are required with proper uniform and name of the person written on the uniform:

- | | |
|---|---|
| i) Trained paramedical staff | 1 |
| ii) Nursing staff with knowledge of first aid | 1 |
| iii) Driver for ambulance | 1 |

12.13 Crane Services

The Concessionaire shall provide a crane of adequate capacity (minimum 20 MT) at each toll plaza location (s) with all necessary equipment so that it can reach the site of the incident within 30 minutes of call and clear the disabled/accident vehicles. It shall also be fitted with a GPS based vehicle tracking system to monitor its movement on 24 hours x 7 days of a week basis.

12.14 Communication System

The Concessionaire shall provide a suitable Communication System with all necessary equipment for meeting his O&M obligations.

12.15 Advanced Traffic Management Systems (ATMS)

ATMS shall be provided as per Clause 816.1 to 816.17 of Specifications for Road and Bridge Works of MORTH.

12.16 Operation and Maintenance Center

12.16.1 There shall be operation and maintenance center(s) either at the toll plaza (s) or at any other location along the Project Highway as identified by the Concessionaire. The land for the same shall be acquired by the Concessionaire at his cost. The operation and maintenance center would have following minimum facilities:

- i) Main control center and administrative block.
- ii) Equipment for operation and maintenance and storage space for them.
- iii) Storage space for equipment and material for traffic signs and markings.
- iv) Workshop.
- v) General garage and repair shop.
- vi) Testing laboratory.
- vii) Parking space for minimum 4 numbers of large vehicles and for other expected vehicle during peak hours including those for working staff and visitors.

12.16.2 All building works shall be designed to meet the functional requirements and shall be compatible with regional architecture and micro climate. Locally available materials shall be given preference but not at the cost of construction quality.

12.16.3 The circulation roads and parking spaces in the O&M center shall be paved to withstand vehicle loads and forces due to frequent acceleration and braking of vehicles.

Parking bays/lots shall have proper cross slope and drainage. The marking of the parking bays shall be as per IRC:35 to demarcate parking and circulation space. Parking lots shall have illumination as provided in IS: 1944 (Parts I and II).

12.16.4 The whole campus of operation and maintenance center shall have system for security with safe entry and exit.

SECTION - 13

SPECIAL REQUIREMENTS FOR HILL ROADS

13.1 General

13.1.1 The concessionaire shall pay due attention to geo-technical, environmental and social aspects of hill roads and take appropriate measures to ensure the following: (The guidelines given in IRC:SP:48 may be referred to, for details).

- (i) Stability against geological disturbances.
- (ii) Prevention of soil erosion.
- (iii) Provision of efficient drainage and preservation of natural drainage system.

13.1.2 If there are any landslide prone areas along the road alignment, adequate investigation shall be undertaken and appropriate remedial measures shall be provided as per guidelines given in IRC:SP:48.

13.1.3 Where any new construction/realignment is involved, the alignment shall avoid large scale cuttings and fillings and follow the profile of land, as far as possible.

Areas having potential landslide or settlement problems shall be avoided. Adverse impact on the environment shall be reduced by adopting proper mitigation measures. Refer to guidelines given in IRC:SP:48.

13.1.4 Unstable hillsides shall be adequately addressed by providing appropriate bio-engineering and stabilization measures.

13.1.5 Necessary safeguard shall be taken to protect ecology sensitive areas like wildlife and bird sanctuaries, reserve forests, national parks, etc.

13.1.6 Provision of protective structures for traffic such as parapets, railings, roadside safety barriers, boulder nets, etc. shall be provided, where necessary.

13.2 Setback Distance at Horizontal Curves

Requisite sight distance should be available across the inside of horizontal curves. Lack of visibility in the lateral direction may arise due to obstructions like walls, cut-slopes, wooded areas, etc. Setback distance from the central line of the carriage way, within which the offending obstructions should be cleared to ensure the needed visibility, can be determined using the equation given in IRC:52.

13.3 Grade Compensation at Curves

At horizontal curves, the gradient shall be eased by applying the grade compensation correction for gradients steeper than 4% in accordance with IRC:52.

13.4 Hairpin Bends

Hairpin bends, where unavoidable, may be designed either as a circular curve with transition curves at each end or as a compound circular curve.

Design criteria given in IRC:52 shall be adopted for the design of hair pin bends. At hairpin bends the full roadway width should be surfaced.

13.5 Climbing Lane

Climbing lane shall be provided, where specified in Schedule-‘B’ of the Concession Agreement, in order to address the necessity of making available separate lane for safe overtaking for vehicle travelling uphill. Proper signing and road markings shall be provided to ensure that the absolute right of way for climbing vehicles is available.

13.6 Rock Blasting

Heavy rock blasting should be avoided. Controlled blasting shall be resorted to. Blasting shall be supervised by experienced personnel. Blasting and related operations shall be carried out in accordance with Clause 302 of MORTH Specifications.

13.7 Cut Slopes

Cuts lopes shall be rendered stable in the construction stage itself, by cutting at the correct angle and benching etc. including slope stabilizing structures liked rains, breast walls, pitching, etc.

13.8 Tunnels

Where it is necessary to cross hills or high ridges, the various alternatives including construction of tunnel to avoid deep cuts shall be considered and the most preferred alternative shall be chosen. The alternative to be followed shall be indicated in Schedule 'B' of the Concession Agreement. Where road is to be taken through tunnel, its salient details shall be indicated in Schedule 'B' of the Concession Agreement. The design and specification of tunnels shall be as Section 15 of this Manual.

13.9 Drainage

For drainage of water from roadside, an effective system of drainage shall be constructed to lead the run-off to natural watercourses. In particular, catch water drains (Refer to para 6.5 of this Manual) shall be provided above the cut slopes. It shall be ensured that water is not drained into villages and cultivated land. Location of cross drains and culverts should be so chosen as to avoid erosion of the outlet. Erosion control works like drop walls, apron at out-fall points along with pitching/paving of the channel shall be provided where required.

13.10 Retaining Walls

13.10.1 Retaining Walls shall be Provided:

- i) To support the downhill side unstable strata or fills,
- ii) To achieve width of roadway, where cutting into hill is restricted,
- iii) To arrest damage caused to the valley side and the road, by undercutting by a stream or other watercourse,

- iv) At valley points, where water flows over the road,
- v) At places where the valley side gets saturated in them on soon sand is likely to result in slips and damage to the road,
- vi) At any other locations warranting provision of retaining walls.

13.10.2 The retaining walls on the existing roads shall be inspected by the concessionaire to check and assess the requirements of repairs and/or strengthening or reconstruction. If so required, the repair and/or strengthening or reconstruction work shall be carried out as per the assessment.

13.10.3 For general features, arrangement and design, guidelines given in IRC:SP:48 may be referred to.

13.11 Aprons etc.

Construction of apron, pitching, flooring shall conform to Clauses 2503 to 2507 of MORTH Specifications.

13.12 Disposal of Debris

Disposal sites shall be identified for disposal of waste, debris, etc. Tipping of waste in to valley sides, stream channels, water bodies, and forest areas shall not be resorted to.

13.13 Report to be submitted

The concessionaire shall submit report containing proposal for special requirements in hill areas to the IE for review and comments, if any.

SECTION - 14

TUNNELS

14.1 General

14.1.1 Project highway shall be constructed in tunnel either to carry the alignment under or through a natural obstacle or to minimize the impact on the community under conditions such as:

- (i) Long, narrow mountainous terrain where a cut section is economically unviable or leads to adverse environmental consequences.
- (ii) Narrow right-of-way where all the surface area must be retained for road purpose.
- (iii) Railway yard, airport or similar facilities.
- (iv) Parks or other land uses, existing or planned.
- (v) Prohibitive costs of land acquisition exceeding the costs of tunnel construction and operation.

14.1.2 Planning and design of tunnel shall be based on various conditions along the project highway alignment including the topography, geology, meteorology, environment, locations and traffic volumes and shall generally conform to provisions of IRC:SP:91 and this Manual.

14.1.3 Wherever tunnel is required to be provided its location, length and number of lanes shall be indicated in Schedule 'B' of the Concession Agreement.

14.2 Geometrics

14.2.1 A tunnel shall have the same geometric standards as on the main carriageway outside the tunnel except as specified in this Section.

14.2.2 *Cross Section*

Shape of tunnel cross section shall be commensurate with the methodology of construction, e.g., mining or cut-and-cover method, geotechnical conditions and structural consideration.

14.2.3 *Horizontal Clearance*

The tunnel shall cater for carriageway, paved shoulder, edge strip as on the adjoining carriageways outside the tunnel, and space to be provided for ventilation ducts, escape footway, emergency lay-bye where necessary, lighting, drainage, fire and other services.

14.2.4 *Vertical Clearance*

The tunnel shall have a minimum vertical clearance of 5.5 m over the full width of carriageway and paved shoulders. Vertical clearance over footway shall be 3.0 m minimum. Additional vertical clearance shall be provided for accommodating tunnel ventilation and lighting fixtures.

14.2.5 *Number of Traffic Lanes*

Design service volume for tunnel shall be same as for the portion of highway outside the tunnel. Number of lanes to be provided shall be based on the traffic projections for 25 years. Tunnels shall have minimum 3 lanes carriageway and paved shoulders of 2.5 m on either side. Provision shall be made for providing additional tubes as and when traffic demands.

14.2.6 *Carriageway and Paved Shoulder*

The carriageways of the tunnels shall be of cement concrete. Tunnels shall have paved shoulder of 2.5 m on either side. In case of tunnels having more than 500 m length provision shall be made for 100 m long and 3.0 m wide emergency lay bye beyond the left most lane at 750 m intervals to facilitate refuge by break down/damaged vehicles and also for maintenance vehicles. Proper transitions, line of sight and informatory signs shall be ensured for such lay-bye.

Typical tunnel cross sections for unidirectional traffic conditions for three-lane configuration with cut and cover construction and mining type construction are shown in **Figs. 14.1 and 14.2**. A typical layout of lay-bye is shown in **Fig. 14.3**.

14.2.7 *Tunnel Spacing*

The clear distance between the twin tubes shall be kept depending upon the type of strata and structural stability of the tunnel subject.

14.2.8 *Tunnel Passage*

The twin tunnels of more than 500 m length if provided shall be connected by a cross passage at an inclination to facilitate diversion of the traffic from one tube to other tube in the event of an incident/accident in one of the tubes at a spacing of 300 m. The cross passage shall be at an angle of 30 degrees with the direction of flow as shown in **Fig. 14.4**. The cross passage shall have provision for one traffic lane, edge strip of 0.60 m, crash barriers and walkways on either side. In normal conditions the cross passage shall be barricaded.

14.2.9 *Vertical Alignment*

The vertical gradient shall not be more than 2.5 per cent for tunnels of length more than 500 m. In short tunnels the gradient may be limited to 6 percent however, in such cases the ventilation system should be designed to take effect of gradient and possible incidence of fire.

14.2.10 *Horizontal Alignment*

The horizontal alignment shall be straight as far as practicable. However the straight stretch shall not be more than 1500 m to avoid the effect of monotony and induction of an unconscious increase in speed. Similarly, last few metres of the tunnel shall have gentle curve. The curves if provided shall be gentle and meet the minimum radius requirements for design speed of the tunnel. Tunnel alignment at the ends and open/approach cuts shall merge smoothly with adjoining road in the open air. The crossing of central median, wherever applicable shall be provided at suitable locations at approaches of both tunnel tubes so as to allow emergency

services gain immediate access to either tube and also to send back diverted traffic to proper traffic lanes.

14.2.11 Tunnel Approach

Tunnel approach shall have smoothly aligned tunnel walls without any sudden narrowing to avoid a shift from the tunnel wall and a good day/night visibility of the edge lines. Tunnel wall lining shall be of white colour with high luminous reflectance.

14.2.12 Tunnel Portals

Tunnel portals should, apart from providing protection at entry and exit, convey drivers about the presence of the tunnel, reduce the luminance of facing walls and be in harmony with the surrounding environment from aesthetics considerations.

14.3 Geotechnical Investigations

In order to make a realistic geotechnical and geophysical assessment of the ground through which the tunnel is to pass and detailed mapping of surface geology of the tunnel area necessary for the planning and design of alignment and portal locations, shape of tunnel, tunnel supporting systems, minimum distance to be kept between two tunnels, independent geotechnical investigations should be carried in accordance with the provisions of Section 3 of IRC:SP:91.

14.4 Structural Design

14.4.1 Assessment of applicable loads shall be based on structural properties of the ground likely to be met during tunneling as arrived from detailed geo-technical investigations.

14.4.2 The design shall cater to the most adverse combination of load conditions including only those loads which have reasonable probability of simultaneous occurring with due consideration for the methodology of construction particularly in case of soft strata and soils. The design shall be checked for loading conditions during the stages of construction, operation and maintenance.

14.4.3 Tunnels in Rock

Provisions of Section 4 of IRC:SP:91 shall be followed for the structural design of tunnels passing through rock.

14.4.4 Tunnels through Soft Strata and Soils

Structural design of tunnel system passing through soft strata and soils may be carried out by suitable national or international standards, specialist literature and best engineering practices.

14.5 Design of Drainage System

Efficient and effective drainage system shall be provided in the tunnel for the removal of water from rainfall, seepage, tunnel washing operations, vehicle drippings/spillage on fire fighting operations.

14.5.1 In order to trap rainwater from hill slopes and prevent it from flowing into the approach cuts and the tunnel, suitable catch water drains shall be provided above the top of sides of the open/approach cuts and above excavated portals.

14.5.2 In the open/approach cuts discontinuous kerbs shall be provided to demarcate the edge of the carriageway. Beyond the kerbs, side drains with adequate waterway shall be provided in the open/approach cuts.

14.5.3 Inside the tunnel, suitable side drains shall be provided behind the kerbs/crash barriers. Suitable drain pipes going through the kerbs/crash barriers shall be provided to lead seepage and wash water to the drains. The drains shall be located below the walkways meant for the pedestrians and maintenance personnel, as shown in the sketches below. The carriageway shall have suitable camber to facilitate drainage into the side drains. In case of bi-directional tunnel, the camber shall be from the centre outwards and in case of uni-directional tunnel from high speed lane towards low speed lane. The vertical profile shall facilitate self-draining of tunnel by providing high point somewhere in the tunnel. However, for long tunnels this may not be possible and detailed draining system shall be designed by providing sumps and combination of self-draining and pumping arrangements.

14.5.4 The black topped road surface inside tunnel, generally constructed on rocky subgrade, gets damaged due to seepage water and creates severe problem for surface drainage. Hence the pavement inside the tunnel and in approach cuts shall be of high performance pavement concrete.

14.6 Waterproofing

Waterproofing in the form of tunnel lining such as cast in situ plain or reinforced concrete shall be provided for structural protection from surrounding weathering effects as well as operational considerations. To prevent water leaks inside the tunnel, water proof sheet at least 0.8 mm thick with synthetic textile buffer between shotcrete and lining shall be provided.

14.7 Ventilation

14.7.1 Natural ventilation may be sufficient for tunnels of length up to 500 m. However for tunnels of length more than 250 m natural ventilation system should be used only after thorough evaluation of reliance on natural ventilation especially with reference to effects of meteorological and operating conditions.

14.7.2 Mechanical system of ventilation shall be provided in case of tunnels of length more than 500 m.

14.7.3 Detailed design of ventilation shall be carried out as per Section 7 of IRC:SP:91 keeping in view the length, shape, size, tunnel environs and complexion of the likely traffic for which tunnel has been designed.

14.8 Tunnel Illumination

Tunnel illumination/lighting shall be designed and provided as per MORTH guidelines for Expressway.

14.9 Tunnel Furnishing

Provisions shall be made for installation of tunnel furnishing such as sign boards, fire fighting arrangements, cable trays for telephone and power lines etc. in consultation with relevant local authorities.

14.10 Signages and Carriageway Markings

14.10.1 Variable messages signs inside the tunnel shall be provided for the information of traffic of lane blockage/closure due to incidents related to vehicles/non-vehicles, weather and human hazards etc. or maintenance operations as also to warn of possible hazard ahead due to any abnormal situation. Signage system shall be complemented by providing traffic lights above each lane at the entry portal end and inside. Signages indicating distance travelled, distance/direction to an exit on evacuation route shall be provided inside the tunnel.

14.10.2 Tunnel carriageway markings consisting of a discontinuous line separating the traffic lanes and continuous line separating the lateral traffic lane from the paved shoulder and emergency lay-bye shall have good day/night visibility and conform to IRC:35. The markings shall be done by means of self-propelled machine which has a satisfactory cut-off capable of applying broken line automatically.

14.10.2.1 Material

- i) Hot applied thermoplastic paint with glass beads shall be used as carriageway marking material.
- ii) Carriageway marking may also be in the form of pre-fabricated sheet material, e.g. plastic sheets, which may be set into the pavement with upper surface flush with the pavement surface.

14.11 Emergency Facilities

14.11.1 Tunnel emergency facilities categorized mitigate damage in the event of incidence of fire or any other accident in the tunnel shall be provided in conformity with the standards for installation of emergency facilities according to the classification based on traffic volume and length of tunnel as shown in **Fig. 14.5** and guidelines of emergency facilities for each classification of tunnel vide **Table 14.1** as per details in following Para 14.11.2.

14.11.2 Types of details of emergency facilities to be provided are categorized as Information and Alarm Equipment, Fire Extinguishing Equipment, Escape and Guidance Facilities and other equipment. Requirements are as under:

i) Information and Alarm Equipment

- a) Emergency Telephone to be used exclusively for dispatching information regarding the occurrence of an accident to the highway authorities by persons involved in or discovering the accident (installed at intervals of 200 m).

Table 14.1 Installation Standards of Emergency Facilities

Emergency Facilities		Classification					Remarks	
Information alarm equipment	Emergency telephone		AA	A	B	C	D	Omitted in Class D tunnels less than 200 m in Length
	Pushbutton type information equipment			○	○	○	○	
	Fire detector			○	○	○	○	Omitted in tunnel without ventilation system
	Emergency alarm equipment	Tunnel entrance information board In- tunnel information board	○	○	○	○	○	Can be omitted in tunnels less than 200 m in Length To be installed in Class A tunnels 3,000 m or more in length
Fire extinguishing	Fire extinguisher		○	○	○	○	○	To be installed in Class B tunnels 1,000 m or more in length
	Fire plug		○	○	●			
Escape and guidance equipment	Guide board	Emergency exit lamps	To be installed in tunnels with evacuation adits					
		Guide board	To be installed in tunnels with evacuation adits					
		Emergency exit direction board	To be installed in tunnels with evacuation adits					
		Guide board	○	○	○			To be installed in tunnels without evacuation adits
Escape and guidance equipment	Smoke discharge equipment and Escape passage		● Evacuation adits to be provided in tunnels of around 750 m or more in length.					
			● Smoke discharge equipment to be provided in tunnels of around 1,500 m or more in length.					
			● Evacuation tunnels provide for those Class AA tunnels and Class A tunnels of a length of 3,000 m or more which employ a two-way traffic system and a longitudinal ventilation system.					
			● Either evacuation adits or smoke discharge to be provided for Class AA					
Other equipment	Hydrant		○	○	●			To be provided in Class B tunnels 1,000 m or more in length. Tunnels equipped with hydrants are to be provided with water supply ports near the entrance.
	Radio communication auxiliary equipment	Coaxial cables	○	●				To be provided in Class A tunnels 3,000 m or more in length.
	Radio rebroadcasting equipment	Entrances/exit telephone interrupt function provided	○	○				To be provided in Class A tunnels 3,000 m or more in length.
	Cell phone connectivity		○	○	○	○	○	To be provided
	Loudspeaker equipment		To be provided in tunnels equipped with a radio rebroadcasting equipment (with interruption function)					
	Water sprinkler system		○	●				To be provided in Class A tunnels 3,000 m or more in length, and serviced in two way traffic.
	CCTV		○	●				To be provided in Class A tunnels 3,000 m or more in length.
	Lighting equipment for power failure		To be provided in tunnels 200 m or more in length.					
	Emergency Power supply equipment	Independent power plant	To be provided in tunnels 500 m or more in length.					
		Non-failure power supply equipment	To be provided in tunnels 200 m or more in length.					

LEGEND:

O- Mandatory

• - Use with consideration

- b) Push button type information equipment to be pressed by persons involved in or discovering an accident in order to inform the highway authorities etc. of the occurrence of the accident (installed at intervals of 50 m).
- c) Fire Detectors: detect fires and automatically notify their location to the highway authorities etc. (installed at interval of 25 m).
- d) Emergency Alarm Equipment: when something goes out of order in the tunnel, drivers running in the access zone as well as in tunnel promptly notified through this alarm equipment. The system includes entrance information boards at tunnel entrances and the in-tunnel information boards in emergency parking areas in the tunnels.

ii) Fire Extinguishing Equipment

- a) Fire Extinguishers: installed for initial control of small-scale fires. Portable powder-type fire extinguisher, two per set, are equipped (installed at intervals of 50 m).
- b) Fire Plug: hose-reel water plugs are installed for initial control of ordinary fires. Designed for road users to be able to handle them (installed at intervals of 50 m).
- c) Smoke Discharge Equipment: when a fire arises, this device keeps the spread of smoke to a minimum level and also functions to force smoke to be discharged. Usually, ventilation equipment (working in reverse mode) is used as a smoke remover.

iii) Escape and Guidance Facilities

- a) Guide board in an emergency, these direct road users in the tunnel the distance/direction to an exit or evacuation route, the current position, and other information.
- b) Escape Passage: These are evacuation tunnels and evacuation exits for the road users in the tunnel to a safe place. The former is built for escape, separately from the main tunnel, while the latter connects the main tunnel to an evacuation which runs in parallel with it, or two main tunnels. The evacuation tunnel may have a vertical clearance of 4.5 m. The exit for evacuation shall be shutter type of light weight and non-inflammable materials. Adequate signage for direction of movement and easy opening mechanism shall be provided. Evacuation tunnel shall be used only by the evacuating persons and emergency vehicles.

iv) Other Equipment

- a) Hydrant supply water for fire fighting activities by fire service crew. The storage capacity of tank is designed to supply water to the following fire fighting measures for at least 40 minutes simultaneously. Design allowance shall be 20 percent extra.

- three fire hydrants (with fire hose)
 - two sections of sprinkler
 - two hydrants.
- b) Radio Communication Auxiliary Equipment: used for communication with the fire squads engaged in rescue or fire-fighting activities in the tunnel.
- c) Mobile Connectivity: Arrangements for mobile connectivity shall be provided.
- d) Radio Re broad casting Equipment: This is installed in the tunnel so that radio broadcasting can be made by the authorities to transmit information in an emergency.
- e) Loudspeaker Equipment: reliable information is supplied to those who have alighted from their vehicles.
- f) Water Sprinkler System: Sprinkle fire particles of water from water spray heads in order to prevent fire from spreading, support fire-fighting activities.
- g) Observation Equipment: CCTV with zoom function are installed at intervals of 200 m.
- h) Lighting Equipment for Power Failure: maintains minimum lighting required during power failure or a fire.
- i) Emergency Power Supply Equipment: used to keep emergency facilities functioning during power failure. There are two kinds, storage cell type and an independent power plant.

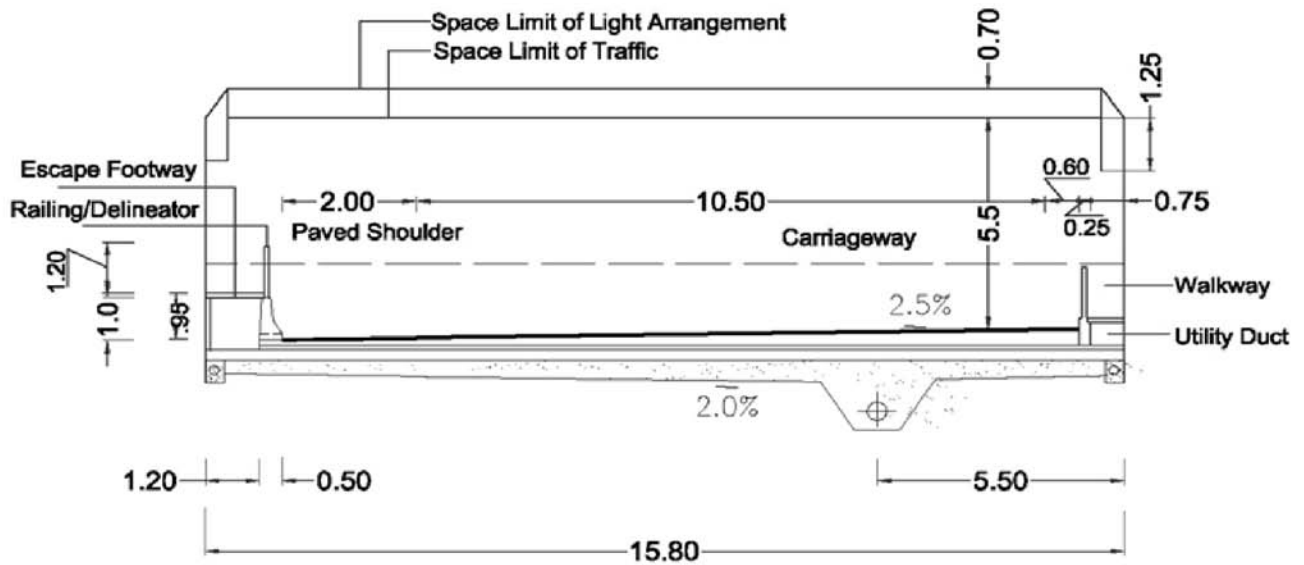
14.12 Safety During Construction

14.12.1 It shall be ensured that all applicable rules and regulations relating to the construction of tunnels are duly complied with in strict conformity with the spirit and body of such regulations.

14.12.2 A Project Safety Plan (PSP) relevant to particular site shall be prepared by the Concessionaire and got approved from the competent authority. The PSP shall address all site-specific issues and take all the identified risk elements. During all operations connected with the construction of tunnels appropriate safety precautions shall be taken through the implementation of the PSP.

14.12.3 An emergency management plan shall be part of the approved Project Safety Plan which shall be well communicated to all working personnel and prominently displayed at site. Emergency Research Measures should be drawn up to take care of various possible contingencies.

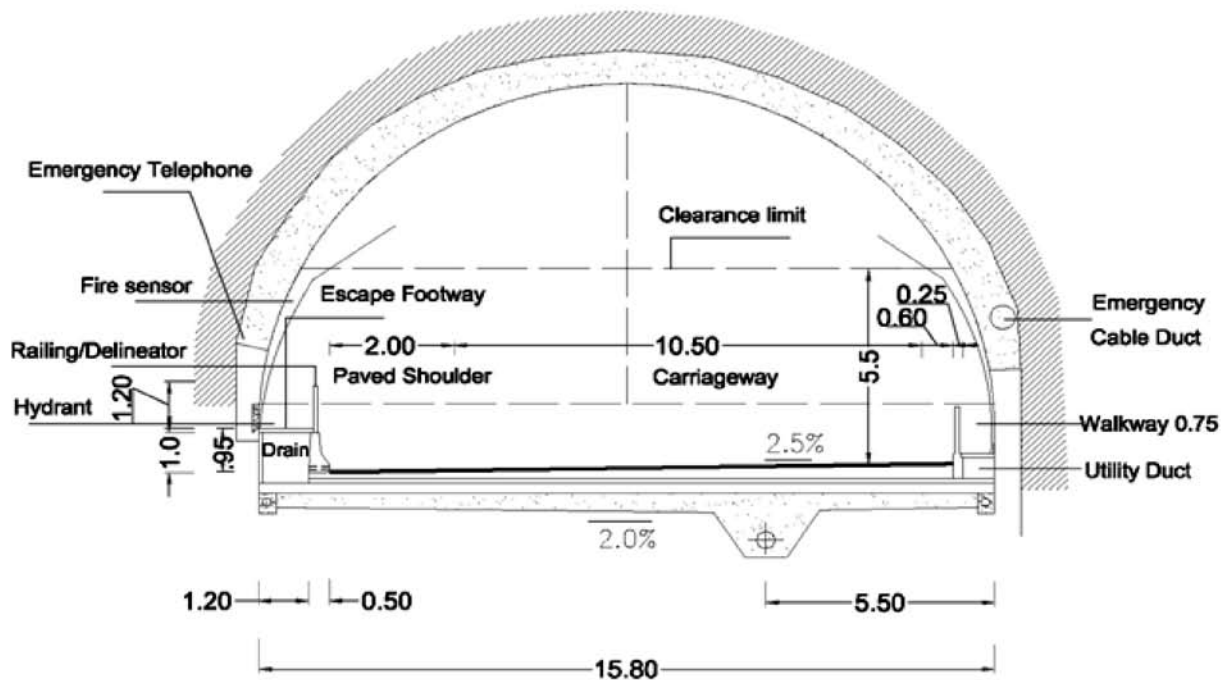
14.12.4 Provisions of Section 6 of IRC:SP:91 shall generally be followed for safety during construction of tunnels.



**Typical Cross-section of Three Lane Tunnel
Cut and Cover Construction**

NOTE - All Dimensions are in metre

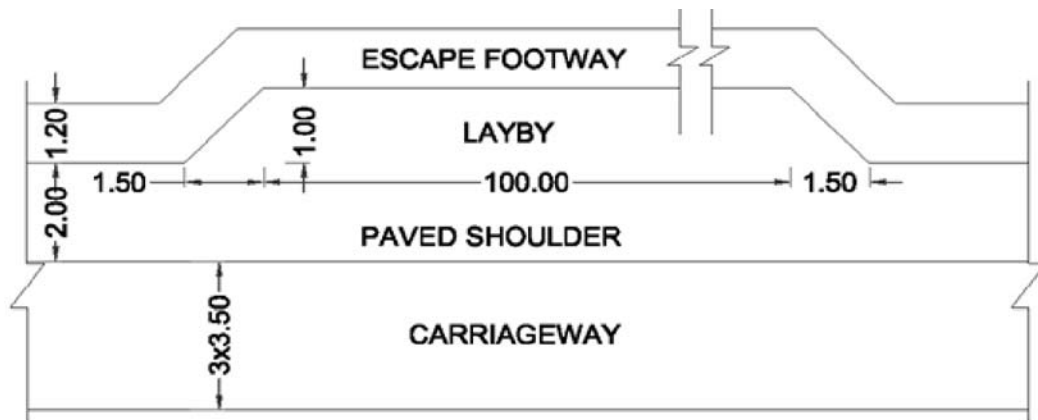
Fig. 14.1



**Typical Cross-section of Three Lane Tunnel
Mining Type Construction**

NOTE - All Dimensions are in metre

Fig. 14.2



Typical Layby Inside Tunnel For Tunnels Length More Than 500 m

(At 750 m Interval)

NOTE - All Dimesions are in metre

Fig. 14.3

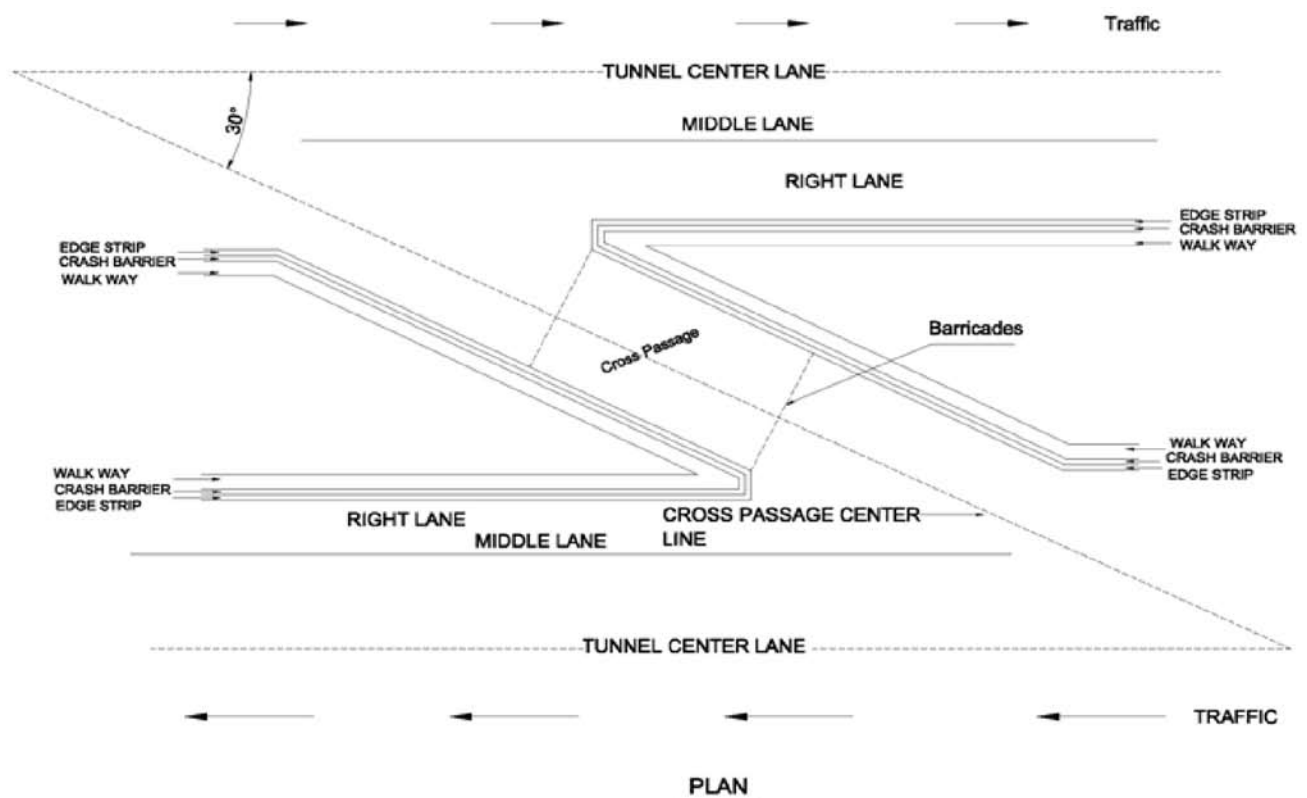
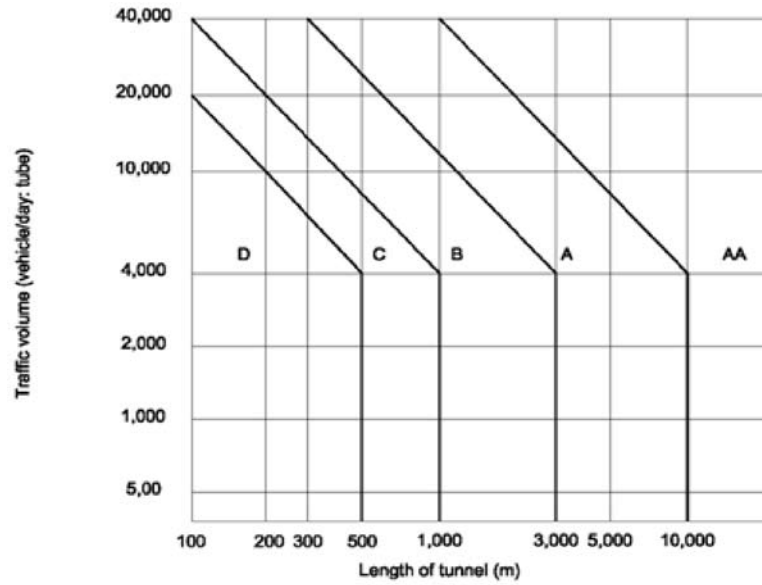


Fig. 14.4



Classification of Tunnels

Fig. 14.5

APPENDIX - 1
(REFER CLAUSE 10.4.10)

(TO BE PUBLISHED IN THE GAZETTE OF INDIA, PART 1, SECTION 1)

NO.H-25011/04/2011-P&P (TOLL) VOL. LL
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
NEW DELHI, 110001 THE AUGUST, 2011

RESOLUTION

The Government of India in response to public demand has constituted a Committee on 20th April, 2010 under the chairmanship of Nandan Nilekani, Chairman, Unique Identification Authority of India to recommend the adoption of Electronic Toll Collection (ETC) System across India's National Highways Network. The Committee has submitted its report on 28.6.2010 and to implement the recommendations of the Committee, Government has constituted an Apex Committee to finalise the required standards for the different components of ETC system and then suggest the operational methodology for implementation and operation of ETC. Apex Committee has finalised the specifications for the following :-

- i) RFID Transceiver
- ii) RFID Tag
- iii) Data exchange format between Toll Plaza Server and the Central ETC System.

These specifications are meant for Unified Electronic Toll Collection System across the country for all toll plazas on the National Highways. The detailed specifications are given below:-

1 Specifications for RFID Transceiver

1.1 General

S. No.	Parameter	Particular
1)	Frequency	UHF 865 MHZ to 867 MHZ*
2)	Communication	Ethernet/Serial communication (EIA standard RS 232 C/RS 485)
3)	RF Power maximum	1W-transmitted & 4W-EIRP (Equivalent maximum Isotropically Radiated Power)*
4)	Reading distance	With the Transceiver mounted typically at a height of 6m above the road surface, the coverage of the antennas shall not exceed a diameter of 3.6m.
5)	Antenna	Circularly Polarized
6)	Protocol	EPC Gen 2, ISO 18000-6 C and shall comply with the general conformance requirements of the standard
7)	Visual diagnostics	The Transceiver shall have LED indicators for sense; transmit Fault and Power which shall be visible clearly to the operator on ground while the system is operation.

* is in the wireless license free band for RFID use in India. Typical existing product(s) for 'RFID-based-ETC' operates in the 865 MHz- 868 MHz band.

1.2 Environmental

S. No.	Parameter	Particular
1)	Enclosure	Light weight enclosure for the RFID Transceiver and circularly polarized antenna
2)	Environmental	IP 65 or better for out door units
3)	Relative Humidity	95% Condensing
4)	Operating Temperature	-20°C to 55°C
5)	Storage Temperature	-40°C to 85°C

1.3 Operating Characteristics

S. No.	Parameter	Particulars
1)	Air Interface & Adaptive Noise Features	The Transceiver technology employed should have the capability to optimize read rates for the vehicle identification application and adapt to instantaneous noise and interference level
2)	Application capability	1. Should have read reliability exceeding 99.5% in the distance range specified. 2. Diagnostic and Reporting Tools
3)	Upgradeability	The firmware should be upgradable to support future protocols.
4)	Transaction Capability	Reading of Tag & EPC memory for at least 2 Tags per second for a moving vehicle with a speed limit of 40 kilometres/hour. •
5)	Driver Software	The transceiver driver software shall be provided along with the transceiver that will interface to the ETC client through socket interface and handle the communication with ETC client. The packet structures shall be as notified in the ETC client-transceiver interface. The driver software shall implement filtering using a range of EPC-codes provided by set of bit pattern masks.

2 Specifications for RFID Tag:

The tags shall be essentially non-transferable RFID transponders designed to be used in conjunction with compatible Transceivers and are meant to identify the vehicle for ETC application.

2.1 General

S. No.	Parameter	Particular
1)	Power	Tags are Passive
2)	Frequency	UHG 860 MHZ to 960 MHZ as per EPC Gen 2 standards
3)	Data Transfer Rate	At least 512 kbps under ideal conditions & 64 to 512 kbps under field conditions
8)	Protocol	EPC Gen 2, ISO 18000-6C
9)	Dimensions (including the substrate/backing)	Maximum area occupied on the windshield shall be 50 Sq. Cm.
10)	Material	Plastic substrate with printed antenna.
11)	Physical printing of Tag ID on the Tag	The tag ID shall be physically printed on the tag using the Hexadecimal numbering system and shall be adequately clear for easy visual recognition.
12)	Tamper Proof RFID Label	<p>The tags should be RFID Tamper Proof Label specially designed for tagging directly to a surface, such as Glass (windshield) of an automobile. Any attempt to rip or tamper the label (tag) should result in disabling the functionality of tags to ensure a unique one to one relationship between the tag and the vehicle thereby preventing unauthorized tag removal and transfers. Such features of the RFID label should result in following actions:</p> <ol style="list-style-type: none"> 1) Destroy or Damage the Antenna 2) Break the chip-antenna connection
		The manufacturing process, construction of tags and associated materials should ensure reliable tamper indication even when sophisticated tamper methods of Mechanical Attack (e.g. Razor Blades, Knives etc). Chemical Attack (using Corrosives Solvents etc.) and Thermal Attacks are employed.

2.2 Environmental

S. No.	Parameter	Particular
1)	Relative Humidity	95% Condensing
2)	Operating Temperature	-20°C to 80°C ambient
3)	Storage Temperature	-40°C to 100°C

2.3 Installation

S. No.	Parameter	Particular
1)	Location	The RFID tag shall be installed at a fixed location on the inside of the wind shield of the vehicle.*
2)	Installation mechanism	<p>The RFID tag shall have a self-adhesive backing with which it can be fixed to inside of the wind shield. The adhesive shall be such that</p> <ul style="list-style-type: none"> • It allows reliable and accurate reading of the tag by the transceiver located at a specified distance. • The RFID chip and/or the antenna get irreparably damaged when an attempt is made to remove the installed Tag from the windshield by any means. Detailed functionality is given in point No. 8 of Para 3.2.1 of this document. • The tamper proof attribute will be test from accredited testing organization before taking delivery

* location to be optimized for each class of vehicle during trials

2.4 Memory

S. No.	Parameters	Particulars
1)	Tag Memory (minimum)	Unique Tag ID- 64 bytes. EPC memory - 240 bits
2)	Data Retention	10 Years minimum with UV protection for normal sunlight exposure and ambient temperature of 45°C

3 AVI PROCESSES

To ensure standardization as well as security in the system, vehicle identification as well as tag commissioning & initiation processes are also defined below.

3.1 Tag Commissioning

3.1.1 Each tag will be required to have a non-changeable and unique tag ID, which must be read by the transceiver at the point-of-sale.

3.1.2 At the time of commissioning, the point-of-sale module shall read the unique tag ID and allocate an EPC code & a randomly generated initiation code. It shall then write the EPC. code, vehicle registration number, vehicle class code and the initiation code in the EPC memory area using the software module provided. The tag ID, EPC code, vehicle registration number, the vehicle class code and initiation code shall also be stored in the central database.

3.2 Tag Initiation

3.2.1 Tag initiation will be a process carried out during tag commissioning or when the original owner suspects a cloning of the tag.

3.2.2 In the first case, the tag initiation software shall generate a random initiation code, write in the tag and store in the central database as mentioned in 4.1.2. Each time a tag is read by the transceiver for tag commissioning, a new initiation code will be generated, written on the Tag and stored in the central database along with other information.

3.2.3 In the second case, the tag initiation software shall generate a random initiation code and read tag ID, EPC code, vehicle registration number & vehicle class code from the tag mounted on the windshield. After due verification from the central database, the value of initiation code shall be updated on the tag as well as on the central database. Old initiation code and EPC code shall be marked for special handling for 'catching' the clone as and when the cloned tag comes into contact with transceivers at the toll gates.

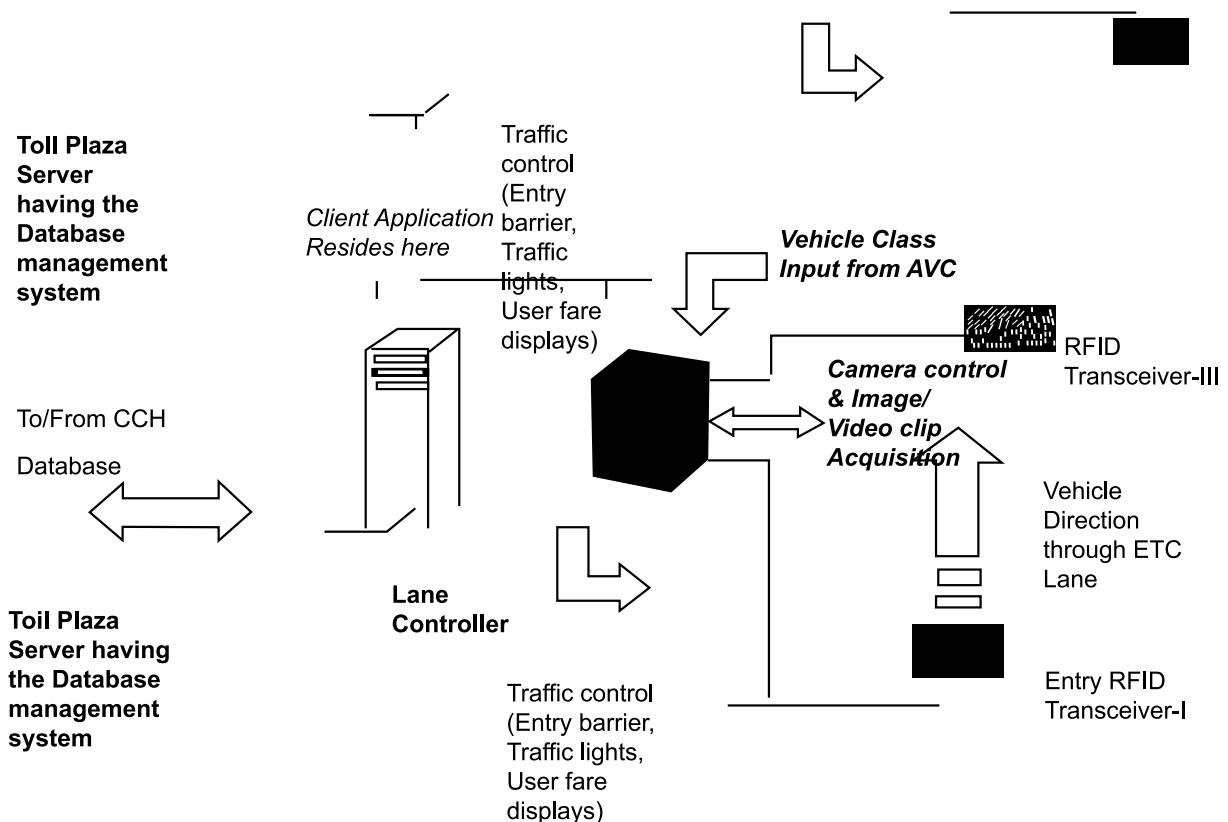
4 Automatic Vehicle Identification at Toll Point

4.1 The communication sequence between the transceiver and tag shall conform to ISO1 8000-6C.

4.2 The transceiver shall retrieve the tag and EPC memory contents for those tags whose EPC code satisfies the mask stored in the transceiver for a matching entry. The EPC code shall be used to index in to the data base from where the tag ID, vehicle registration number, the vehicle class code and the initiation code will be retrieved from the data base and verified against the corresponding values read from the tag.

5 DATA FORMAT

5.1 Schematic



5.2 Data downloaded from Central Database into Data Management System (Toll Plaza Server) and each lane controller

1)	Tag ID (The Tag ID on the tag is only 8 bytes long but extra memory has been provided in the database)	20 Bytes per vehicle	5,000,000	Written into the Database during tag commissioning
2)	EPC Code	12 Bytes per vehicle	5,000,000	Written into the Database during tag commissioning
3)	Vehicle Registration number	12 Bytes per vehicle	5,000,000	Written into the Database during tag commissioning
4)	Vehicle Class code	2 Bytes per vehicle	5,000,000	Written into the Database during tag commissioning
5)	Initiation code	4 Bytes per vehicle	5,000,000	3 bytes random No. & 1 Byte checksum on Item Nos. 2 to 5
6)	Tag Status (Valid, Exempt, Blacklisted)	1 Byte per vehicle	5,000,000	-

The above data is downloaded from the central Data base at User-set table time intervals varying between 15 min to 8 hours.

5.3 Toll Tariff tables down loaded from Central Data base in to Data Management System (Toll Plaza Server) and each lane controller

5.3.1 This table contains the approved toll tariff records for the toll plaza. The toll tariff can be based on vehicle class, lane type, time of day and shall be applicable from a given start date only. The table will contain all the toll tariff records- the old, current and future. Any discounting for local road users must be done by the clearing house. The table is likely to be updated each time the toll tariff is revised (typically about once in 2 years).

S. No.	Data	Size and Format	No. of Values of Data Parameter to be Stored in the Data Management System	Remarks
1)	Vehicle Class Code	20 Bytes	As many required	–
2)	Lane Type	20 Bytes	As many required	Valid Values will be 'Cash Lane', 'ETC Lane', 'Premium cash lane.
3)	Valid from Data	20 Bytes	As many required	Date of start of applicability of toll fare.
4)	Time Interval from	20 Bytes	As many required	Can be used for time differential toll charges
5)	Time interval till	10 Bytes	As many required	Can be used for time differential toll charges

5.4 Transaction Data generated by client application for ETC vehicle

5.4.1 Transactions generated (described under section 2.2.g.III in this document) by the client application is transferred to the Central Clearing House database. Each Transaction consists of the following items. Data size are larger than what is required now and are designed to hand lecturer expansion.

S. No.	Data	Data Size	Remarks
1)	Date and Time Stamp	20 Bytes	Time stamp of the vehicle passing through the toll plaza
2)	Transaction identification	16 bytes	This field uniquely identifies transaction. and comprises of Transaction Serial number (8 bytes), Controller ID (2 bytes), Toll Plaza ID (1 bytes) and Toll Operator ID (3 bytes).
3)	Tag ID	20 Bytes	As read from the vehicle against the database
4)	EPC Code	12 Bytes	As read from the vehicle against the database
5)	Vehicle Registration number	12 Bytes	As read from the vehicle against the database
6)	Vehicle Class code	2 Bytes	As read from the vehicle against the database
7)	Initiation code	4 Bytes	As read from the vehicle against the database
8)	Tag Status (Valid, Exempt, Blacklisted)	1 Byte	As read from the toll plaza replica of the CCH database
9)	Toll Amount	10 Bytes	Non-Discounted. Any discount on this shall be implemented by the Clearing house
10)	Vehicle Image	100 kb	JPEG format

5.4.2 Transactions shall be uploaded into the central Database at User set table time intervals varying between 5 minutes to 8 hours (vehicle image need not be uploaded to the Central database to minimize the network bandwidth).

5.4.3 The data management system (toll plaza server) shall have the capacity to store at least 280,000 such transactions per lane.

5.5 Data in Central Database for ETC vehicle

5.5.1 Replica of this data (Item 1 to 6) shall be available at the toll plaza. There plica shall be made for only valid Tags including those that are listed for special handling.

S. No.	Data	Size and format
1)	Tag ID (The tag ID on the Tag is only 8 by teslong but extra memory has been provided in the database)	20 Bytes
2)	EPC Code	12 Bytes
3)	Vehicle Registration number	12 Bytes
4)	Vehicle Class code	2 Bytes
5)	Tag Status (Valid, Exempt, Blacklisted)	1 Byte
6)	Initiation code	4 Bytes
7)	Tag Registration Date	20 Bytes

8)	Vehicle Owner details consisting of name, address, phone numbers, bank account details, credit card details, balance details (when paid, amount paid and current balance), valid-up to details (when the information is going to be not considered)	a) Name-90 Bytes and (including first, middle and Surname) b) Contact details: Address- Free format c) Phone numbers (Land line Mobile telephone numbers) Bytes each E-mail address-Free format d) Bank Account details: BranchName-12 Bytes IFSC Code-12 Bytes e) Credit Card Details: Credit card No-16 Bytes Type of Card 0 Jisa/Master Card/...)-11 Bytes Issuing Bank-10 Bytes 'Valid upto' Date-20 Bytes f) Balance Details: Datepaid-20 Bytes, Amount paid -10 Bytes Currentbalance-10 Bytes g) 'Valid up to' Date - 20 Bytes
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(Sanjay Bandopadhaya)

Joint Secretary to the Govt. of India

Tele No.23351061

ORDER

ORDERED that a copy of the resolution be placed on the Ministry's website for wide publication.

ORDERED also that there solution be published in the Gazette of India for general information.

(Sanjay Bandopadhaya)

Joint Secretary to the Govt. of India

TeleNo.23351061

To

The Manager

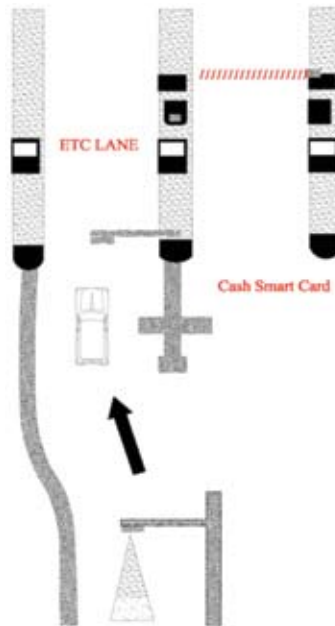
Government of India Press (Bharat Sarkar Press) FARIDABAD.

APPENDIX - 2

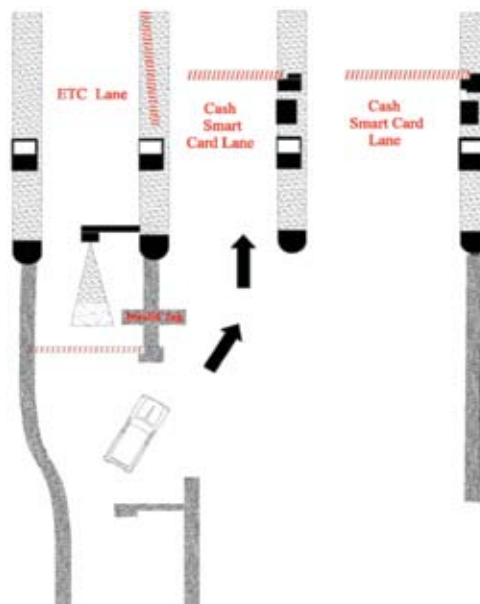
ETC PRE-SCREENING ARRANGEMENT AND OPERATION

A) VEHICLE WITH VALID TAG

when the vehicle approaches the dedicated ETC lane, the first transceiver reads the Tag and allow the vehicle to proceed.

**B) VEHICLE WITHOUT TAG OR INVALID TAG**

when the vehicle approaches the dedicated ETC lane, the first transceiver detects vehicle as non-Tag or invalid Tag and bring down the barrier blocking the entry to ETC lane. This will force the vehicle to eject from the ETC lane and go to adjacent cash lanes.



वर्ष 2021 के लिए केंद्रवार औद्योगिक श्रमिकों के लिए उपभोक्ता मूल्य सूचकांक आधार 2016 = 100 Centre Wise Consumer Price
Index Number for Industrial workers on Base 2016 = 100 for Year 2021

क्र. सं./S no	(राज्य)State Description	संक्षिप्त नाम/Short Name	(केंद्र)Centre Desc	जनवरी/Jan	फरवरी/Feb	मार्च/Mar	अप्रैल/Apr	मई/May	जून/Jun	जुलाई/Jul	अगस्त/Aug	सितंबर/Sep	अक्टूबर/Oct	नवंबर/Nov	दिसंबर/Dec
1	आंध्र प्रदेश/ANDHRA PRADESH	AP	गुंटूर/Guntur	119.5*	120.0	121.0	121.1	120.8	122.3						
2	आंध्र प्रदेश/ANDHRA PRADESH	AP	नेल्लोर/Nellore	115.6	116.9	118.8	118.3	118.5	119.7						
3	आंध्र प्रदेश/ANDHRA PRADESH	AP	विशाखापट्टनम/Visakhapatnam	129.1	131.2	131.6	131.5*	131.6	133.4						
4	असम/ASSAM	ASM	बिस्वनाथ-चाराली/Biswanath-Chariali	123.0	123.1	123.7	124.5	125.1	127.1						
5	असम/ASSAM	ASM	डूम-डूमा तिनसुकिया/Doom-Dooma Tinsukia	132.7	131.0	127.8	128.2	130.9	132.4						
6	असम/ASSAM	ASM	गुवाहाटी/Guwahati	126.8	125.0	125.9	128.2	131.1	132.5						
7	असम/ASSAM	ASM	लबाक-सिलचर/Labac-Silchar	117.7	115.3	114.2	114.4	116.2	117.8						
8	असम/ASSAM	ASM	नुमालीगढ़-गोलाघाट/Numaligarh-Golaghat	114.9	114.5*	114.2	115.1	117.1	117.1						
9	असम/ASSAM	ASM	शिवसागर/Sibsagar	117.1	116.0	117.7	117.3	118.8	119.6						
10	बिहार/BIHAR	BIH	मुंगेर-जमालपुर/Munger-Jamalpur	115.7	117.5	117.2	118.2	117.8	118.2						
11	बिहार/BIHAR	BIH	पटना/Patna	117.4	117.4	118.2	118.5*	117.9	119.2						
12	चंडीगढ़(यूटी)/CHANDIGARH(UT)	CHD	चंडीगढ़/Chandigarh	122.5*	122.4	122.7	122.7	123.0	123.5*						
13	चंडीगढ़/CHHATTISGARH	CHS	भिलाई/Bhilai	111.7	112.4	113.2	114.6	115.7	117.9						
14	चंडीगढ़/CHHATTISGARH	CHS	कोरबा/Korba	122.0	121.4	122.5*	124.4	124.9	125.0						
15	चंडीगढ़/CHHATTISGARH	CHS	रायपुर/Raipur	112.1	111.9	112.5	115.7	115.1	116.3						
16	दादर एवं नगर हवेली/DADRA & NAGAR HAVELI(UT)	DNH	दादरा और नगर हवेली/Dadra & Nagar Haveli	113.2	113.5	112.7	114.0	113.5	114.6						
17	दिल्ली(एनसीटी)/DELHI (NCT)	DLI	दिल्ली/Delhi	111.8	112.8	114.1	114.8	114.8	115.4						
18	गोवा/GOA	GOA	गोवा/Goa	112.9	113.5*	114.2	115.3	116.2	117.4						

19	गुजरात/GUJARAT	GUJ	अहमदाबाद/Ahmedabad	113.3	113.9	114.6	115.4	115.6	116.2						
20	गुजरात/GUJARAT	GUJ	भावनगर/Bhavnagar	111.8	113.0	114.0	117.1	117.3	117.9						
21	गुजरात/GUJARAT	GUJ	राजकोट/Rajkot	114.9	116.1	117.5*	120.0	119.7	120.4						
22	गुजरात/GUJARAT	GUJ	सुरत/Surat	112.8	112.9	113.7	116.0	116.5*	117.9						
23	गुजरात/GUJARAT	GUJ	वडोदरा/Vadodara	114.7	115.2	115.9	116.8	117.0	117.9						
24	हरियाणा/HARYANA	HRY	फरीदाबाद/Faridabad	115.6	116.4	116.6	117.0	117.5	118.5*						
25	हरियाणा/HARYANA	HRY	गुरुग्राम/Gurugram	119.9	119.4	119.7	120.4	120.4	120.5						
26	हरियाणा/HARYANA	HRY	यमुनानगर/Yamunanagar	114.6	114.6	115.6	115.8	116.0	116.0						
27	हिमाचल प्रदेश/HIMACHAL PRADESH	HP	हिमाचल प्रदेश/Himachal Pradesh	120.0	120.5*	121.4	121.8	121.7	122.5						
28	जम्मू और कश्मीर/JAMMU & KASHMIR	J&K	जम्मू और कश्मीर/Jammu & Kashmir	122.3	123.3	124.2	124.7	124.7	126.1						
29	झारखंड/JHARKHAND	JRK	बोकारो/Bokaro	114.9	118.2	118.4	118.7	120.0	122.2						
30	झारखंड/JHARKHAND	JRK	धनबाद-झरिया/Dhanbad-Jharia	119.7	121.1	123.5	124.6	125.3	126.8						
31	झारखंड/JHARKHAND	JRK	जमशेदपुर/Jamshedpur	127.1	127.4	130.4	130.3	130.0	132.1						
32	झारखंड/JHARKHAND	JRK	रामगढ़/Ramgarh	124.0	122.3	124.0	125.2	124.4	127.0						
33	कर्नाटक/KARNATAKA	KNT	बेलगाम/Belgaum	118.7	119.6	120.0	120.3	120.3	120.8						
34	कर्नाटक/KARNATAKA	KNT	बेंगलुरु/Bengaluru	115.0	116.1	116.1	116.5	116.9	117.7						
35	कर्नाटक/KARNATAKA	KNT	चिकमंगलूर/Chikmagalur	110.7	112.2	112.2	111.4	111.5	112.2						
36	कर्नाटक/KARNATAKA	KNT	दावनगरे/Davanagere	121.4	123.4	123.6	122.9	123.1	124.8						
37	कर्नाटक/KARNATAKA	KNT	हबली, धारवाड़/Hubli-Dharwad	116.8	116.9	118.0	118.8	119.1	121.0						
38	कर्नाटक/KARNATAKA	KNT	मरकरा-कोडगु/Mercara-Kodagu	111.1	112.5	113.7	113.6	113.7	114.7						
39	कर्नाटक/KARNATAKA	KNT	मैसूर/Mysore	114.5*	116.6	117.7	118.2	119.8	121.5						
40	केरल/KERALA	KRL	एर्नाकुलम / अलवे/Ernakulam/Alwaye	123.7	125.0	125.2	126.1	126.2	126.7						
41	केरल/KERALA	KRL	इडुक्की/Idukki	122.4	123.2	123.4	123.3	123.2	125.6						
42	केरल/KERALA	KRL	कोल्लम/Kollam	119.5	121.8	123.0	122.6	123.1	124.6						
43	मध्य प्रदेश/MADHYA PRADESH	MP	भोपाल/Bhopal	113.9	115.1	117.2	117.1	117.3	120.4						
44	मध्य प्रदेश/MADHYA PRADESH	MP	छिंदवाड़ा/Chhindwara	118.0	118.8	118.7	118.8	120.7	120.8						
45	मध्य प्रदेश/MADHYA PRADESH	MP	इंदौर/Indore	113.7	114.9	115.5	116.9	117.0	115.9						
46	मध्य प्रदेश/MADHYA PRADESH	MP	जबलपुर/Jabalpur	116.3	118.9	119.9	123.5*	123.8	125.4						
47	महाराष्ट्र/MAHARASHTRA	MHR	मुंबई/Mumbai	112.7	113.9	114.6	115.3	115.6	116.8						

48	महाराष्ट्र/MAHARASHTRA	MHR	नागपूर/Nagpur	117.9	117.3	117.7	118.1	118.7	119.1						
49	महाराष्ट्र/MAHARASHTRA	MHR	नासिक/Nasik	115.6	116.2	116.3	116.2	117.2	118.9						
50	महाराष्ट्र/MAHARASHTRA	MHR	पुणे/Pune	115.5	116.3	117.1	117.9	117.1	119.1	RA-5					
51	महाराष्ट्र/MAHARASHTRA	MHR	सोलापूर/Solapur	120.4	120.8	120.7	121.5*	122.9	124.9						
52	महाराष्ट्र/MAHARASHTRA	MHR	ठाणे/Thane	111.6	112.6	113.6	114.5*	114.8	114.9						
53	मेघालय/MEGHALAYA	MEG	शिलोंग/Shillong	126.0	126.7	126.7	126.7	128.6	134.8						
54	उड़ीसा/ODISHA	ODI	अंगुल-तालचर/Angul-Talchar	125.4	126.4	126.4	127.3	128.7	129.5						
55	उड़ीसा/ODISHA	ODI	कटक/Cuttack	124.6	126.3	126.4	127.0	127.5*	127.7						
56	उड़ीसा/ODISHA	ODI	क्योंझर/Keonjhar	124.8	125.5*	124.9	125.5	126.8	128.0						
57	पुडुचेरी (यूटी)/PUDUCHERRY(UT)	PUD	पुडुचेरी/Puducherry	122.0	124.8	122.6	123.1	122.3	125.8						
58	पंजाब/PUNJAB	PUN	अमृतसर/Amritsar	119.2	119.5*	120.3	121.2	120.2	120.8						
59	पंजाब/PUNJAB	PUN	जालंधर/Jalandhar	119.3	118.8	118.6	118.8	119.2	119.4						
60	पंजाब/PUNJAB	PUN	लुधियाना/Ludhiana	119.8	119.0	121.6	120.6	120.5	120.6						
61	पंजाब/PUNJAB	PUN	संगरूर/Sangrur	115.8	115.3	118.3	118.9	119.4	120.1						
62	राजस्थान/RAJASTHAN	RJN	अलवर/Alwar	115.9	116.3	116.4	117.2	119.7	122.3						
63	राजस्थान/RAJASTHAN	RJN	भीलवाड़ा/Bhilwara	115.1	115.9	116.1	118.3	117.1	117.9						
64	राजस्थान/RAJASTHAN	RJN	जयपुर/Jaipur	113.5	115.5	116.3	115.6	114.9	114.6						
65	तमिलनाडु/TAMIL NADU	TN	चेन्नई/Chennai	121.5*	120.7	119.5*	119.5	121.2	123.3						
66	तमिलनाडु/TAMIL NADU	TN	कोयंबटूर/Coimbatore	118.3	118.4	119.1	119.3	118.7	120.4						
67	तमिलनाडु/TAMIL NADU	TN	कोन्नूर/Coonoor	125.3	128.4	125.8	123.5*	127.6	130.3						
68	तमिलनाडु/TAMIL NADU	TN	मदुरै/Madurai	120.1	124.1	124.9	123.3	125.1	125.2						
69	तमिलनाडु/TAMIL NADU	TN	सेलम/Salem	118.9	120.6	120.1	119.4	119.5*	121.6						
70	तमिलनाडु/TAMIL NADU	TN	तिरुनेलवेली/Tirunelveli	122.9	123.7	124.3	123.1	124.9	124.5*						
71	तमिलनाडु/TAMIL NADU	TN	विरुध नगर/Virudhu Nagar	119.1	120.9	120.1	121.0	120.5	121.5						
72	तेलंगाना/TELANGANA	TEL	हैदराबाद/Hyderabad	117.8	118.3	118.6	118.7	119.9	121.3						
73	तेलंगाना/TELANGANA	TEL	मंचेरियल/Mancheriyal	126.8	127.3	127.9	127.8	129.7	131.4						
74	तेलंगाना/TELANGANA	TEL	वारंगल/Warangal	118.1	117.6	119.0	119.9	120.1	121.9						
75	त्रिपुरा/TRIPURA	TRP	त्रिपुरा/Tripura	116.9	115.0	115.0	115.4	116.9	118.6						
76	उत्तर प्रदेश/UTTAR PRADESH	UP	आगरा/Agra	116.6	119.8	120.8	121.3	122.6	122.8						
77	उत्तर प्रदेश/UTTAR PRADESH	UP	गाजियाबाद/Ghaziabad/G.B. Nagar	118.4	118.8	119.8	121.0	121.7	121.8						
78	उत्तर प्रदेश/UTTAR PRADESH	UP	कानपुर/Kanpur	119.6	120.3	121.0	122.9	123.1	122.9						
79	उत्तर प्रदेश/UTTAR PRADESH	UP	लखनऊ/Lucknow	121.4	123.0	124.0	124.3	124.4	125.2						
80	उत्तर प्रदेश/UTTAR PRADESH	UP	वाराणसी/Varanasi	121.6	122.1	123.6	122.7	123.2	125.4						

Annex - I
(Schedule-B)
Description of the Project

1 Width of Carriageway

- 1.1 Two lane divided Carriageway with /without paved shoulder shall be undertaken. The paved carriageway shall be 10.0m meter wide in case of carriageway with paved shoulder and 7m in case of without paved shoulder of flexible type in accordance with the typical cross sections drawings in the Manual. In the built-up areas the carriageway width is 10.0m (Ten) in case of flexible type pavement and 7m of Rigid type.

PN -40

S. No.	Ch. From	Ch. To	Location Name of Village	Carriageway width
1	48.000	49.000	Visapur	7
2	53.000	54.200	Jakken	7
3	54.200	55.800	Amalawadi	7
4	57.900	59.500	Chowkikamba village	7
5	61.000	64.000	Jaigao	7
6	65.200	66.000	Aundh	10
7	66.000	67.100	Aundh	7
8	74.200	75.200	Gopuj	7
9	79.400	80.600	Gurushale	7
10	82.700	83.900	Shriraswadi/Nimsod	7
11	92.300	92.67	Nimsod/ Mhasurne	7

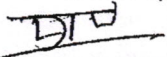
- 1.2 Except as otherwise provided in this Agreement, but subject to the provisions of Annex-II of this Schedule-B, the width of the paved carriageway shall conform to Clause 1.1 above.

2 Project Facilities

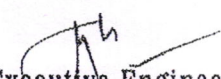
Project facilities shall be constructed in conformity with Annex-I of Schedule- C.

3 Specifications and Standards

The Project shall be constructed in conformity with the Specifications and Standards specified in Annex-I of Schedule-D.


Deputy Engineer,
P. W. Sub. Dn. Vaduj.



 Executive Engineer,
Public Works Division Satara

 Superintending Engineer,
Public Works Circle, Satara

4 Other Features of the project

4.1. Cross Section

The project highway Cross sections should follow IRC: SP: 73-2015, "Manual of Specifications & Standards for two Laning of Highways with Paved Shoulder" as per Appendix B-1.

Summary of Widening Scheme

Sr.No.	Design chainage (Km)		Length (km)	TCS - Type	Type of Widening
	From	To			
1	47	54.54	7540	Type -3a	Open Country -Widening & Strengthening without Paved Shoulder with overlay of Existing Pavement
2	54.54	54.62	80	Type -3c	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement
3	54.62	54.82	200	Type -3a	Open Country -Widening & Strengthening without Paved Shoulder with overlay of Existing Pavement
4	54.82	54.86	40	Type -3c	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement
5	54.86	56.05	1190	Type -3a	Open Country -Widening & Strengthening without Paved Shoulder with overlay of Existing Pavement
6	56.05	56.09	40	Type -3c	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement

[Signature]
Deputy Engineer,
P. W. Sub. Dn. Vaduj.

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PN-40) Improvement to Phaltan, Pusegaon, Aundh, Gopuj, Nimsod, Mhasurme Road, SH-147, Km 0/000 to 89/000, Dist Satara. (Part II- Pusegaon to Mhasurme Km 47/000 to 92/670) under Maharashtra Road Improvement Programme on Hybrid Annuity Mode



[Signature]
Executive Engineer,
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Public Works Circle, Satara

Public Private Partnership in Hybrid Annuity Project

7	56.09	58	1910	Type -3a	Open Country -Widening & Strengthening without Paved Shoulder with overlay of Existing Pavement
8	58	65.5	7500	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement
9	65.5	66	500	Type -1a	Built up Area , Paved Shoulder and RCC drain with Widening & Strengthening with overlay of Existing Pavement
10	66	66.7	700	Type -5	Built up Area , Paved Shoulder and RCC drain with concrete Pavement
11	66.7	77.69	10990	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement
12	77.69	77.71	20	Type -3c	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement
13	77.71	80.15	2440	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement
14	80.15	80.18	30	Type -3c	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement
15	80.18	81.9	1720	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement

Deputy Engineer,
P. W. Sub. Dn. Vaduj.

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PN-40) Improvement to Phaltan, Pusegaon, Aundh, Gopuj, Nimsod, Mhasurane Road, SH-147, Km 0/000 to 89/000, Dist Satara. (Part II- Pusegaon to Mhasurane Km 47/000 to 92/670) under Maharashtra Road Improvement Programme on Hybrid Annuity Mode



Executive Engineer,
Public Works Division Satara

Superintending Engineer
Public Works Circle, Satara

16	81.9	82.6	700	Type -5	Built up Area , Paved Shoulder and RCC drain with concrete Pavement
17	82.6	84.03	1430	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement
18	84.03	84.06	30	Type -3c	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement
19	84.06	88.1	4040	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement
20	88.1	88.8	700	Type -5	Built up Area , Paved Shoulder and RCC drain with concrete Pavement
21	88.8	90.07	1270	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement
22	90.07	90.12	50	Type -3c	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement
23	90.12	92.67	2550	Type -3b	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement
		Total	45670		


Deputy Engineer,
P. W. Sub. Dn. Vaduj.



Executive Engineer,
Public Works Division Satara


Superintending Engineer
Public Works Circle, Satara

Provision of various types of Cross Sections for PN -40

Sr. No.	Proposed Typical Cross Section	Type of C/S	OVERALL LENGTH IN Meter
1	Built up Area , Paved Shoulder and RCC drain with Widening & Strengthening with overlay of Existing Pavement	TYPE 1A	500
2	Open Country -Widening & Strengthening without Paved Shoulder with overlay of Existing Pavement	TYPE 3A	10840
3	Open Country -Widening & Strengthening without Paved Shoulder with partial reconstruction of Existing Pavement	TYPE 3B	31940
4	Open Country -Widening & Strengthening without Paved Shoulder with full reconstruction of Existing Pavement	TYPE 3C	290
5	Built up Area , Paved Shoulder and RCC drain with concrete Pavement	TYPE 5	2100
Total			45670

4.2. Alignment Plan and Longitudinal Section

An alignment plan and vertical profile of project highway is given at **Appendix BII** in soft copy. The minimum FRL given in enclosed drawing shall have to be achieved by concessionaire.

4.3. Bypass and Realignment

There are no bypasses and no re-alignments in the project highway.

4.4. Service Road/Slip Road

There is no Service/Slip Roads shall be provided in length indicated in **Appendix B IV**. Cross Sections should follow IRC: SP: 73-2015, "Manual of Specifications & Standards for two Laning of Highways with Paved Shoulder, restricted to Availability of land width"

4.5. Type of Footpath

- (a) In built-up sections, Footpaths shall be provided in following shall be provided in following locations-

For PN -40

S. No.	Built up Stretch	Design Chainage (Km)		Length (m)
		From	To	
1				

PN-40) Improvement to Phaltan, Pusegaon, Aundh, Gopuj, Nimsod, Mhasurme Road, SH-147, Km 0/000 to 89/000, Dist Satara. (Part II- Pusegaon to Mhasurme Km 47/000 to 92/670) under Maharashtra Road Improvement Programme on Hybrid Annuity Mode

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Executive Engineer,
Public Works Division Satara

Superintending Engineer
Public Works Circle, Satara

1	Aundh	65.500	66.000	500
2	Aundh	66.000	66.700	700
3	Nimsod	81.900	82.600	700
4	Gurusale	88.100	88.800	700

- (b) In open country, earthen shoulders of available width as per land availability shall be provided with **150 mm thick compacted layer of granular material.** (As in TCS shown)

4.6. Six Lane Stretches (if Any) – Deleted.

4.7. Proposed Right of Way (ROW)

The details of the proposed ROW are given in **Appendix B VI.**

4.8. At Grade Intersection

At grade intersection shall be provided as per locations specified in Appendix BVII for major and minor intersections.

Note : The concessionaire shall take up the 'Detailed Engineering Study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in section-3 of Manual.(IRC: SP: 73-2015, "Manual of Specifications & Standards for two Laning of Highways with Paved Shoulder")

4.9. Type of Pavement

Pavement design shall be carried out in accordance with Section 5 sub para 5. of the Manual.

New Flexible Pavement & Widening with new flexible pavement shall be constructed adjacent to flexible overlay as per provisions of IRC: 37-2012 and IRC: SP-73-2015 with minimum crust composition as follows in consultation with Independent Engineer.

For PN -40

S. No.	Description	Minimum Crust Composition of Flexible Pavement
1	Bituminous Concrete with Tack Coat	40 mm
2	Dense Bituminous Concrete with Tack	50 mm
3	Wet Mix Macadam	250 mm
4	Granular Sub Base	200 mm
	Total	540 mm

[Signature]
Deputy Engineer,
P. W. Sub. Dn. Vaduj.

Grade Separated Intersections



[Signature]
Executive Engineer,
Public Works Division Satara

[Signature]
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Public Works Circle, Satara



Government of Maharashtra, India

Public Works Department

Improvement to Phaltan, Pusegaon, Aundh, Gopuj, Nimsod, Mhasurne Road, SH-147, Km 0/000 to 89/000, Dist Satara. (Part II- Pusegaon to Mhasurne Km 47/000 to 92/670) under Maharashtra Road Improvement Programme on Hybrid Annuity Mode – PN 40

MAIN REPORT

DECEMBER 2017



SHRIKHANDE
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9.3 Pavement

9.3.1 Flexible Pavement

Flexible pavement is designed for project road as per IRC-37-2012. All layers of pavement both bituminous and granular are designed for full design life of 15 years as the traffic volume is minimum. Details of pavement design along with calculations are given in Design Report (Vol-II). Following are salient features of Flexible pavement design.

- PN40**
1. Design Life–15Years
 2. Traffic MSA–2MSA
 3. CBR of soil -9%
 4. Carriage way-Two Lane Undivided

Values of lane distribution factors and Vehicle Damaging factor are taken as per IRC and as analyzed. Summary of design flexible pavement is given as under

- Subgrade–500mm (CBR 10%Min)
- Granular Sub Base (GSB) – 200mm (Grading-IV)
- Wet Mix Macadam (WMM) - 250mm
- Dense Bituminous Macadam (DBM) – 50mm
- Bituminous Concrete (BC) – 40mm

9.3.2 Overlay Design

Overlay design has been carried out as per IRC 81;

Following is the overlay design for both stretches

- a) From Pusegaon to Mhasurne – 50mm DBM + 40mm BC + profile correction in DBM

9.3.3. Rigid Pavement

Rigid pavement has been designed as per IRC 58

Concrete pavement is proposed in village portions. Following is the summary of concrete pavement in villages.

- Sub grade –500mm (CBR 10%Min)
- Granular Sub Base (GSB) –200mm (Grading-V)
- Dry Lean Concrete (DLC) –100mm
- Pavement Quality Concrete (PQC) – 250 mm

Detail design is attached in the design report.

(b) When only one tender is received for a particular work which is got reduced by negotiations.

(c) When the lowest tender before the final stage of acceptance becomes invalid for any reason, say for non-payment of security deposit, non-completion of tender documents within the stipulated time-limit, etc., such a tender does not hold good and automatically stands rejected with the forfeiture of the earnest-money deposit and the second lowest tender becomes the lowest for being considered for acceptance, for which approval of the tender committee is not necessary.

Note 3.—Whenever any negotiated tenders are proposed to be invited due to absence and inadequacy of response to open tenders and any material variations are made in the terms later, the fresh terms and conditions on which the contract is proposed to be negotiated, should be made known to all the contractors who are likely to be interested in the offer. Precautions, however, should be taken to see that the terms offered by one contractor for the contract are not disclosed to other contractors.

209. The work costing up to Rs. 1 lakh should be given to the labour co-operative societies without calling for tenders at the estimated rates based on divisional schedule of rates brought up-to-date. While awarding the works, the following will be the classification of the labour co-operative societies based on their financial status, managerial and technical capacity and staff :—

(I) Maximum eligibility up to Rs. 20,000 'C' Class.

(II) Maximum eligibility up to Rs. 50,000 'B' Class.

(III) Maximum eligibility up to Rs. 1,00,000 'A' Class.

The authorities competent to classify the labour co-operative societies in 'A', 'B' & 'C' Classes are shown at Appendix 17. Before classify the society, the Superintending Engineer/Executive Engineer should obtain a certificate based on the conditions as per Appendix 17 from the District Deputy Registrar of Co-operative Societies with whom the Labour Co-operative Society is registered. The classification should be reviewed every three years taking into account the financial status, managerial and technical capacity and staff and the performance of the society.

As regards the allotment of works between piece-workers and labour co-operative societies, the latter should be preferred. The piece-workers should be awarded works where labour co-operative societies do not exist or do not come forward to take up the work.

When open tenders are called for works costing between Rs. 1 lakh to Rs. 2 lakhs and labour co-operative societies quote for the same and if the society's tender is within 5 per cent or Rs. 5,000 maximum in comparison with the lowest tenderer, the society may be given preference over the lowest acceptable tender. The fact that the societies may have refused to accept the work costing up to Rs. 1,00,000 at the estimated rates at the earlier stage should not be against the societies while letting out to them after inviting tenders, if they would qualify for it on the basis of 5 per cent or Rs. 5,000 concession except for works on National Highways.

Clarification in respect of effect of Goods & Services Act, 2017 on works contracts and demands raised by the Contractors' Association regarding the process and condition of the contracts.

Government of Maharashtra

Public Works Department

Govt. Circular No. Sankirna-2017/C.R.121(Part-II)/Building-2

Hutatma Rajguru Chowk, Madam Kama Road,

Mantralaya, Mumbai- 400 032

Date- 19th September, 2017

Read:

- 1) Government of Maharashtra Circular (Finance Department): GST-1017/ C.R.81/ Karadhan-1, dated- 19th August, 2017
- 2) Government of Maharashtra (PWD): Letter No-Sankirna-2017/C.R.121 (II)/ Bld-2, dated- 4th September, 2017
- 3) Government of Maharashtra (PWD): Letter No-Baithak -2017/C.R.326/Roads-1, dated- 8th September, 2017
- 4) Government of Maharashtra Circular (Finance Department): GST-1017/C.R.155/Karadhan-1, dated- 11th September, 2017

Preamble:

Government of Maharashtra vide their notification of the Finance Department has made the GST applicable w.e.f. 1st July, 2017. The contractors all over the State have been raising queries about implementation of the Goods & Services Tax with respect to the ongoing and new contracts. Upon careful consideration and detailed study of the matter, the Government in PWD has clarified the queries vide letters dated 04/09/2017 and 08/09/2017. A combined Circular of the clarifications is issued as under for the benefit of the field officers.

Circular:

1. Clarification about GST:

- 1.1 The Finance Department has issued Circular regarding implementation of GST in respect of ongoing works and works under tendering process vide their circular No. GST/1017/ Pra. Kra. 81/Karadhan1, Dated 19/08/2017 and GST/1017/Pra Kra 155/Karadhan1 11/09/2017

It is clarified herewith that, extra burden of GST if any, shall be compensated by PWD upon production of authenticated records of net extra burden on account of GST (after deducting VAT and / OR Excise as in earlier contracts). The Claims to this effect shall be submitted by the contractors to the concerned Executive Engineer. The Executive Engineer will scrutinize and reimburse the claims within 30 days of receipt of such claims.

1.2 As directed by the Finance Department vide circular dated 11/09/2017, the offers received from the contractors in various tenders from 1st July, 2017 till date shall be evaluated and accepted by competent authority considering the effect of GST.

1.3 If the tenders are below or at par with estimated cost and the contractors give affidavit that they will not claim anything extra on account of GST, such tenders shall be accepted. Rest of the tenders shall be rejected and recalled immediately.

2. SSR/ Preparation of Estimates/ Calling of Tenders for new works/ Deduction of GST at source.

2.1 State Schedule of Rates:

CE Mumbai will be the Convenor of the State Schedule of Rates (SSR) Committee. All CEs and all zonal SEs will be members of the committee. Most of the meetings and exchanges should be done over VC and e-mails. A Chartered Accountant shall also be included as member of the committee. One member from Builder Association of India and one member from Contractors' Association in rotation from all regions shall be members of SSR Committee. The SSR Committee will prepare the SSR and get approval of the Government latest by 30th April every year. The SSR will be effective from 1st June every year. The corrections in SSR as pointed out by CEs shall be considered by the SSR Committee.

2.2 Preparation of Estimates:

The rates of various items in the SSR shall be exclusive of GST. While preparing estimate for the works, GST shall be added as per the prevailing rates, in the recapitulation sheet of the estimate prepared based on the SSR.

2.3 The tenders for new works:

The tender shall be called based on the rates without GST. GST shall be payable on the accepted contract value.

2.4 The detailed instructions about GST deduction at source will be issued separately.

3. Clarifications about tender procedure:

3.1 Acceptance of Tenders:

3.1.1 The guidelines for acceptance of single tender were issued vide GR dated 12/04/2017. Now revised guidelines for the acceptance of a single tender are as below:

The condition of receipt of minimum 3 technically qualified bids in the first call cannot be relaxed as it is as per requirements of CVC. However, for works of emergency and urgent nature, if 2 technically qualified bids are received in the first call, then the same can be processed with the permission of the Chief Engineer. The Chief Engineer while permitting the opening of 2 bids shall keep the reasons in writing on record. If only single bid is received in the first call then it shall be outrightly rejected & second call shall be made with short tender notice of 8 working days. **The publicity of such urgent works shall be made directly to the concerned papers as allowed by DGIPR at the time of 1st call.**

3.1.1 If only single technically qualified bid is received again on second call, the tender shall be processed as per usual procedure. There is no need to recall the tender in such cases.

3.2 Extension of Time Limit:

In case of non-availability of land or any other valid reasons, the time limit extension shall be granted by the authority competent to accept the tender. In case the tender is accepted at Government level, the Chief Engineer shall be final authority for grant of extension of time limit (under intimation to Government). The reasons for granting the extension shall invariably be kept on record.

3.3 Submission of hard copy:

Submission of hard copy is a requirement based on CVC guidelines & hence cannot be done away with. However, hard copies shall be opened only if there are problems in opening/ downloading of tender offers. If the contractor inadvertently or otherwise does not submit hard copy, then it shall not constitute a bar to open his e-offer. His online tender shall be opened by the tender opening authority and shall be processed. If the contractor's offer is lowest then it shall be accepted and his downloaded tender shall be treated as hard copy.

3.4 Clubbing of works

The work shall be clubbed together if they are in one continuous length of the road. However, no clubbing shall be resorted to if the works are distinctly apart from each other and are not on the same road. For achieving good quality in execution, the minimum road length shall be 10 Km and in case of building maintenance single estimate shall be prepared for one entire building.

3.5 Classes of Registration:

All classes of registration upto Rs.1.5 Crores shall remain valid as before.

Necessary correction has been made in the online registration system.

4 Clarifications about tender conditions:**4.1 The Earnest Money deposit for works shall be**

- (i) for works costing upto 1.5 Cr. EMD = 1 %
- (ii) for works costing above 1.5 Cr. EMD = 0.5 % of amount due to tender or Rs.1.50 Lakhs whichever is more

4.2 Security Deposit : Henceforth, for all works the Security Deposit shall be 2 % of amount put to tender rounded to next Rs.1000.

4.3 Additional performance security:

4.3.1 Additional performance security is permitted to be accepted in the form of DD/ FDR/ BG of any Nationalized/ Scheduled Bank. This shall be enclosed in the financial envelope (envelope no.2). A self attested affidavit that 'Additional Performance Security is enclosed in envelope No.2' shall be included in the Technical Envelope No.1. If the Additional Performance Security is not found included in envelope No.2 (financial envelope) (in cases which are found below 1 % of amount put to tender) the offer shall be treated as invalid and rejected forthwith.

4.3.1 Additional Performance Security of the successful bidder shall be returned immediately upon satisfactory completion of work; the certificate of which shall be issued by the EE before releasing the additional security.

4.3.2 Additional Performance Security for tenders below estimated costs shall be released on the day of opening of the financial bid except for L-1 and L-2. The Additional Performance Security of L-2 shall be released within time limit of 30 subsequent working days or award of work to L-1, whichever is later.

4.4 Regarding use of machinery:

4.4.1 The life of new machinery will be considered as 15 years.

4.4.2 There will no need of fitness certificate from SE (Mechanical) for first 6 years.

4.4.3 After 6th year, the machinery shall be checked and certified for its fitness by SE Mechanical/ACE (Mechanical) every 3rd year till the 15th year.

4.4.4 After the 15th year, the contractor will get machinery certified every year from SE/ ACE (Mechanical) and produce the certificate of

fitness. The certificate will be required for machinery where it is necessary and not issued by RTO.

5 Price variation:

The price variation clause in SBD is deleted. However, star rates shall be provided for in the SBD for bitumen, cement and steel. The difference between purchase price of contractor and the star rate shall be recoverable from the contractors or payable to the contractors.

6 Variation in Quantities:

The Clause 38 regarding variation in quantities is deleted from SBD.

Excess quantity shall be executed only after prior permission of the authority granting Administrative Approval to the work. It shall be paid at tender rate only. The CE/ SE/ EEs are directed to prepare the AA estimates based on geological investigations/ RCC designs. No change in quantity of foundations and RCC shall be permitted as the department has faced tremendous criticism due to avoidable excesses in quantities. Also the Administrative Approval will stand automatically revised if Technical Sanction is for a lesser value.

7 Tender Fees:

7.1 As the tenders are published online, the reduced tender fees shall be as follows.

Sr. No.	Cost of work put to tender	Tender purchase and process fees
1	Upto 3 lakh	Rs. 200 + GST
2	3 to 50 lakh	Rs. 500 + GST
3	50 lakh to 200 lakh	Rs. 1000 + GST
4	2 Cr to 5 Crs	Rs. 2000 + GST
5	5 Crs to 10 Crs	Rs. 3000 + GST
6	10 Crs to 50 Crs	Rs. 5000 + GST
7	More than 50 Crs	Rs. 10000+GST

7.2 If it is clarified by the local GST authority that GST is not applicable to tender purchase fee, then GST shall not be levied. The clarification shall be kept on record by the Executive Engineer/ Superintending Engineer/ Chief Engineer.

8 Duration of contracts:

The duration of contracts shall be decided based on the nature of work.

9 SSR for 2017-18:

The rates in the State Schedule of Rates are being verified with respect to GST Act being applicable w.e.f.01/07/2017 once again and new State Schedule of Rates shall be published. For items involving use of material like sand, aggregates, bricks etc, the rates may vary district wise. The variation in rates shall be approved for the district by the concerned Superintending Engineer and shall be adopted for that district after recording the reasons in writing (under intimation to the Government). SSR and District Rates of all items shall be published on the Government website.

10 Miscellaneous:

10.1 Turnover for bid capacity:

Highest turnover during the last 5 years shall be considered for calculating the bid capacity. The conditions of turnover in last 5 years has the word 'Minimum' in SBD, it shall be replaced by the word 'Maximum'.

10.2 Similar type of works:

The condition in SBD about similar type of works shall be modified by the Chief Engineer to the limit of 30 % of quantity (Minimum).

10.3 The balance sheets audited by the Chartered Accounts shall be considered and accepted.

10.4 Pre-registered consortiums registered in Stamp office will be accepted as joint ventures.

10.5 For the works of Unemployed Engineers, conditions related to ownership of hot mix plants/ batch mix plants/ machineries shall not be mandatory. A self attested hire agreement shall be sufficient. If the self attested hire agreement

is found false/ erroneous, stringent action shall be initiated by the Chief Engineer.

- 10.6 If the rates received in response to tenders received at district level tenders are above the estimated cost, then Government in PWD will consider the proposal to enhance the powers of acceptance of tenders of EE/ SE/ CE. All Chief Engineers are instructed to compile & submit data of offers and percentage above in the offers due to the effect of GST.
- 10.7 The Security Deposit of contractor shall be released online immediately after the completion of the Defect Liability period irrespective of the demand for its release.
- 10.8 For works upto Rs.1.50 Crores, the condition of ownership of hot mix plant / paver shall not be made mandatory. A self attested hire agreement shall be sufficient. If the self attested hire agreement is found false or erroneous, stringent action shall be initiated by the Chief Engineer.
- 10.9 The Chief Engineer shall review the conditions of the AMC and modify conditions, if any, with respect to accident liability in the contract.
- 10.10 The percentage ratio of 33:33:34 unit Labour Co-operative Societies, Unemployed Engineer Contractor and other contractors stands unchanged. All the previous facilities for Labour co-operative Societies and Unemployed Engineers Contractor also stand unchanged.

This Government Circular of Maharashtra Government is available at the website www.maharashtra.gov.in. Reference no. for this is 201709191210142918. This order has been signed digitally.

By order and in the name of the Governor of Maharashtra.

**Sachin M
Chivate**

Digitally signed by Sachin M Chivate
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(Sachin Chivate)
 Under Secretary, PWD

To,

1. A.C.S. to Hon'ble Chief Minister, Maharashtra
2. P.A. to Hon'ble Finance Minister, Maharashtra
3. P.A. to Hon'ble Minister (PW), Maharashtra

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By order and in the name of the Governor of Maharashtra.

**Sachin M
Chivate**

(Sachin Chivate)
Under Secretary, PWD

Digitally signed by Sachin M Chivate
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 Date: 2017.09.19 12:00:50 +05'30'

To,

1. A.C.S. to Hon'ble Chief Minister, Maharashtra
2. P.A. to Hon'ble Finance Minister, Maharashtra
3. P.A. to Hon'ble Minister (PW), Maharashtra

4. P.A. to Chief Secretary, Maharashtra
5. P.A. to A.C.S. Finance, Mantralaya, Mumbai
6. P.A. to P.S. (PWD),/ Secretary (Roads)/ Secretary (Buildings)
7. Chief Engineer, P.W.Region, Mumbai/ Pune/ Nashik/ Nagpur/ Amravati/
Aurangabad/ Special Projects Mumbai
8. Chief Engineer, Electrical (PWD), Mumbai
9. All Deputy Secretaries/ Under Secretaries, PWD, Mantralaya. Mumbai
10. All Superintending Engineers/ Executive Engineers, PWD
11. All Desk Officers, PWD, Mantralaya. Mumbai
12. Reference File (Desk Bldg-2).

Ghop Accountant

today at 4:50 PM



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WORKS

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(b) (i) A complete analysis of the rates of any particular item or items of a work should be made in all cases in which an amount of Rs. 5,000 or more is to be spent on such item or items.

(ii) Where it is considered necessary to increase the rate for any item entered in the schedule of rate by 10 per cent or more such increase should be justified by a proper analysis.

(iii) When it is found from a number of cases that the amount of tenders for works are less than the amounts of the estimates for the same by 10 per cent or more (where the latter are based on the rates entered in the schedule of rates), the Executive Engineers should take steps for reducing the rates entered in the schedule of rates justifying such reduction by a proper analysis.

(c) Superintending Engineers should invariably inspect the schedule of rates during their annual inspections of Executive Engineer's offices and bring to the notice of Government instances if any where the orders are not complied with.

(d) The Superintending Engineers/Executive Engineers are authorised to supply copies of schedule of rates to local bodies on payment of suitable fees including cost of supplying them. The fee in each case should be fixed at a round figure such that it will cover the cost of copying, comparing and supplying schedules.

I.-CONTRACTS

(a) General

188. The recognised systems for carrying out work otherwise than by the employment of daily labour are "piece work", "rate list" and "contract work". Piece-work is that for which only a rate is agreed upon by a piece worker without reference to the quantity of work to be done or the time within which it is to be completed. Such work is carried out on A-1 or A-2 form. In the "rate list" system petty works can be carried out by a number of piece-workers on schedules of costs known as rate lists without reference to quantity and time. The term "contract" as used in this chapter, does not include piece-work and rate list nor does it include materials or stores purchased under requisition. All other work done or supply made under agreement, is termed "contract work", and in agreements for such undertaking which should invariably be in writing, there should be a stipulation as to the quantity of work to be done, and the time within which it is to be completed besides other conditions for penalty and liabilities.

Note.- In the case piece-work and rate list systems there is a risk in sanctioning through rates since the early part of a work may be more profitable to the piece-worker than the later part of it and the piece-worker may do only the easier and more profitable part of the item and leave the later. In such cases where extra cost of certain items is liable to be caused by such variations as longer leads, higher lifts or harder material, utmost care should be taken to provide different rates for different parts of the work or to provide separate rates for additional leads or lifts, etc., in excess of a minimum.

188

STORES

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(4)

190. Applications from members of the scheduled castes for contracts, for the construction of wells and roads and carrying out repairs to old ones the cost of which is met out of the special grants set apart for the purpose to give relief to the masses and rural population in villages, should be considered favourably subject to the proviso that the quality of the work offered shall be up to the standard required and reasonably economical.

191. Except as provided in paragraph 189, tenders for works should be given out only on regular contract forms and should be invited publicly

Exception.—These orders shall not apply to—(a) works situated in outlying places where regular contractors are not available —

(b) works which require special treatment in construction,

(c) irrigation works of a special technical nature such as masonry dams, regulators, outlets, standing wave flumes, flume falls and such other devices,

(d) such works as road consolidation or alterations to open canals, involving difficulty in enforcement of rate of progress or special quality of the work required to be done, and

(e) works carried out in emergencies such as danger of breach in canals etc.

192. "Contracts" are of two kinds, viz., lump sum and schedule, as defined below :—

(a) In the lump sum contract the contractor agrees to execute the complete work with all its contingencies in accordance with the drawings and specifications for a fixed sum, the following being its essential characteristics :—

(i) In order to regulate the amount to be added to or deducted from the fixed sum on account of additions and alterations not covered by the contract and not involving increase or decrease of quantities except when the design is altered, specific mention should be made that the rates as provided for such items in the sanctioned schedule of rates of the division will be paid.

(ii) Except as provided in clause (i) no allusion is made in the contract to the departmental estimate of the work, schedule of rates or quantities of work to be done.

(iii) Detailed measurements of the work done are not required to be recorded except in respect of additions and alterations.

The form of lump sum contract prescribed by Government is form C.

(b) Schedule contracts are those in which the contractor undertakes to execute the work at fixed rates, the sum he is to receive being dependent on the quantities and kind of work done or material supplied. The forms used for such contracts are B-1, B-2, D and E.

5017

Re: Draft Para titled 'Recovery of Rs.19.62 lakh at the instance of Audit'**From :** Priyanka z <priyanka1.pjb.ae@cag.gov.in>

Tue, Dec 27, 2022 02:31 PM

Subject : Re: Draft Para titled 'Recovery of Rs.19.62 lakh at the instance of Audit'

1 attachment

To : PAG AUDIT II GUJARAT AHMEDABAD <pagau2gujarat@cag.gov.in>, AG Audit II Maharashtra Nagpur <agaumaharashtra2@cag.gov.in>, AG AU Goa <agaugoa@cag.gov.in>, A.G.Audit.II.Rajasthan Jaipur <agaurajasthan2@cag.gov.in>, PAG Audit I Rajasthan Jaipur <agaurajasthan1@cag.gov.in>, PAG Audit I Maharashtra Mumbai <agaumaharashtra1@cag.gov.in>, PAG Audit I Gujarat Rajkot <pagau1gujarat@cag.gov.in>

AG
90, Admin
29/12/22 (Coord for Circulation)

Please find attach complete draft para.

From: "PAG AUDIT II GUJARAT AHMEDABAD" <pagau2gujarat@cag.gov.in>**To:** "Priyanka z" <priyanka1.pjb.ae@cag.gov.in>**Sent:** Tuesday, December 27, 2022 1:07:10 PM**Subject:** Re: Draft Para titled 'Recovery of Rs.19.62 lakh at the instance of Audit'

madam,
attached para is incomplete, pls check.
regards.

29 DEC 2022
CAG/926A

44
SAO/Coordn.
AAO/Coord.
29/12

From: "Priyanka z" <priyanka1.pjb.ae@cag.gov.in>

To: "PAG AUDIT II GUJARAT AHMEDABAD" <pagau2gujarat@cag.gov.in>, "AG Audit II Maharashtra Nagpur" <agaumaharashtra2@cag.gov.in>, "AG AU Goa" <agaugoa@cag.gov.in>, "A.G.Audit.II.Rajasthan Jaipur" <agaurajasthan2@cag.gov.in>, "PAG Audit I Rajasthan Jaipur" <agaurajasthan1@cag.gov.in>, "PAG Audit I Maharashtra Mumbai" <agaumaharashtra1@cag.gov.in>, "PAG Audit I Gujarat Rajkot" <pagau1gujarat@cag.gov.in>

Sent: Tuesday, December 27, 2022 12:44:09 PM**Subject:** Draft Para titled 'Recovery of Rs.19.62 lakh at the instance of Audit'

Respected Sir/ Madam,

As directed, please find attach draft para regarding crediting of entire amount of NPS subscription returned from NSDL into the GPF Account of the employees without adjusting Government Share and interest thereupon has been approved by the competent authority.

It is also requested that during the ensuing audits of the concerned Ministries/Department of Government of India and their attached/subordinate office, the issue raised in the draft para may be reviewed and examined to ensure compliance of the orders of DoPT and deposition of government share, returned from NSDL relating to NPS schemes, into the government exchequer.

--
Regards

Asstt. Admn. Officer
Western Region Wing
O/o the CAG of India,
New Delhi
Ext No. 7223

व.उप-महालेखाकार (प्र.) सचिवालय में प्राप्त
29 DEC 2022
Received Sr. Dy. Accountant General (Admn.) Secretariat
क्र./No. 9A6A/CAG/630



एकुलैव कुटुम्बकम्
ONE EARTH - ONE FAMILY - ONE FUTURE

75
Azadi Ka
Amrit Mahotsav

AG/CAG-107
29/12/22

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Azadi Ka
Amrit Mahotsav



वसुधैव कुटुम्बकम्
ONE EARTH • ONE FAMILY • ONE FUTURE

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Regards

Asstt. Admn. Officer
Western Region Wing
O/o the CAG of India,
New Delhi
Ext No. 7223

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Azadi Ka
Amrit Mahotsav



वसुधैव कुटुम्बकम्
ONE EARTH • ONE FAMILY • ONE FUTURE

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Draft Para
Central Public Works Department
MINISTRY OF HOUSING AND URBAN AFFAIRS

Recovery of ₹19.62 lakh at the instance of Audit.

CPWD credited entire amount of NPS subscription returned from NSDL into the employees GPF Account of the employees without adjusting Government Share and interest thereupon.

As per the provisions of the Casual Labourers (Grant of Temporary Status and Regularization) Scheme (the scheme) of Government of India (GoI), 1993, casual labourers who had rendered service for a continuous period of one year or more were granted temporary status with effect from September 1993. After rendering three years' continuous service subsequent to conferment of temporary status, the casual labourers would be treated on par with temporary Group 'D' employees for the purpose of contribution to the General Provident Fund (GPF). This scheme was circulated (January 1994) by O/o Director General (Works) for the Central Public Works Department (CPWD) (the Directorate). Subsequently, the Scheme was reviewed (April 2004) in the light of introduction of New Pension Scheme (now National Pension System (NPS)) and it was communicated (26 April 2004) that no further deductions towards GPF of such employees would be effected w.e.f. 01 January 2004, onwards and the amount lying in their GPF accounts, including deductions made after 01 January 2004 shall be paid to them as there was no provision of GPF in the NPS. Later on, orders were issued (March 2011) by the Directorate to regularize such employees. After their regularization, these employees were brought under NPS.

The Office Memorandum (16 Apr 2004) was quashed by various benches of Central Administrative Tribunal/Hon'ble High Courts, who decided that the scheme could not be modified retrospectively. The Special Leave Petitions (SLP) filed by the Government of India were also dismissed by the Apex Court. Consequently, it was decided that the casual labourers who had been granted temporary status under the scheme and had completed three years of continuous service after that, would be entitled to contribute towards GPF. Such employees of CPWD were, thus again permitted (March 2016) to subscribe under GPF Rules. The Central Pension Accounting Office (CPAO), Department of Expenditure, Ministry of Finance has directed (July 2018) that National Securities Depository Limited (NSDL) may be requested by the concerned Pay & Accounts Offices to deposit the NPS subscriptions, Government Contribution plus interest thereon into the Government Account.

During the audit of Electrical Division-16 of CPWD (July 2018) it was observed that in three cases the entire amount returned by NSDL, in pursuance of directions of CPAO, had been transferred into the GPF accounts of the concerned employees. Since 50 per cent contribution under NPS was made by the Government of India as the employers' contribution, the employees should have been entitled to their share of contribution and entitled interest only. The observation of erroneous credits of NPS to the GPF accounts was brought to the notice of the Division by Audit.

In this regard CPWD was requested to make available the details of such employees in other divisions of CPWD also, however, despite reminders, information in respect of only eight such employees of five other Divisions were provided. Out of the 11 cases, NSDL had returned the balance of nine employees to the concerned divisions. It was

noticed that in all the nine cases the entire amount was transferred to the GPF accounts of the employees without deducting the share of government contribution (Annexure).

In response to the audit observations, CPWD has replied that the GPF accounts of the employees has been recast and the interest has been calculated as per the prevailing rates of GPF for credit to the respective GPF accounts. The excess credit of ₹14.86 lakh (Annexure) in seven cases has been transferred into the Government accounts as prescribed by CPAO.

It was further observed that in two cases¹ the Divisions had transfer entire amount, received from NSDL, into the GPF accounts without adjusting government share and interest thereupon, i.e., ₹3,40,703 and ₹3,38,566 respectively, which had been withdrawn by the employees in excess of their share. However, on being pointed out by Audit, the respective Divisions had recovered the excess withdrawal from the employees with penal interest of ₹0.44 lakh and ₹0.25 lakh respectively and credited into the Government accounts.

Since due diligence had not been carried out, excess amounts get credited to the GPF accounts of the employees and liability of the Government of India also increased by such amount. It is evident that in the nine cases ₹19.62 lakh, including penal interest of ₹0.69 lakh erroneously deposited into the GPF accounts, had been recovered and transferred to the Government account at the instance of Audit. In spite of reminders to the Chief Engineers/CPWD to make available details of employees in other divisions whose GPF accounts have been erroneously credited, covered under the scheme, no information has been received since last three years.

The issue was brought to the notice of the Directorate/CPWD (July 2019) and Ministry of Housing and Urban Affairs (February 2022). However, the reply was still awaited (May 2022).

¹ Hindon Central Electrical Division, Ghaziabad and Parliament House Civil Works Div., 36 GRG Road

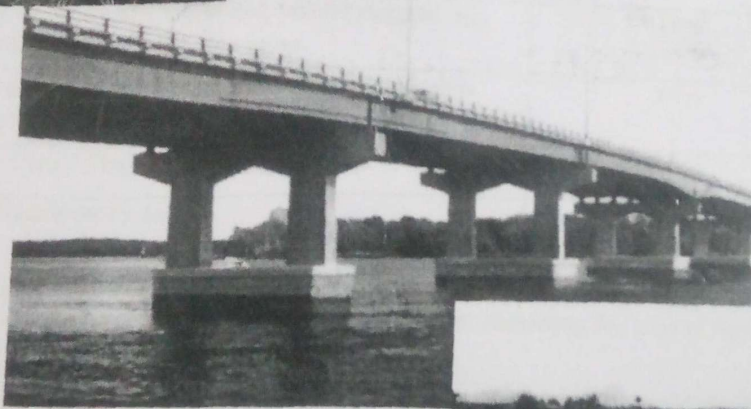
Annexure
(Amount in ₹)

S. No.	Name of the Division and number of employees in brackets	Employee Contribution	Gol Contribution	Total contribution	Amount returned by NSDL and deposited in GPF	Actual amount which was deposited in GPF A/c of the employee	Excess amount deposited in GPF account of employee	Amount recovered
1.	ED-16, Vidyt Bhawan	115283	115283	230566	340548	140027	200521	200521
2.	(3)	115283	115283	230566	340548	140027	200521	200521
3.		117542	117542	235084	341890	143100	198790	198790
4.	Parliament Annexe	115990	115990	231980	331522	141523	189999	189999
5.	Elect. Works Div., 36	116001	116001	232002	331562	141539	190023	190023
6.	GRG Road (3)	115762	115762	231524	331562	141184	190378	190378
7.	Parliament Library	187475	187475	374950	555370	239972	315398	315398
8.	Elect. Works Div.(1)							
	Hindon Central	112937	112937	225874	340703	136996	203707	247821
	Electrical Division, Ghaziabad (1)							(including penal interest)
9.	Parliament House Civil Works Div., 36 GRG	110790	110790	221580	338566	134813	203748	228821
	Road (1)							(including penal interest)
							18,93,085	19,62,272



Govt. Of Maharashtra Public Works Department

Schedule of Rates 2018-19



**For State of Maharashtra
(w.e.f. 19/09/2018)**

- f) Printed outputs of SCADA system shall be attached with the Bills. If such results are not attached or if it is found that SCADA system is not used without prior permission of concerned Superintending Engineer, the penalty of 10% of final rate of the respective item, should be levied to contractor and shall be deducted from his RA/ final bill.
- g) Use of Geo textiles, for strengthening the soil is work of special techniques requiring precise use of materials and skilled supervision. Use of Geo textiles in soil stabilization may be included in estimate only after the prior permission of the Chief Engineer.
- h) As far as possible, use of Cold mix items shall be discouraged. However, if found necessary, Rate Analysis For cold mix item with seal coat shall be prepared separately by the Superintending Engineer of that particular District.
- i) For cost towards procurement and temporary storage of water for construction purpose necessary provisions are made in Rate Abstract.
- j) Machinery hire charges rates are as per market rates and rates of Irrigation Department.
- k) Superintending Engineer shall decide reduced task rates for Items required for diversion, wherever diversion is required.

- xxi)** The rates of various Concrete and BT items are inclusive of SCADA. SCADA is compulsarily adopted to the various works as per Govt. circular. However where it is not possible to use/adopt SCADA due to not availability of internet network or in case of small works, Misc. works, Repair works the rate shall be deducted from basic SSR rates. The amount to be deducted for concrete items shall be Rs. 117.00 per cum and for BT item shall be Rs. 57.00 per cum and the amount shall be converted per Sqm respectively. The permission of not adopting SCADA shall be obtained from the Superintending Engineer or Chief Engineer who is the Competent Authority to accord Technical Sanction prior to execution or at the time of sanction of estimate as the case may be.
- xxii)** For RCC / PQC items involving modified type of curing, the basic rate of such items shall be increased by 5% to consider cost of curing compound.
- xxiii)** For built up drain, the basic rate of item shall be increased as mentioned for foul conditions (i.e. Point No. (x) Page No. 4 of this general note)
- xxiv)** The DPR and estimate must certify on quarry chart that
- a) Quarries selected have sufficient quantity of required of specific quality needed.
 - b) That shortest lead has been considered while preparing the estimates.
- xxv)** For murum & earth, lead from nearby farms / private lands shall not be taken. It should be taken from approved quarries only.
- xxvi)** The rates of sand shall be average of the sand sale rates of last five years obtained from respective District Collector. Also the rates of items shall be in two parts i.e. 1) small works requiring sand upto 10Cum & 2) works requiring sand more than 10 Cum.
- xxvii)** Manufactured sand/ Crushed sand shall be used for work if natural sand is not available. However, in such cases the job mix design shall be get done before use wherever required.
- xxviii)** New items included in last year SSR shall be encouraged & used on pilot basis.

सार्वजनिक बांधकाम विभागाच्या ई निविदा प्रक्रियेअंतर्गत निविदा प्रसिध्दी, निविदा लिफाफे उघडणे आणि निविदा तपासणी व स्विकृतीबाबत १ वर्ष अभ्यासाअंती प्राप्त निविदा, अभिप्राय, सूचना व अडचणी विचारात घेऊन दि.१२/४/२०१७ च्या शासन निर्णयाच्या अनुषंगाने एकत्रित सुधारित सूचना

महाराष्ट्र शासन

सार्वजनिक बांधकाम विभाग

शासन निर्णय, क्रमांक : सीएटी/२०१७/प्र क्र ०८/इमा-२

मंत्रालय, मुंबई ४०० ०३२.

दिनांक : २७/०९/२०१८

- वाचा : (१) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्रमांक : सीएटी/२०१७/प्र.क्र.८/इमा-२, दिनांक १२ एप्रिल, २०१७
- (२) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्रमांक : सीएटी/२०१७/प्र.क्र.८/इमा-२, दिनांक २९ जून, २०१७
- (३) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्रमांक : सीएटी/२०१७/प्र.क्र.८/इमा-२, दिनांक २७ जुलै, २०१७
- (४) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्रमांक : संकीर्ण-२०१७/सीआर-१२१ (भाग-२)/इमा-२, दिनांक १९ सप्टेंबर, २०१७
- (५) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्रमांक : संकीर्ण-२०१७/सीआर-१२१ (भाग-२)/इमा-२, दिनांक २३ सप्टेंबर, २०१७
- (६) सार्वजनिक बांधकाम विभागाचे पत्र क्र.संकीर्ण-२०१७/सीआर-१२१ (भाग-२)/इमा-२ दिनांक ४ सप्टेंबर, २०१८
- (७) सार्वजनिक बांधकाम विभाग, शासन निर्णय क्रमांक-सीएटी-२०१८/प्र.क्र.१८/इमा-२, दिनांक ७ फेब्रुवारी, २०१८
- (८) सार्वजनिक बांधकाम विभाग, शासन निर्णय क्रमांक-सीएटी-२०१७/प्र.क्र.८/इमा२, दिनांक २४ मे, २०१८

प्रस्तावना:-

सार्वजनिक बांधकाम विभागामध्ये रस्ते, पूल बांधकाम, परिरक्षण व दुरुस्ती तसेच इमारती बांधकाम परिरक्षण व दुरुस्तीच्या अनुषंगाने विविध प्रकारच्या निविदा मागविताना व सक्षम स्तरावर स्विकृती करून काम करण्याबाबत विविध सूचना यापूर्वी शासनाने निर्गमित केलेल्या आहेत. या सर्व सूचना निरनिराळ्या शासन निर्णयाद्वारे यापूर्वीच निर्गमित करण्यात आल्या असल्यातरी देखील शासनाकडे प्राप्त होणाऱ्या निविदेमधील छाननी व तदनुषंगाने प्रधान सचिव तसेच अपर मुख्य सचिव (वित्त विभाग) यांचेकडे झालेल्या बैठकीमध्ये निविदांच्या तपासणीमध्ये उद्भवलेल्या अडचणी विचारात घेऊन संपूर्ण प्रक्रियेचा एकात्मिक विचार करून जुन्या सर्व सूचना अधिक्रमित करून निविदा विषयक कामकाजासाठी नव्याने सुधारित सूचना निर्गमित करणे क्रमप्राप्त ठरले आहे. या अनुषंगाने या सर्व प्रकरणी शासन स्तरावरही सखोल अभ्यासाअंती या सर्व बाबींचा सर्वकष अभ्यास करून खालील बाबींवर एकत्रित सूचना या शासन निर्णयाद्वारे प्रसृत करण्यात येत आहेत :-

- (१) सार्वजनिक बांधकाम विभागातील प्रस्तावांना प्रशासकीय मान्यता प्राप्त झाल्यानंतर तांत्रिक मंजूरी प्रदान करणे व निविदा सूचना प्रसिध्द करणेपर्यंत कालावधी निश्चित करणे.
- (२) ई निविदा प्रसिध्दी
- (३) ई निविदा प्रसिध्दी कालावधी
- (४) ई निविदा उघडण्यापूर्वी निविदा प्राधिकार्याने करावयाची कार्यवाही
- (५) ई निविदा उघडतांना निविदा प्राधिकार्याने करावयाची कार्यवाही
- (६) ई निविदा स्विकृती

रस्ते, पूल व इमारतींची नवीन बांधकामे, व्यवस्थापन, नियोजन, संकलन, दुरुस्ती, अन्वेषण यासाठी नियुक्त करावयाच्या सल्लागारांच्या निविदा विषयक आदेश या निर्णयात अंतर्भूत नाहीत. त्यासाठी स्वतंत्र शासन निर्णय निर्गमित करण्यात आला आहे.

शासन निर्णय :-

शासनाची विविध कामे सार्वजनिक बांधकाम विभागाकडून शीघ्रगतीने व्हावी यासाठी यापूर्वीपासूनच रु.३.०० लक्ष रकमेवरील कामांकरीता दि.२६/११/२०१४ पासून ई निविदेचा अवलंब करण्यात येत आहे. याबाबत वर संदर्भात नमूद केलेले शासन निर्णय/परिपत्रके अधिक्रमित करुन उपरोक्त मुद्यांबाबत खालीलप्रमाणे सुधारित आदेश निर्गमित करण्यात येत आहेत.

१. सार्वजनिक बांधकाम विभागांतर्गत प्रकल्पांना प्रशासकीय मान्यता प्राप्त झाल्यानंतर निविदेच्या अनुषंगाने क्षेत्रीय स्तरावरील कार्यालयीन बाबींची कार्यपध्दती -

क्षेत्रीय स्तरावरील कार्यालयीन बाबींची कार्यपध्दती (कमाल कालावधी दिवस)							
अ.क्र.	क्षेत्रीय स्तरावर कार्यवाहीच्या बाबी	स्तर व कालावधी				शेरा	
		उपविभाग	विभाग	मंडळ	प्रादेशिक विभाग		
१	प्रादेशिक स्तरावर प्रशासकीय मान्यता प्रदान करण्यासाठी नकाशे व अंदाजपत्रके तयार करणे	७	३	२	५	वरील मर्यादेत मंडळ अथवा प्रादेशिक स्तरावर धारिका अंतिम करणे आवश्यक राहिल.	
२	शासन स्तरावरील प्रशासकीय मान्यता प्राप्त करण्यासाठी नकाशे व अंदाजपत्रके तयार करणे	१५	३	२	५		

क्षेत्रीय स्तरावरील कार्यलयीन बाबींची कार्यपध्दती (कमाल कालावधी दिवस)							
अ.क्र.		क्षेत्रीय स्तरावर कार्यवाहीच्या बाबी	स्तर व कालावधी				शेरा
			उपविभाग	विभाग	मंडळ	प्रादेशिक विभाग	
३		योजनांतर्गत/योजनेतर कामास प्रशासकीय मान्यता/जॉब क्रमांक प्राप्त झाल्यानंतर सविस्तर नकाशे व दरपत्रक तयार करण्याचा कालावधी (सर्वेक्षण, पाया तपासणी, चाचणी करणे इत्यादी) सर्व बाबी समाविष्ट करून सविस्तर नकाशावर आधारीत सविस्तर अंदाजपत्रक					एका शाखा अभियंत्याकडे किमान ५० कि.मी. लांबी देखभाल व दुरुस्तीसाठी गृहित धरून ५ अंदाजपत्रके ७ दिवसात तयार करणे आवश्यक आहे.
	i)	रस्त्यांची अंदाजपत्रके	७	१	१	१	
		अ) देखभाल व दुरुस्ती AMC	७	१	१	१	
		ब) मजबुतीकरण व डांबरीकरण	१५	१	१	१	
		क) नूतनीकरण	७	१	१	१	
		ड) नाविन्यपूर्ण कामे	१५	२	२	२	
	ii)	पूलांची अंदाजपत्रके	१५	१	१	१	संकल्पचित्र मंडळाकडून GAD प्राप्त झाल्यानंतर
		अ) ६० मीटर पर्यंतचे छोटे पूल	१५	१	१	१	
		ब) ६० मी. ते २५० मी. लांबीचे पूल	१५	३	३	२	संकल्पचित्र मंडळाकडून GAD प्राप्त झाल्यानंतर
		क) २५० मी. ते ५०० मी. लांबीचे पूल	२५	३	३	२	संकल्पचित्र मंडळाकडून GAD प्राप्त झाल्यानंतर
		ड) ५०० मी. पेक्षा जास्त लांबीचे पूल	६०	३	५	२	संकल्पचित्र मंडळाकडून GAD प्राप्त झाल्यानंतर
		इ) पूलांची नाविन्यपूर्ण कामे	३०	२	१	१	संकल्पचित्र मंडळाकडून GAD प्राप्त झाल्यानंतर
		ई) पूल दुरुस्ती	१५	१	१	१	
		फ) तंत्र/तांत्रिक सल्लागार सेल	७	१	१	१	
	iii)	इमारतीचे अंदाजपत्रके					
		अ) (१०० चौ.मी.) पर्यंत	१०	३	३	२	
		ब) (१०० चौ.मी. ते ५००० चौ.मी.)	१५	३	३	३	

क्षेत्रिय स्तरावरील कार्यलयीन बाबींची कार्यपध्दती (कमाल कालावधी दिवस)							
अ.क्र.	क्षेत्रिय स्तरावर कार्यवाहीच्या बाबी	स्तर व कालावधी				शेरा	
		उपविभाग	विभाग	मंडळ	प्रादेशिक विभाग		
	क) (१५००० चौ.मी. पेक्षा जास्त व ५ मजल्यापेक्षा जास्त)	२५	३	५	२		
	ड) इमारतीची दुरुस्ती	७	१	१	१		
	इ) इमारतीची नाविन्यपूर्ण कामे/ हेरिटेज कामे	१५	१	१	१		
	ई) तज्ञ/ तांत्रिक सल्लागार सेल नियुक्तीची अंदाजपत्रके	७	१	१	१		
	फ) अन्य सेवा/ उपकरणे विषयक अंदाजपत्रके	७	१	१	१		
४	सविस्तर नकाशे व अंदाजपत्रक तपासणी तांत्रिक मंजूरी देणे (आवश्यक दुरुस्तीसह)	१	२	२	२	कामाची किंमत वाढवल्यास रस्ते लांबीचा वाव कमी करून पूल व इमारती प्रकल्प नव्याने प्रशासकीय मान्यतेसाठी सादर करणे व नवीन प्रशासकीय मान्यता प्राप्त झाल्यानंतर तांत्रिक मान्यतेची कार्यवाही अपेक्षित आहे.	
५	तांत्रिक मंजूरी प्राप्त नकाशे व अंदाजपत्रकवर प्रारूप निविदा तयार करणे व त्यास मंजूरी देऊन निविदा प्रसिध्दीची कार्यवाही करणे.	१	२	२	२		
६	प्रारूप निविदा मसूदा मंजूरी मिळाल्यानंतर कामाच्या निविदा मागविणे	१	१	०	०		
७	निविदा कालावधी	शासन परिपत्रक १२/०४/२०१७ प्रमाणे					
८	निविदा पूर्व बैठकीतील मुद्द्याचे निराकरण व CSD मंजूर करून Upload करणे	०	२	२	२		

क्षेत्रीय स्तरावरील कार्यलयीन बाबींची कार्यपद्धती (कमाल कालावधी दिवस)							
अ.क्र.	क्षेत्रीय स्तरावर कार्यवाहीच्या बाबी	स्तर व कालावधी				शेरा	
		उपविभाग	विभाग	मंडळ	प्रादेशिक विभाग		
९	निविदा लिफाफा क्र.१ उघडणे व छाननी अंतिम करणे	०	७	७	०		
१०	निविदा लिफाफा क्र.२ उघडणे व सक्षम स्तरावर निविदा मंजूरीस्तव सादर करणे	०	३	३	२		
११	प्राप्त निविदा छाननीनंतर सक्षम स्तरावर मंजूर करणे	०	२	३	५	मुख्य अभियंता यांनी शासन स्तरावर निविदा त्वरीत कार्यवाहीकरीता सादर करावी.	
१२	मंजूर निविदेच्या कंत्राटदाराचे प्रतिभूती खर्च प्राप्त झाल्यावर कार्यारंभ आदेश निर्गमित करणे	०	१	१	१		
१३	निविदेच्या २५ % कामातील २५% इतके काम न झाल्यास नोटीस देणे	१	१	१	०		
१४	निविदेच्या ५० % कामातील ५०% इतके काम झाल्यास नुकसान भरपाई	१	१	१	०		
१५	कंत्राटदार दर्जेदार काम करत नसल्यास कारवाई करून निविदा रद्द करणे	०	७	७	०	कंत्राटदारास नोटीस दिल्यास ही कारवाई करणे अपेक्षित आहे.	
१६	कामाचा दर्जा तपासणी करून योग्य असल्यास २५ % काम २५ % मुदतीत झाल्यास प्रथम देयक कंत्राटदाराने सादर केल्यास अदा करणे	१	१	०	०	ही कार्यवाही निधी उपलब्धतेच्या अधीन राहून करावी.	
१७	कामाचा दर्जा योग्य असल्यास प्रथम देयकानंतरची पुढील देयके नियमितरित्या तपासून मंजूर करावे	२	२	०	०	निधी उपलब्ध झाल्यास देयक पारीत करून ठेवण्यासाठी ही मुदत आहे. (देयक प्राप्त झाल्यानंतर)	

क्षेत्रिय स्तरावरील कार्यलयीन बाबींची कार्यपध्दती (कमाल कालावधी दिवस)							
अ.क्र.		क्षेत्रिय स्तरावर कार्यवाहीच्या बाबी	स्तर व कालावधी				शेरा
			उपविभाग	विभाग	मंडळ	प्रादेशिक विभाग	
१८		निविदा व अंतिम देयके सादर करावे.	१५	१५	०	०	अंतिम देयकाबाबतीत ज्यांच्या कालावधीत काम पूर्ण झाले आहे ते संबंधीत अधिकारी जबाबदार राहतील.
१९		निधी उपलब्ध असल्यास देयक अदा करणे	२	२	०	०	
२०		निधी उपलब्ध नसल्यास अंतिम देयक पारित करणे	२	२	०	०	
२१		अंतिम देयक पारित केल्यानंतर S.D. परत करणे	१	१	०	०	
२२		कंत्राटातील देखभाल दुरुस्ती नियमित DLP नुसार करणे व अभिलेख ठेवणे व कंत्राटदारास कळविणे	१५	७	२	०	अंतिम देयक अदा केल्यानंतर विहित मुदतीत करावयाची कार्यवाही
	i)	काम निर्धारित दर्जाचे करणे	२	२	०	०	
	ii)	काम साधारण करणे	२	२	०	०	
	iii)	कामाची दुरुस्ती...	३	३	०	०	
२३		DLP मध्ये काम खराब झाल्यास कंत्राटदारास नोटीस देणेची कारवाई करणे	३	३	०	०	
२४		कामाचे Barchart ABC तयार करुन अभिलेख ठेवणे (Record Keeping)	३०	३०	५	०	अधीक्षक अभियंता यांनी ६० मीटर पेक्षा मोठा पूल व २५०० चौमी पेक्षा जास्त इमारतीचे अभिलेख तयार करुन अंतिम करणे अपेक्षित आहे.

२. ई निविदा प्रसिध्दी

सार्वजनिक बांधकाम विभागांतर्गत शासनाच्या विविध विभागांची तसेच सार्वजनिक बांधकाम विभागाच्या अधिपत्याखालील रस्ते, पूल, इमारत व इतर अनुषंगिक बांधकामे व अस्तित्वात असलेल्या रस्ते, पूल व इमारतींची दुरुस्ती करण्यात येते. सध्याच्या पध्दतीमध्ये रु.३.०० लक्ष रकमेवरील कामे ई निविदा सूचना प्रसिध्द करून, प्राप्त निविदेतील निम्नस्तर निविदाकारास/कंत्राटदारास त्याची ई निविदा स्विकृती करून कार्यारंभ आदेश ई निविदेतील विहित मुदतीत कामे करण्याच्या अटींसह देण्यात येतो. या सर्व कामांच्या निविदा मागविण्यासाठी शासनाने यापूर्वी संदर्भाधीन शासन निर्णय / परिपत्रकाद्वारे सूचना निर्गमित केलेल्या आहेत. आता पूर्वीच्या सर्व सूचना अधिक्रमित करून नव्याने खालीलप्रमाणे एकत्रित सूचना निर्गमित करण्यात येत आहेत :-

१.१ रु.३.०० लक्षच्या आतील कामांसाठी वृत्तपत्रातून जाहिरात देऊन खरेदी करण्याची अथवा निविदा मागविण्याची आवश्यकता नाही. अशा छोट्या कामांसाठी कार्यकारी अभियंता व अधीक्षक अभियंता यांच्या नोटीस बोर्डवर निविदा सूचना मराठी व इंग्रजी भाषेतून प्रसिध्द करण्यात यावी व प्रथम सूचनेसाठी आठ दिवस व त्यास प्रतिसाद न मिळाल्यास द्वितीय सूचनेसाठी तीन दिवस एवढा कालावधी ठेवण्यात यावा. सामान्य प्रशासन विभागाच्या विहित मार्गदर्शक सूचनांप्रमाणे ज्या वृत्तपत्रात निविदा प्रसिध्द करावयाच्या आहेत, त्यांचा स्तर खालील तक्त्याप्रमाणे असावा :-

अ.क्र.	कामाची किंमत	प्रसिध्दीचा स्तर		
		जिल्हा स्तर	राज्य स्तर	राष्ट्रीय स्तर
१.	रु. ३ लक्ष ते रु. ५० लक्ष	मराठी (१ वृत्तपत्र)	मराठी (१ वृत्तपत्र) इंग्रजी (१ वृत्तपत्र)	
२.	रु. ५० लक्ष ते २५ कोटी	मराठी (१ वृत्तपत्र)	मराठी (२ वृत्तपत्र) हिंदी (१ वृत्तपत्र)	इंग्रजी (२ वृत्तपत्र) हिंदी (१ वृत्तपत्र)
३.	रु. २५ कोटी आणि त्यावरील	मराठी (२ वृत्तपत्रे)	मराठी (२ वृत्तपत्रे) इंग्रजी (२ वृत्तपत्रे) हिंदी (१ वृत्तपत्र)	इंग्रजी (२ वृत्तपत्रे) हिंदी (२ वृत्तपत्रे)
४.	रु. १०० कोटी	मराठी (२ वृत्तपत्रे) इंग्रजी (२ वृत्तपत्रे)	मराठी (२ वृत्तपत्रे) इंग्रजी (२ वृत्तपत्रे) हिंदी (२ वृत्तपत्रे)	इंग्रजी (२ वृत्तपत्रे) हिंदी (२ वृत्तपत्रे)

टिप : ज्या जिल्ह्यातील काम आहे, त्या जिल्ह्यातील wide circulation (सर्वात जास्त प्रमाणात प्रसिध्द होणारी) असणाऱ्या महत्वाच्या वृत्तपत्रात जाहिराती प्रसिध्द करणे महासंचालक (प्रसिध्दी) यांना अनिवार्य राहिल. वृत्तपत्रात द्यावयाची जाहिरात ही प्रपत्र-१ मध्ये नमूद विहित नमून्यात असावी. यात कुठलाही बदल करण्यात येऊ नये. जाहिरातींची प्रसिध्दी तातडीने होणे आवश्यक असल्यास संबंधित कार्यकारी अभियंता यांनी उपसंचालक, (प्रसिध्दी)/संचालक/महासंचालक, माहिती संचालनालय यांचेशी व्यक्तीशः संपर्क साधून तीन दिवसांचे आत निविदा प्रसिध्द होतील असे पहावे. प्रसिध्दी संचालनालयाकडून याबाबत काही हरकत घेतल्यास त्याचे तात्काळ निराकरण करण्यासाठी सचिव (बांधकामे)/सचिव (रस्ते) आणि अथवा प्रधान सचिव (सा.बां.) यांचेशी तात्काळ संपर्क साधून सूचना प्रसिध्दीबाबत हयगय होणार नाही याकडे लक्ष द्यावे. निविदा सूचना प्रसिध्दी पत्रात प्रसिध्दी विभागाकडे पाठविल्यानंतर तीन दिवसांचे आत ई निविदा प्रसिध्द झाली नाही तर त्याची कारणे अभिलेखावर ठेवण्यात यावी. ज्या वृत्तपत्रात निविदा सूचना प्रसिध्द झाली आहे ते वृत्तपत्र संबंधित कार्यकारी अभियंता व अधीक्षक अभियंता यांनी निविदा धारिकेस जोडावे. निविदा प्रसिध्द झालेले संपूर्ण वृत्तपत्र (फक्त कात्रण नव्हे) निविदा धारिकेवर उपलब्ध झाले नाही तर निविदा स्विकृत करणाऱ्या सक्षम प्राधिकाऱ्यांनी ही बाब धारिकेवर ठेवावी.

१.२ ई निविदा प्रसिध्दी यापूढे mahatenders.in या NIC च्या व शासनाने विशिष्ट आदेश दिल्यास योग्य त्या web portal वर प्रसिध्द कराव्यात. केंद्र शासनाने मंजूर केलेल्या कामांसाठी केंद्र शासनाच्या प्रसिध्दी निकषांचे अनुपालन करावे.

२. ई निविदा प्रसिध्दीचा कालावधी

२.१ निविदा प्रसिध्दीचा किमान कालावधी खालील तक्त्यात दिल्याप्रमाणे असावा :-

अ.क्र.	कामाची किंमत	प्रथम वेळ	द्वितीय वेळ	तृतीय वेळ
१.	रु. ३ लक्ष ते रु. ५० लक्ष	१५ दिवस	१० दिवस	७ दिवस
२.	रु. ५० लक्ष ते रु. २५ कोटी	२५ दिवस	१५ दिवस	१० दिवस
३.	रु. २५ कोटी ते १०० कोटी	२५ दिवस	२५ दिवस	१५ दिवस
४.	रु. १०० कोटी आणि त्यावरील फिडीक/SBD	४५ दिवस	३० दिवस	१५ दिवस

टिप:- प्रस्तुतचे दिवस हे सुट्टीसह असल्याने कालावधीमध्ये कार्यालयीन दिवसांसह सुट्ट्या अंतर्भुत आहेत.

- १) निविदा प्रसिध्दीचा प्रथम प्रसिध्दी कालावधी काही कारणास्तव कमी करावयाचा झाल्यास तसा प्रस्ताव सा.बां.विभागाच्या मुख्य अभियंत्यांनी विषयानुरूप सचिव (रस्ते)/ सचिव (बांधकामे) यांचेकडे पाठवावा व पूर्वमान्यता घ्यावी. मात्र किमान कालावधी ७ दिवस इतका राहिल.
- २) अतिमहत्वाच्या जसे की हेलीपॅड, निवडणूक विषयक कामे, मा.राज्यपाल तसेच अन्य अति महत्वाच्या व्यक्तींच्या दौ-यासंदर्भात अन्य कामे व जनजाती क्षेत्रातील रु.१ कोटी पर्यंत कामांचा निविदा प्रसिध्दीचा कालावधी ३ दिवस इतका राहिल.

२.२ निविदा प्रारूप व त्यातील सर्वसाधारण अटी

रु.१५ कोटी पर्यंतच्या रकमेच्या निविदा ब-१ (percentage rate) नमुन्यात मागविण्यात याव्यात व रु. १५ कोटी पेक्षा जास्त रकमेच्या निविदा SBD नमुन्यात मागविण्यात याव्यात.

पुलांच्या कामाच्या बाबतीत पाया निश्चित नसल्यास अशा पुलांच्या निविदा EPC/सुधारीत C (क) नमुन्यावर मागविण्यात याव्यात. रु.५० कोटीवरील इमारतींच्या कामांच्या निविदा EPC निविदा नमुन्यावर मागवाव्यात. ROB ची कामे EPC निविदा नमुन्यावर मागवावीत. हे सर्व निविदा नमुने स्वतंत्र पत्राने क्षेत्रीय अधिका-यांना उपलब्ध करण्यात येतील.

२.३ प्रारूप निविदा मंजूरीचे अधिकार :

निविदा प्रारूप मंजूरीचे अधिकार खालीलप्रमाणे प्रदान करण्यात येत आहेत :-

कार्यकारी अभियंता	:	रु. १ कोटी पर्यंत किंमतीच्या निविदा
अधीक्षक अभियंता	:	रु. १ कोटीपेक्षा जास्त ते रु.२.५० कोटी पर्यंतच्या किंमतीच्या निविदा
मुख्य अभियंता	:	रु.२.५० कोटी वरील सर्व किंमतीच्या निविदा

२.४ प्रारूप निविदा प्रपत्रामध्ये सुधारणा करणे.

१. निविदा सूचना प्रसिध्द करण्या पुर्वी प्रारूप निविदा प्रपत्र, सक्षम अधिका-यांकडून मंजूरी प्राप्त करून घेण्यात याव्यात.

२. प्रसिध्द केलेल्या निविदेतील अथवा निविदा सूचनेतील कोणत्याही बाबीत बदल करण्यात येऊ नयेत. बदल करणे अत्यावश्यक असल्यास खालील तक्त्यात दर्शविलेल्या सक्षम अधिका-यांच्या पूर्वमंजूरीनेच करण्यात यावेत, याची दक्षता घ्यावी. तसेच, अशी मंजूरी प्रदान करतानाची कारणे website वर ठळकपणे प्रसिध्द करावीत.

अ.क्र.	निविदा स्विकृतीचे अधिकार	मंजूरी प्रदान करणारे सक्षम अधिकारी
१.	कार्यकारी अभियंता	संबंधीत अधीक्षक अभियंता
२.	अधीक्षक अभियंता	संबंधीत मुख्य अभियंता
३.	मुख्य अभियंता	मुख्य अभियंता

२.५ निविदा पूर्व बैठक रु.१.५० कोटीपेक्षा जास्त रकमेच्या निविदांकरीता आयोजित करण्यात यावी.

अ.क्र.	मुद्दा	सुधारित कार्यपद्धती
१.	निविदा पूर्व बैठक	निविदा पूर्व बैठक निविदा सादर करावयाच्या अंतिम दिनांकाच्या कमीत कमी ७ दिवस अगोदर घेणे आवश्यक आहे.
२.	सी.एस.डी.(Common Set of Deviations) निर्गमित करणे	निविदा पुर्व बैठकी नंतर शक्य तितक्या लवकर सक्षम प्राधिकारीच्या मान्यतेने सी.एस.डी. (Common Set of Deviations) निर्गमित करावी. तसेच, सदर सी.एस.डी. (Common Set of Deviations) हा निविदेचा भाग राहील.

शासनाच्या असे निदर्शनास आले आहे की काही वेळा निविदा पूर्व बैठकीस प्रारूप निविदा मंजूर करणाऱ्या अधिकाऱ्यांऐवजी निम्नस्तरीय अधिकारी उपस्थित राहतात. या शासन निर्णयाद्वारे सूचित करण्यात येते की, निविदा पूर्व बैठकीस प्रारूप निविदा मंजूर करणाऱ्या अधिकाऱ्यांनी उपस्थित रहाणे अनिवार्य राहिल, जेणेकरून बैठकीत उपस्थित होणाऱ्या मुद्यांबाबत सक्षम प्राधिका-याकडून त्वरीत शंका निरसन / निर्णय होऊ शकेल.

२.६ निविदा सादर करावयाचे कार्यालय

१. रु. १ कोटी पर्यंत किंमतीच्या निविदा	कार्यकारी अभियंता कार्यालय
२. रु. १ कोटी पेक्षा जास्त किंमतीच्या सर्व निविदा	अधीक्षक अभियंता कार्यालय

ई-निविदा पोर्टलवर निविदाबाबत “बीड लॉक” झाल्यानंतर कंत्राटदारांसाठी निविदा सादर करावयाच्या वेळेपासून ७२ तासात एका प्रतीत हार्ड कॉपी खालीलपैकी कोणत्याही एका ठिकाणी सादर करणे अनिवार्य आहे.

- १) संबंधीत कार्यकारी अभियंता यांचे कार्यालय
- २) मुख्य अभियंता यांनी नामनिर्देशीत केलेल्या संलग्न कार्यकारी अभियंता यांचे कार्यालय
- ३) संबंधीत अधीक्षक अभियंता यांचे कार्यालय
- ४) संबंधीत मुख्य अभियंता यांचे कार्यालय

त्यानुसार लिफाफा क्र.१ उघडण्याचा दिनांक निविदा सूचनेत नमूद करण्यात यावा.

ई-निविदा प्रक्रियेमध्ये काही अडचण निर्माण झाल्यासच सदर निविदेची हार्ड कॉपी उघडण्यात यावी. परंतु कोणत्याही परिस्थितीत प्रत्यक्षात स्विकारण्यात आलेली निविदा कागदपत्रे संबंधितास निविदा उघडण्याच्या दिनांक व वेळ यांची पुर्वसूचना दिल्याशिवाय उघडण्यात येणार नाही.

२.७ इसारा रक्कम

शासनाने विहीत केलेल्या प्रमाणानुसार ज्यावेळी कंत्राटदार कामांसाठी निविदा सादर करतो त्यावेळी प्रत्येक कामासाठी स्वतंत्रपणे इसा-याची रक्कम भरणे आवश्यक आहे. इसा-याची रक्कम भरण्यास सूट मिळण्यासाठी ठेकेदारांना काही रक्कम शासनाकडे ठेवल्यावर व आवश्यक बंधपत्र पूर्ण केल्यानंतर इसारा रक्कम भरण्यापासून सूट देण्याची तरतूद यापूर्वीच रद्द करण्यात आली आहे. इसारा रक्कम online RTGS/NEFT/DD/FDR द्वारे संबंधीत कंत्राटदाराच्या बँक खात्यातून भरणे बंधनकारक राहिल.

इसारा रक्कम (Earnest Money Deposit) खालीलप्रमाणे घेण्यात यावी:-

- i) रु.१.५० कोटी रकमेपर्यंतची कामे:- निविदा रकमेच्या १ %
- ii) रु.१.५० कोटी रकमेवरील कामे :- निविदा रकमेच्या ०.५० % किंवा रु.१.५० लक्ष यापैकी जास्त असेल ती रक्कम

२.८ सुरक्षा ठेव रक्कम (Security Deposit):-

रु.१.५० कोटी पर्यंतच्या कामांकरिता निविदा रकमेच्या २ % (Rounded to next Rs.१०००)

रु.१.५० कोटी रकमेवरील कामांकरिता निविदा रकमेच्या १ % (Rounded to next Rs.१०००)

२.९ रुपये १.०० कोटी पेक्षा जास्त रकमेच्या सर्व कामांसाठी खालीलप्रमाणे पोस्ट क्वालिफिकेशन क्रायटेरियाची तरतूद निविदा प्रपत्रामध्ये ठेवण्यात यावी.

अ.	मागील ५ वर्षातील कंत्राटदाराची कमाल उलाढाल : (<i>Annual Turnover</i>)	:	देय असलेल्या कामाच्या वार्षिक किंमतीच्या कमीत कमी ७५ टक्के इतकी असावी. (वार्षिक किंमत) = (कामाची एकुण किंमत) (कामाचा कालावधी वर्षात)
ब.	मागील ५ वर्षात कंत्राटदाराने तुल्यबळ किंमतीचे किमान एक त्याच स्वरुपाचे काम पूर्ण केले असले पाहिजे त्याची कमीत कमी किंमत	:	देय कामांच्या किंमतीनुसार (प्रचलित दराने) १. रु.१ कोटी ते रु.१० कोटी : ३० % २. रु.१० कोटी पेक्षा जास्त : ६० % किंवा रु.६ कोटी यापैकी जास्त असणारी किंमत
क.	देय कामासाठी मागील ५ (पाच) वर्षांपैकी कोणत्याही एका वर्षात ज्या महत्वाच्या परिमाणाच्या बाबी करावयाच्या आहेत त्याचे कमीत कमी परिमाण	:	देय कामातील महत्वाच्या बाबींच्या परिमाणाच्या %
ड.	कंत्राटदाराची निविदा भरण्याची सक्षमता (बीड कॅपॅसिटी)	:	(अ x एन x २) - बी <i>Maximum</i> जेथे अ - गेल्या ५ (पाच) वर्षातील कमीत कमी वार्षिक उलाढाल (चालू दराने) एन - देय कामाचा कालावधी बी - हातातील कामांची किंमत (देय कामांच्या कालावधीतील)
इ.	देय कामाच्या विशिष्ट स्वरुपानुसार समकक्ष काम कंत्राटदारांनी प्रत्यक्ष केलेले असणे अनिवार्य करण्यात यावे. संबंधितांनी हे काम अन्य कंत्राटदारांकडून सबलेट (sublet) करून घेतले असल्यास त्याबद्दल संबंधित कार्यकारी अभियंता यांची लिखित परवानगी जोडणे अनिवार्य राहिल.		
उदा.	१) बहुमजली इमारतीच्या बांधकामाबाबत विशिष्ट व वेगळ्या तंत्रज्ञानाचा वापर करणे अपेक्षित असल्याने किमान तळमजला अधिक वरील काही मजले अशा स्वरुपाच्या इमारतीचे बांधकाम (वरील मजल्यांची संख्या क्षेत्रीयस्तरावर विहित करण्यात यावी.) २) पाईल फाऊंडेशनचे काम ३) पुलाच्या बांधकामाच्या नियोजित स्वरुपानुसार तशा पुलाचे बांधकाम इत्यादी.		
फ)	देय कामासाठी कंत्राटदाराकडे उपलब्ध असावयाची स्वतःच्या मालकीची यंत्रसामुग्री व प्रकल्प व्यवस्थापनाबाबतची व्यवस्था याचे निकष मुख्य अभियंता यांनी प्रत्येक प्रकरणी तपासणी करून निश्चित करावी.		

२. उलाढाल, कामाची किंमत इत्यादीची परिगणना चालू दराने करताना प्रतिवर्षी १० % वाढ विचारात घेण्यात यावी.

३. उपरोक्त (क) नुसार बाबींची निवड करताना देय कामामधील महत्वाच्या व ठळक बाबी विचारात घ्याव्यात.
४. हातातील कामांची उर्वरित किंमत बिनचूक व परिपूर्णरीत्या सादर करणे कंत्राटदारांवर बंधनकारक राहिल. तसेच, देय कामासाठी निविदा सादर केल्या नंतर पण त्यासंबंधी अंतिम निर्णय होण्यापूर्वी एखादे नवीन काम मिळाल्यास त्यासंबंधीची माहिती त्वरीत सादर करणे देखील कंत्राटदारांवर बंधनकारक राहिल. अन्यथा नियमानुसार ते यथोचित कारवाईस पात्र राहतील.
५. उपरोक्त (इ) नुसार निकष निश्चित करताना समकक्ष कामाची व्याख्या निःसंदिग्ध असण्याबाबत दक्षता घ्यावी.
६. कामाच्या करारनाम्यात पोस्ट क्वॉलिफिकेशनचा क्रायटेरिया समाविष्ट केलेला आहे, ही बाब निविदा सूचनेमध्ये स्पष्टपणे नमूद करावी.

२.९.१) पंजीकृत कंत्राटदारांबाबत सूचना :-

२.९.१:-अ) रु.१.५० कोटी पर्यंतच्या रकमेच्या निविदांकरीता कंत्राटदार नोंदणी (पंजीकृत) असण्याची अट अनिवार्य करण्यात यावी.

२.९.१:-ब) रु.१.५० कोटीपेक्षा जास्त रकमेच्या निविदांकरीता कंत्राटदार पंजीकृत असावेत. (Registered with PWD) ही अट वगळण्यात यावी.

२.९.१:-क) निविदा मागविण्यासाठी पध्दती:-

१	रस्ते बांधकाम व दुरुस्ती	रु.१५ कोटी पर्यंत	ब-१ निविदा
		रु.१५ कोटी ते ५० कोटी	SBD/EPC निविदा
		रु.५० कोटी वरील	EPC निविदा
२	पुल बांधकाम व दुरुस्ती	रु.५० कोटी पर्यंत	सुधारित -C ^० निविदा
		रु.५० कोटी पेक्षा जास्त	EPC निविदा
३	इमारती देखभाल, बांधकाम व दुरुस्ती	रु.१५ कोटी	ब-१ निविदा
		रु.१५ कोटी ते ५० कोटी	SBD निविदा
		रु.५० कोटी वरील	EPC निविदा

२.९.१:-ड) आंतरराष्ट्रीय कंत्राटदार यांची उप कंपनी भारतीय असल्यास निविदेत भाग घेण्याची अट निविदा सूचनेत समाविष्ट करावी. यास व्यापक स्तरावर प्रसिद्धी देवून तसेच प्रत्येक निविदेमध्ये सर्व कंत्राटांसाठी पात्रता निकष निश्चित करण्यात येवून सर्व निकषांप्रमाणेच कंत्राटदारांना पात्र/अपात्र ठरविण्यात यावे. तसेच अपात्रतेची कारणे संकेत स्थळावर प्रसिद्ध करून अशा अपात्र कंत्राटदारांना त्यांचे म्हणणे मांडण्याची संधी ५ दिवसांच्या कालावधीसाठी देण्यात यावी व क्षुल्लक कारणांमुळे (ज्यांचा उल्लेख ४.५.२ मध्ये नमूद केलेला आहे) कंत्राटदार अपात्र होत असेल तर तत्संबंधी आवश्यक त्या निकषांची पूर्तता या निर्धारित कालावधीत त्यांनी केल्यास त्यांच्या पात्रतेविषयी सक्षम प्राधिकार्यांनी निर्णय घेवून सुधारित पात्र कंत्राटदारांची यादी संकेत स्थळावर प्रसिद्ध करावी व त्यांना निविदा स्पर्धेत भाग घेण्याची परवानगी द्यावी.

सा.बां.विभागात त्या आर्थिक वर्षात अन्य प्रादेशिक विभाग/ मंडळ/ विभागास अन्य कंत्राटदार अन्य कामासाठी पात्र झालेले असल्यास केवळ काही कागदपत्रे सादर न करुन कंत्राटदार सा.बां.विभागात कंत्राटपध्दतीचा जो गैरफायदा घेत आहेत तो टाळण्यासाठी व अन्य प्रवृत्तीचा बीमोड करण्यासाठी त्यांना निविदेसाठी तांत्रिकदृष्ट्या पात्र समजावे व आर्थिक देकार उघडावेत. यामुळे निविदेतील स्पर्धात्मक दर प्राप्त होतील व Cartel formation होत असल्यास ती संभाव्यता टाळता येईल. यामुळे सा.बां. विभागाच्या अधिकाऱ्यांवर विनाकारण आरोप होणार नाहीत. २.९.२) सार्वजनिक बांधकाम विभागामध्ये सल्लागारांच्या नियुक्त्या करणे व त्यांच्याकडून विहित कालावधीत काम करुन घेणे अपरिहार्य असल्यास अशा परिस्थितीत सल्लागाराची नियुक्ती करुन त्यांना त्या वेळेस शुल्क हे प्रकल्पाच्या टक्केवारीनुसार ते निश्चित मूल्याचे (Fixed consultancy charges) असे राहिल. या निश्चित मूल्याच्या आधारे निविदांमध्ये प्रकल्पाची किंमत कितीही वाढली तरी सल्लागार शुल्क मात्र निर्धारित केलेल्या मूल्याशिवाय जास्त अदा होणार नाही ही अट प्रकर्षाने नमूद करावी व ती सल्लागारांना बांधिल असेल.

२.९.३) सल्लागार नियुक्तीसाठी सार्वजनिक बांधकाम विभागाने १९९७ साली व तदनंतर २०१६ मध्ये शासन निर्णय निर्गमित केलेले आहेत. यामध्ये जाहिरात देवून विविध सेवांसाठी सल्लागारांचे पॅनेल तयार करावे असे आदेशित केलेले आहे. शासनाच्या असेही निदर्शनास आलेले आहे की, या Empanelment प्रकियेमुळे जे सल्लागार सार्वजनिक बांधकाम विभागाकडे पात्र झाल्यानंतरही Empanel झालेले नाहीत, अशा सल्लागारांना सार्वजनिक बांधकाम विभागाच्या निविदा प्रकियेत भाग घेता येत नाही. या विषयी सखोल अभ्यास करुन ज्यांच्या बांधकामाच्या निविदेच्या अपंजीकृत कंत्राटदारांना निविदा प्रकियेत भाग घेता येईल असे आदेशित केले आहे. विविध सल्लागारांच्या कामाच्या जाहिराती काढतांना या सर्व निविदा सूचनांमध्ये Empanel न झालेल्या सल्लागारांनाही निविदा प्रकियेत भाग घेता येईल अशी तरतूद करावी. यात सर्व सल्लागारांची पश्चात अर्हता बाबतचे नियम स्वतंत्रपणे निर्गमित करण्यात येत आहेत. सल्लागारांच्या निविदा भारतीय कंपनी/फर्म शी संलग्न असलेल्या आंतरराष्ट्रीय सल्लागारांनाही भरता येतील अशी तरतूद निविदेत करावी. वरीलप्रमाणे स्थापत्य कंत्राटदाराकरिता पंजीकृत नसण्याची अट, विद्युत, यांत्रिकी व वास्तुशास्त्र शाखेच्या कंत्राटदाराकरिता सुद्धा लागू राहिल.

सल्लागारांच्या निविदा मागविताना अनामत रकमेची आवश्यकता नाही. निविदा RFP तत्त्वावर करताना QCBS पध्दतीचा वापर करावा. निविदा स्वीकृतीपैकी पात्र सल्लागारातून Performance Security, Bank Guarantee स्वरूपात घेण्यात यावी.

२.९.४) स्थापत्य, विद्युत, यांत्रिकी व वास्तुशास्त्रीय शाखेच्या सर्व कंत्राटदारांना SBD निविदा बाबत बाबनिहाय दरपृथःकरणे सादर करणे अनिवार्य राहिल.

२.९.५) भाववाढ कलम :-

अ) काम पूर्ण करण्याचा कालावधी कितीही असला तरी कामाच्या निविदेत भाववाढ कलम व डांबर, स्टील व सिमेंट साठीचे स्टार रेट बाबतचे कलम समाविष्ट करावे. मात्र ज्या कामासाठी १००% तरतूद उपलब्ध आहे अशा कामाच्या निविदेमध्ये भाववाढ कलम व स्टार रेटची तरतूद समाविष्ट करू नये.

ब) तसेच ठेव व अंशदान योजनेसाठी (DEPOSIT) १००% अनामत रक्कम प्राप्त असेल तर भाववाढ व स्टार रेट चे कलम अंतर्भूत करू नये. ज्या कामासाठी मर्यादित तरतूद व भागशः अनुदान / ठेव अनामत रक्कम प्राप्त असेल अशा कामाच्या निविदेमध्ये सिमेंट, स्टील व डांबरासाठी स्टार रेट व भाववाढ कलम समाविष्ट करावे.

३. ई निविदा उघडण्यापूर्वी निविदा प्राधिकाऱ्याने करावयाची कार्यवाही

३.१ यापूर्वी बऱ्याच नामांकित कंत्राटदारांकडून त्यांना निविदा उपलब्ध करून देण्यात आल्या नसल्याबाबत तक्रारी प्राप्त झाल्या आहेत. आता ई-निविदा प्रणालीमध्ये लिखित संकेत स्थळावरून कोणताही कंत्राटदार कोटूनही निविदा संच प्राप्त करून घेऊ शकेल (Download) व निविदा सादर करू शकेल (Upload). तथापि निविदेची विधीग्राह्यता निविदेत नमूद केलेल्या अटी व शर्तीच्या अधीन राहिल. आवश्यकता असल्यास कंत्राटदाराकडून निविदा विधीग्राह्यता वाढवून घेण्यात यावी.

३.२ साधारणतः कार्यकारी अभियंता स्तरावर प्राप्त होणाऱ्या निविदांमध्ये निविदापूर्व बैठकीची तरतूद नसते. अशा ठिकाणी कार्यकारी अभियंता यांनी निविदा उघडण्यापूर्वी ज्या निविदाकारांनी/ कंत्राटदारांनी त्यांच्याकडे निविदा भरलेल्या आहेत, अशा सर्व कंत्राटदारांना निविदा उघडण्याच्या दिनांकाला अथवा लगेचच्या तीन दिवसात कार्यालयात विवक्षित वेळ देऊन बोलवावे. आतापर्यंत पार पाडण्यात आलेली त्या निविदेसंबंधीची सर्व प्रक्रिया ही पारदर्शीपणे झालेली आहे आणि Bid lock दिनांकापर्यंत पूर्ण झालेल्या ई निविदा प्रक्रियेसंदर्भात निविदा भरणाऱ्या संबंधित कंत्राटदाराची कोणतीही तक्रार नाही असे प्रमाणपत्र ताबडतोब प्राप्त करून घ्यावे. असे प्रमाणपत्र देण्यास उपस्थित कंत्राटदारांनी नकार दिल्यास तेही अभिलेखित करावे. संबंधित कंत्राटदारांचा विरोध अनाढ्या व नियमास अनुलक्षून नसेल तर तशी कारणे अभिलेखित करावीत. जे कंत्राटदार अनुपस्थित राहिले असतील त्यांची अनुपस्थिती अभिलेखावर नमूद करावी. कार्यकारी अभियंत्यांनी संकेतस्थळामध्ये निविदा प्रक्रियेत अन्य कुठल्याही व्यक्ती अथवा System Integrator/ Service provider किंवा वेब साईट कोऑर्डिनेटरने कोणताही हस्तक्षेप केलेला नाही व या सर्व प्रक्रियेत सर्व संबंधितांनी सर्वतोपरी योग्य काळजी (due diligence) घेतलेली आहे असे अभिलेखावर नमूद करावे व नंतरच निविदा भरणाऱ्या जास्तीतजास्त कंत्राटदारांच्या उपस्थितीत निविदा उघडाव्यात.

४. ई निविदा उघडतांना निविदा प्राधिकाऱ्याने करावयाची कार्यवाही

४.१ कंत्राटदार उपस्थित नसतांना निविदा उघडणे ही बाब संशय निर्माण करणारी व पारदर्शकतेला छेद देणारी असल्याने बहुसंख्य कंत्राटदारांच्या उपस्थितीत निविदा उघडणे अनिवार्य आहे. काही कारणाने बहुसंख्य कंत्राटदार उपस्थित रहात नसतील तर अशी निविदा उघडणे टाळावे. लिफाफा क्र.१ उघडल्यानंतर त्यातील सर्व कागदपत्रांची छाननी करून पात्र/अपात्र कंत्राटदाराविषयीचे सर्व निष्कर्ष, पात्र/अपात्रतेची सर्व कारणे सर्व संबंधित कंत्राटदारांना कळवावित व ही सर्व कारणे सार्वजनिक बांधकाम विभागाच्या संकेत स्थळावर वर प्रसिध्द करण्यात यावी. अशी कारणे प्रसिध्द करण्याची सोय जर निविदा पोर्टल / Service provider च्या पोर्टलवर असेल तर तेथेही सर्व कारणे नमूद करावीत. विशेषतः ज्या कंत्राटदारांना अपात्र करण्यात आले आहे अशा सर्व कंत्राटदारांना त्यांच्या अपात्रतेची कारणे त्यांना स्पष्टपणे कळविण्यात यावीत.

कंत्राटदारांना या संदर्भात अपात्रतेच्या कारणासंदर्भात काही शंका असल्यास त्यांना निविदा उघडण्यात अधिकाऱ्यांनी प्रत्यक्ष सुनावणी घेऊन शंका निरसन करावे. तसे अभिलेखात नमूद करावे. कंत्राटदारास याव्यतिरिक्त सा.बां.विभागाच्या मुख्य अभियंता, सचिव (रस्ते), सचिव (बांधकामे) व प्रधान सचिव (सा.बां.) यांच्याकडे त्यांची तक्रार असल्यास याबाबत (grievance redressed) तक्रार सादर करून त्याबाबत सुधारीत निर्णय झाल्यावर व तो संकेतस्थळावर प्रसिध्द करून अपात्र कंत्राटदारांना ई-मेल द्वारे कळवून नंतरच लिफाफा क्र.२ उघडण्यात येईल. वरील स्वरूपाची तरतूद निविदा प्रसिध्दी mahhhhatender.in व निविदा प्रपत्रात (Tender Document) मध्ये करावी.

अशा रितीने आतापर्यन्तच्या निवड प्रक्रियेत संपूर्णपणे पारदर्शकता पाळण्यात आली आहे व निविदा प्रक्रिया विषयी कुणाचीही तक्रार नाही असे कार्यकारी अभियंता यांनी अभिलेखावर नमूद करून सर्व/बहुसंख्य कंत्राटदारांच्या उपस्थितीत लिफाफा क्र.२ (निविदा दर विषयक लिफाफा) उघडण्यात यावा. कंत्राटदार उपस्थित नसतील तर कंत्राटदाराशी प्रत्यक्ष संपर्क साधून उपस्थित रहाण्यास सुचित करावे व शक्यतो त्यांच्या उपस्थितीतच लिफाफा क्र.२ उघडण्यात यावा. ई-निविदा कंत्राटदार ५ पेक्षा कमी असल्यास किमान २ कंत्राटदारांच्या उपस्थितीत लिफाफा क्र.२ उघडावा. ई निविदा कंत्राटदार संख्येने ५ पेक्षा जास्त असल्यास किमान ३ कंत्राटदारांच्या उपस्थितीत लिफाफा क्र. २ उघडावा जेणेकरून कंत्राटदारांच्या समोरच त्यांचे प्राप्त झालेले देकार किती दराचे आहेत हे सर्वाना ज्ञात होईल. अशा कामकाज पध्दतीमुळे सार्वजनिक बांधकाम विभागाच्या अधिकाऱ्यांविषयी विनाकारण संशय घेतला जाणार नाही. काही कारणांमुळे जर कंत्राटदार सूचना देऊन ही उपस्थित नसतील तर अन्य ३ साक्षीदारांसमोर निविदा उघडण्यात यावी.

४.२ मंडळ स्तरावर प्राप्त होणाऱ्या व उघडल्या जाणाऱ्या निविदांमध्ये निविदापूर्व बैठकीची तरतूद असते. अशा निविदा पूर्व बैठकीत जास्तीतजास्त कंत्राटदार उपस्थित राहून ते सार्वजनिक बांधकाम विभागाच्या निविदा मसूद्याविषयी मुद्दे उपस्थित करतील असे पहावे. जर निविदा विकत घेतलेल्या कंत्राटदाराचे (Prospective bidder) काही अभिवेदन निविदापूर्व बैठकीत नसेल तर तसे अभिवेदन त्याचेकडून लिखित स्वरूपात प्राप्त करून घ्यावे व अभिलेखावर जतन करावे. अभिवेदनातील मुद्द्यांचे निराकरण किंवा कंत्राटदाराने उपस्थित केले मुद्दे, निविदेतील करावयाचा आवश्यक बदल हा सक्षम प्राधिकाऱ्याच्या मान्यतेने ४ दिवसांचे आत करण्यात यावा. सद्यःस्थितीत दृक्श्राव्य माध्यम, व्हिडीओ कॉन्फरन्सींग, ई मेल अशी सर्व संवादाची वेगवान साधने उपलब्ध आहेत. यामुळे पत्रव्यवहारात वेळ वाया न घालवता या सर्व साधनांचा वापर करून निविदाविषयी CSD तांतडीने मंजूर करून घ्यावे व दोन दिवसांच्या कालावधीत Service provider संकेतस्थळावर अपलोड करण्यात यावेत. मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग यांनी या प्रकरणी अनिवार्यता तपासून तत्संबंधीची कारणे अधोरेखित करून जास्तीचा कालावधी मंजूर करावा. निविदा प्राप्त होईपर्यन्तच्या प्रक्रियेमध्ये कुठलीही तक्रार नाही असे प्रमाणपत्र निविदा भरणाऱ्या सर्व कंत्राटदारांकडून प्राप्त करून घ्यावे. तदनंतरच लिफाफा क्र.१ उघडावा. लिफाफा क्र.१ मधील सर्व कागदपत्रांची छाननी केल्यानंतर कंत्राटदारांच्या पात्र/ अपात्रतेविषयीचे निष्कर्ष हे निविदा संकेत स्थळ तसेच mahapwd.com वर प्रसिध्द करण्यात यावे. सर्व पात्र/अपात्र कंत्राटदारांना त्यांच्या पात्र/अपात्रतेबाबत अवगत करण्यात यावे. ५ दिवसामध्ये सर्व अपात्र कंत्राटदारांचे म्हणणे

अभिलेखावर ठेवून निराकरण करावे व ते वेबसाईटवर प्रसिध्द करावे व त्यानंतरच लिफाफा क्र.२ उघडावा.

४.३ एक निविदा (Single Tender) बाबत कार्यपध्दती:- ई निविदा प्रणाली अंतर्गत संपूर्ण पारदर्शकता, योग्य स्पर्धा आणि शासनाच्या हितार्थ, निविदा स्विकृतीत एकच निविदा प्राप्त होणे शासनाच्या हिताचे नाही. त्यामुळे यापूर्वीच्या एकच निविदा प्राप्त झाली असल्याच्यासंदर्भातील सर्व शासन आदेश/सूचना/निर्णय अधिक्रमित करून खालील आदेश निर्गमित करण्यात येत आहेत :-

“एकच निविदा (Single Tender) म्हणजे निविदा सूचना प्रसिध्द केल्यानंतर फक्त एकच निविदा प्राप्त झाली आहे किंवा बऱ्याच निविदा प्राप्त होऊनही तांत्रिक लिफाफा क्र.१ तपासतांना अन्य सर्व कंत्राटदार अपात्र ठरून फक्त एकच कंत्राटदार निविदेसाठी पात्र ठरले आहेत, अशा सर्व निविदा देकारांना एकच निविदा (Single Tender) म्हणून समजण्यात येईल. या सर्व एकच निविदा संदर्भात आदेशित करण्यात येते की, अशा प्राप्त झालेल्या निविदा, लिफाफा क्र.२ न उघडता तात्काळ फेटाळण्यात याव्यात व लगेचच नवीन निविदा मागविण्यात याव्यात. मात्र यासंदर्भात मूळ प्रारूप निविदेमध्ये कुठलाही बदल करू नये. मूळ प्रारूप निविदेमध्ये कुठलाही बदल न केल्यास नवीन केलेली मागणी ही द्वितीय मागणी समजण्यात येईल. अशा मागणीनंतर जर परत एकाकी निविदा प्राप्त झाल्यास अशा निविदांबाबत निविदा उघडून प्रचलित कार्यपध्दतीनुसार पुढील कार्यवाही करावी. अशा निविदेबाबत पुनः फेरनिविदा मागविण्याची आवश्यकता नाही. प्रथम मागणीच्या वेळी दोनच निविदा प्राप्त झाल्यास तीन पात्र निविदा प्राप्त नाही म्हणून प्राप्त दोन निविदा नाकारण्यात येतात ही बाब CVC नियमास धरून नाही. कालापव्यय होऊ नये व कामे वेळेवर व्हावीत यासाठी दोन पात्र निविदा प्राप्त झाल्यास त्या उघडण्यात याव्यात. प्रचलित दरसूचीपेक्षा जास्त दराची निविदा प्राप्त झाल्यास याबाबत लगतच्या वरिष्ठ स्तरावर पूर्ण समर्थनासह निविदा मंजूरीकरीता सादर करावी. जर या निविदा मान्य करण्यासारख्या नसतील तर त्या सक्षम स्तरावर रद्द करून निविदा अटींची फेरतपासणी करावी व स्पर्धात्मक दर प्राप्त करण्यासाठी अटी शिथील करून फेरनिविदा मागव्याव्यात.”

एकच निविदा का प्राप्त होत आहेत याअनुषंगाने निविदेतील अटी व शर्तीचा अभ्यास करून तसेच ज्या अंदाजपत्रकावर आधारित निविदा मागविण्यात आल्या आहेत, त्या अंदाजपत्रकातील बाबींचा अभ्यास करून व बाबींच्या दराविषयी खात्री करून आवश्यक असल्यास संबंधित प्रादेशिक विभागाचे मुख्य अभियंता यांच्या मान्यतेने प्रारूप निविदा मसुद्यात आवश्यक तो बदल आणि कामाची गुणवत्ता व दर्जा खालावणार नाही याची खात्री करून काही अटी शिथिल करण्याबाबत व अंदाजपत्रकीय किंमतीत वाढ दर पुनर्विलोकनामुळे होत असल्यास त्याबाबत मुख्य अभियंता यांनी निर्णय घ्यावा. मुख्य अभियंत्यांनी हा निर्णय अभिलेखावर ठेवावा. तदनंतर अशा बदलेल्या निविदेस प्रसिध्दी देऊन परत देकार मागविण्यात यावेत. असे देकार प्राप्त झाल्यानंतर परत प्रथम वेळेस एकाकी निविदा प्राप्त झाल्यास ती नाकारावी व दुसऱ्या वेळेस निविदा मागवावी. दुसऱ्या वेळेस एकच निविदा प्राप्त झाल्यास ती अंदाजित दरापर्यंत स्वीकारण्याचे अधिकार संबंधीत सक्षम समितीस राहतील. जास्त दराची निविदा सक्षम प्राधिकाऱ्याकडे मंजूरीसाठी सादर करावी.

या सूचनांप्रमाणेच महाराष्ट्र सार्वजनिक बांधकाम नियमावलीमध्ये आवश्यक ती सुधारणा करण्यात आली आहे असे समजावे.

४.४ ई-निविदा प्रणालीअंतर्गत प्रथम बोलीवेळी किमान तीन अथवा तीनपेक्षा जास्त निविदा भरल्याचे आढळल्यास ई-निविदा प्राधिकार्याने निश्चित केलेल्या वेळी लिफाफा क्रमांक (१) (तांत्रिक लिफाफा) उघडावा. तांत्रिक लिफाफामार्फत कागदपत्रांची छाननी करुन फक्त एकच कंत्राटदार पात्र ठरला तर अशा कामांचा लिफाफा क्र.(२) न उघडता सदर निविदा फेटाळण्यात याव्यात व तात्काळ अल्प कालावधीची फेरनिविदा प्रसिध्द करण्यात यावी. तांत्रिक लिफाफा छाननीचा कालावधी ही दोन दिवस इतकाच मर्यादित राहील.

अतितातडीच्या कामांच्या निविदांच्या पहिल्या बोलीवेळी केवळ एकच पात्र निविदा प्राप्त झाल्यास अशी निविदा सत्वर फेटाळण्यात यावी व अल्प मुदतीत फेरनिविदा मागवावी. कालापव्यय टाळण्यासाठी या निविदा पूर्वी ज्या वृत्तपत्रात प्रसिध्द होत होत्या त्यांच्याकडे प्रसिध्दीस पाठवाव्यात व त्याच वेबसाईट वर प्रसिध्द कराव्यात. द्वितीय मागणीच्या वेळी १ किंवा अधिक निविदा प्राप्त झाल्यास त्या निविदा उघडून पुढील कार्यवाही करावी. सद्यस्थितीत निरनिराळ्या निविदांचे अवलोकन करता लिफाफा क्र.१ उघडण्यामध्ये किमान १५ ते ३० दिवस, निविदा उघडण्यामध्ये किमान एक ते दीड महिना आणि निविदा स्विकृती प्रस्ताव सक्षम स्तरावर सादर करण्यासाठी परत एक ते दिड महिन्याचा कालापव्यय झाल्याचे आढळून येत आहे. हा कालापव्यय टाळण्यासाठी निविदा प्रस्ताव सक्षम स्तरावर सत्वर सादर करावे. अशा प्राप्त निविदांबाबत निविदेतील प्राप्त होणारे दर स्पर्धात्मक वाटत नसल्यास निविदा उघडणाऱ्या अधिकाऱ्यांनी व स्विकारणाऱ्या सक्षम समितीने आलेला निम्नतम देकार (Lowest offer) सादर करणाऱ्या कंत्राटदाराबरोबर वाटाघाटी करुन दर कमी करण्याचा प्रयत्न करावा. शासन स्तरावरील निविदांसाठी मुख्य अभियंता यांनी वाटाघाटी कराव्यात. प्राप्त निविदा दर अंदाजपत्रकांपेक्षा जास्तीचे असल्यास व कंत्राटदार निविदेचे दर, कमी करण्यास तयार नसल्यास त्या फेटाळण्यात याव्यात व तांत्रिक मंजूरी दिलेल्या अंदाजपत्रकांचे पुनर्विलोकन करुन सक्षम प्राधिकार्याने आवश्यकता असल्यास दरविषयक बाबींत दुरुस्ती करुन फेरनिविदा मागविण्यात याव्यात. सद्यस्थितीत शासन स्तरावर प्राप्त निविदांमध्ये सर्व निविदा कमी दराच्या प्राप्त होत आहेत. त्यामुळे सर्व जिल्ह्यातील निविदाविषयीचा कल निविदा स्विकृत करणाऱ्या अधीक्षक अभियंता/मुख्य अभियंता यांनी अभिलिखित करावेत व त्यापेक्षा जास्त दराच्या निविदा प्राप्त होत असल्यास त्या स्विकृत करण्यापूर्वी संबंधित निम्नतम दर देकार कंत्राटदारांशी वाटाघाटी करुन निविदा दर वरील मर्यादेत आणण्याचा प्रयत्न करावा. असे शक्य न झाल्यास व संबंधित कार्यकारी अभियंता/अधीक्षक अभियंता यांना प्राप्त झालेले दर योग्य वाटत असल्यास तसे त्यांचे अभिवेदन अभिलेखावर ठेवण्यात यावे व तदनंतर सक्षम प्राधिकार्यानी अशा निविदा स्विकृत कराव्यात.

४.५ निविदांच्या तांत्रिक लिफाफा क्र.१ ची छाननी व मुल्यांकन करतांना निविदा उघडणाऱ्या अधिकाऱ्यांनी व निविदा पडताळणी समितीने ध्यावयाची दक्षता व तदनुषंगाने सूचना :-

सध्याच्या प्रचलित पद्धतीत निविदा कार्यकारी अभियंता व अधीक्षक अभियंता यांच्या स्तरावर उघडल्या जातात व अशा निविदांच्या तांत्रिक लिफाफा क्र.१ ची छाननी त्यांचे स्तरावर होऊन लिफाफा क्र.२ उघडणेबाबत निर्णयही कार्यकारी/अधीक्षक अभियंता घेतात. या पद्धतीत बदल करण्यात येत आहे व यापुढे, खाली परिच्छेद क्र ५.१.४ प्रमाणे नमूद केल्याप्रमाणे निविदा पडताळणी समितीकडून ह्या निविदांची पडताळणी होईल.

निविदा पडताळणी समितीने खालील प्रमाणे कामकाज करावे.

४.५.१ निविदा उघडण्याची सुचना सर्व कंत्राटदारांना द्यावी व त्यांचे उपस्थितीतच निविदा उघडाव्यात. जर काही कंत्राटदारांना निविदा उघडण्याचे दिवशी उपस्थित रहाणे शक्य नसेल तर त्यांच्याकडून त्याबाबत लेखी विनंती अभिलेखावर ठेवावी. मात्र कोणत्याही परिस्थितीत बहुसंख्य कंत्राटदारांच्या उपस्थितीतच निविदा उघडाव्यात.

४.५.२ निविदा पडताळणी समितीने निविदा उघडल्यानंतर त्यांनी निविदेची छाननी करून यासाठी निविदेच्या पात्रते/अपात्रतेविषयी काही शंका निर्माण झाल्यास, विशेषतः खालील बाबींवर त्यांनी कंत्राटदारांकडून स्पष्टीकरण मागविणे अनिवार्य राहिल.

- (१) नोंदणी विषयक कागदपत्रे
- (२) पॉवर ऑफ अॅटर्नीबाबतची स्पष्टीकरणे
- (३) बँक प्रतीभूती हमी मधील त्रुटी
- (४) कंत्राटदाराने सादर केलेल्या तांत्रिक व आर्थिक विवरणात संदिग्धता व त्रुटी आढळत असल्यास त्याबाबत स्पष्टीकरण
- (५) पुलाची लांबी व विनिर्देश, समान कामे, इमारतींची उंची व कामाचे गुणवत्ता निकष, रस्ते बांधकामातील कामांचे/बाबींचे परिमाण व शुल्क
- (६) जॉइंट व्हेंच्यूर (Joint Venture) असल्यास त्यासंबंधी करारनाम्यात त्रुटी असणे, प्रमाणित नसणे, करारनामा नोंदविलेला नसणे, भागीदाराचे शेअर नमूद नसणे
- (७) आर्थिक ताळेबंद व विवरणातील त्रुटीबाबतचे स्पष्टीकरण
- (८) तांत्रिक लिफाफ्यातील सादर केलेले प्रस्ताव/कागदपत्रातील अटी/शर्ती व पत्र व्यवहारातील संदिग्धता, अस्पष्टता इत्यादि.

याबाबत निविदा उघडणाऱ्या सक्षम अधिकाऱ्यांनी (कार्यकारी अभियंता/अधीक्षक अभियंता) संबंधित कंत्राटदारास पात्र/अपात्र ठरविण्यापूर्वी त्यांचेबरोबर लिखित स्वरूपात पत्रव्यवहार करावा व कंत्राटदाराकडून लिखित स्वरूपात स्पष्टीकरण घेऊन ते पडताळावे. किरकोळ व महत्त्व नसलेल्या अटीमुळे निविदाकरास अपात्र करण्यात येऊ नये. अशा ठिकाणी कंत्राटदाराकडून लेखी स्पष्टीकरण घ्यावे व अटीनुसार दुरुस्त कागदपत्रे प्राप्त करून समितीसमोर ठेवून त्याची छाननी करून कंत्राटदाराच्या निविदा पात्रता/अपात्रतेविषयी निर्णय घ्यावा. याबाबतचे सर्व अभिलेख धारिकेत व संकेत स्थळावर ठेवावे व निविदा स्विकृतीसाठी सादर करण्याच्या प्रस्तावात या सर्व पडताळणी पध्दतीचा स्पष्ट उल्लेख करावा.

बऱ्याचदा एक निविदा उघडण्यावेळी पात्र असलेल्या कंत्राटदार दुसऱ्या निविदावेळी सुध्दा अपात्र ठरविण्यात येते. यात कदाचित कंत्राटदाराचे संगनमत (CARTEL FORMATION) होण्याची शक्यता नाकारता येत नाही. यास्तव ज्यांनी देशात/ राज्यात अथवा सा.बां.विभागात सक्षमपणे कामाच्या स्वरूपानुसार जसे की, इमारतीच्या कामासाठी इमारतीचे समतुल्य काम, पुलाच्या कामासाठी पुलाचे समतुल्य काम इत्यादी केले आहे अशा कंत्राटदारास निविदा किरकोळ कारणास्तव (जसे की, PTC, Machinery, आयकर कागदपत्रे, Similar work condition इ.) अपात्र करू नयेत. अशा कंत्राटदारांनी त्यांची पुर्वीची कागदपत्रे उपलब्ध केल्यास ती पडताळून पात्र ठरविण्याबाबत कळवावे व आर्थिक लिफाफा क्र.२ उघडावा.

४.६ अंदापजत्रकीय दराच्या १० टक्क्यापेक्षा अधिक दराने कमी असलेल्या निविदा प्राप्त झाल्यास त्यांच्या स्विकृती संदर्भात सुधारीत मार्गदर्शक सूचना

४.६.१. निविदा प्रक्रियेमध्ये प्राप्त निम्नतम निविदेचा देकार निविदाधीन कामाच्या किंमतीपेक्षा दहा टक्क्या पेक्षा अधिक दराने कमी असेल तर संबंधित कंत्राटदाराकडून एवढ्या कमी दरात काम करण्याचे नियोजनाबाबत सविस्तर तपशील निविदा बोलाविणा-या अधिका-याने प्राप्त करून घ्यावा. कंत्राटदाराने दिलेल्या तपशीलाच्या आधारे सदर काम निम्नतम देकाराच्या किंमतीत पूर्ण करता येणे शक्य असल्याची खात्री करून घेण्यात यावी.

४.६.२. प्राप्त निम्नतम निविदेचा देकार निविदाधीन कामाच्या किंमतीपेक्षा १० % पर्यंत कमी दरांचा असेल तर ठेकेदारांनी निविदाधीन किंमतीच्या १% एवढ्या किंमतीची बँकेची प्रतिपूर्ती हमी / तेवढ्या रकमेचा Demand Draft परफॉर्मन्स सिक्क्युरीटी म्हणून निविदेच्या लिफाफा क्र.२ मध्ये सादर करावी. तसेच (Scan करून ई-निविदेसोबत सादर करावी.) (उदा. १% ते १०% कमी दर - १% रक्कम).

४.६.३. प्राप्त निम्नतम निविदेचा देकार निविदाधीन कामाच्या किंमतीपेक्षा १०% पेक्षा जास्त दराने कमी असेल तर-

(अ) देकार १०% पेक्षा जेवढ्या जास्त दराने आहे तेवढ्या रकमेचा व वरील बाब-४.६.२ प्रमाणे बँकेची प्रतिपूर्ती हमी / DD निविदे सोबत लिफाफा क्रमांक २ मध्ये सादर करावी. (उदा. १४% कमी दर - १०% पर्यंत करीता - १% व (१४% - १०%) - ४% असे एकूण ५%). ही रक्कम रुपये १०००/- पेक्षा कमी असल्यास किमान रुपये १०००/- (एक हजार) ची बँकेची प्रतिपूर्ती हमी DD सादर करणे अनिवार्य राहिल.

(ब) देकार १५% पेक्षा कमी दराचा असल्यास उर्वरित रकमेसाठी दोन पटीने रक्कम DD द्वारे सादर करणे अनिवार्य राहिल. उदा. १९% कमी दर- (१९-१५= ४% x २= ८%)

४.६.४ बँक प्रतिभूती हमी DD ही ऐच्छिक असावी. तसेच सदर रक्कम सध्या जमा करण्यात येणाऱ्या रकमेइतकी असावी.

४.६.५ बँक प्रतिभूती हमी/ DD उपलब्ध करून देणे/ बँकेची प्रतिभूती हमी परत करणे व इतर बाबीबाबत खालील प्रमाणे कार्यवाही करावी :-

(अ) बँक प्रतिभूती हमी / DD निविदा बोलाविणा-या कार्यकारी अभियंता याच्या नावे असावी.

(ब) बँक प्रतिभूती हमी / DD सरकारी/शेड्युल्ड तसेच सार्वजनिक क्षेत्रातील बँकेची असावी.

(क) बँक प्रतिभूती हमीची/DD ची मुदत कामाच्या दोष दायित्व कालावधीनंतर एक महिना कालावधीपर्यन्त असावी.

(ड) बँक प्रतिभूती हमीची / DD ची प्रत Scan करून ई-निविदा भरताना ठेकेदारांनी अपलोड करावी.

(इ) बँक प्रतिभूती हमी / DD सिलबंद लिफाफ्यामधून कंत्राटदारांनी निविदा स्विकृतीच्या दिनांकात कार्यकारी अभियंता यांच्या कार्यालयात जमा करावा. लिफाफ्यावर कामाचे नाव व निविदासूचना क्रमांक लिहिण्यात यावा.

(फ) निविदा उघडल्यावर लिफाफा क्र.१ मधील कागदपत्रांची पूर्तता न झाल्यास संबंधित कंत्राटदारांना त्यांच्या बँक प्रतीभूती हमीचे लिफाफे / DD कार्यकारी अभियंता यांनी निविदा उघडल्याच्या दिनांकापासून ७ दिवसांत परत करावेत.

(घ) लिफाफा क्र.१ मधील कागदपत्रांची पूर्तता घेऊन ज्या कंत्राटदारांचे लिफाफा क्र.२ मधील देकार उघडण्यात येतील त्या मधील निम्नतम २ निविदाकारांचे बँकेची प्रतिभूती हमी लिफाफे / DD वगळता इतर कंत्राटदारांचे बँकेची प्रतिभूती हमी लिफाफे ३ दिवसांत परत करण्यात यावेत.

(च) निम्नतम निविदाकारांना कार्यारंभ आदेश दिल्यानंतर ३ दिवसांत क्र.२ चे निम्नतम निविदाकाराची बँकेची प्रतिभूती हमी / DD परत करण्यात यावी.

(छ) वरील पध्दतीमध्ये खोटी कागदपत्रे/ बँक प्रतिभूती हमी सादर करणा-या कंत्राटदारांची अनामत रक्कम (EMD) जप्त करण्यात यावी व संबंधित कंत्राटदारांना काळ्या यादीत टाकावे. तसेच अशा काळ्या यादीत समाविष्ट केलेल्या कंत्राटदारांनी सादर केलेल्या निविदा उघडू नयेत.

४.६.६. कार्यकारी अभियंता यांनी निम्नतम निविदाकरांकडून प्राप्त बँक प्रतिभूती हमीची Demand Draft मुदत दोष दायित्व कालावधी नंतर एक महिन्यापर्यंत वाढवून घेतल्यानंतरच कार्यारंभ आदेश देण्याची कार्यवाही करावी.

४.६.७. काम समाधानकारकपणे पूर्ण झाल्यावर निविदेतील तरतुदीप्रमाणे ठेकेदारांकडून प्राप्त अतिरिक्त कामगिरी सुरक्षा ठेव रक्कम व बँक प्रतिभूती हमी ३ महिन्यांच्या आत कंत्राटदारांना कार्यकारी अभियंता यांनी परत करावी.

४.६.८ ई निविदा प्रस्ताव सादर करण्याचा स्तर पुढीलप्रमाणे असावा :-

कालापव्यय टाळण्यासाठी कंत्राटदारांकडून प्राप्त झालेल्या ई निविदेचा प्रस्ताव सखोल छाननीअंती खालील तक्त्यात नमूद केल्याप्रमाणे सक्षम प्राधिकार्याकडे थेट सादर करण्यात यावा.

अ.क्र.	कामाची किंमत	ई निविदा प्रस्ताव सादर करावयाचे संबंधित अधिकारी
१.	रु. ३ लक्ष ते १ कोटी	कार्यकारी अभियंता
२.	रु. १ कोटी ते २.५० कोटी	अधीक्षक अभियंता
३.	रु. २.५० कोटी ते १५ कोटी	मुख्य अभियंता
४.	रु. १५ कोटी व त्यावरील	शासन स्तरावर

५. ई निविदा स्विकृती

शासनाच्या ई निविदा वेबसाईट, वेब पोर्टलवर प्रसिध्द झाल्यानंतर निविदेतील अटी व शर्तीमध्ये अंशतःही बदल करण्यात येऊ नये. अशा बदलामुळे कंत्राटदार आणि सर्वसामान्य जनता यांच्यामध्ये शासनाच्या कार्यपध्दतीबाबत संशय निर्माण होतो. तसेच शासनाच्या विश्वासाहतेला तडा पोचण्याची शक्यता नाकारता येत नाही. त्यामुळे ई निविदेतील आशय अथवा तारखेत बदल करावयाचे झाल्यास ते सक्षम प्राधिकार्याच्या लिखित पूर्वपरवानगीनेच करण्यात यावेत. अशा मंजूरी प्रदान करतांना सदरबाबतचे पत्र व त्याची कारणेही ठळकपणे संबंधित वेबसाईट तसेच mahapwd.com वर ठळकपणे प्रसिध्द करण्यात यावे.

५.१.१ अतिरिक्त कामगिरी सुरक्षा ठेव रक्कम (Additional Performance Security Deposit) भरणे

कंत्राटदारांनी अंदाजपत्रकीय दराच्या १० टक्के पेक्षा कमी दर भरल्यास अतिरिक्त इसारा रक्कम/ कामगिरी सुरक्षा ठेव रकमेची बँक प्रतिभूती हमी निविदेसोबत सादर करण्याच्या सूचना दिल्या आहेत. निर्धारित रकमेपेक्षा कमी रकमेची बँक प्रतिभूती हमी सादर केल्यास अथवा आवश्यक बँक प्रतिभूती हमी सादरच न केल्यास सदर कंत्राटदाराची निविदा रद्द करण्यात यावी.

Additional Performance Security Deposit ची रक्कम भरताना कंत्राटदाराची निविदा देकार दोन दशांशपर्यंत ग्राह्य धरून (Rounded upto two decimal points) त्याप्रमाणे रक्कम परिगणीत करण्यात यावी.

Additional Performance Security Deposit ची रक्कम कोणत्याही राष्ट्रीयकृत बँकेच्या DD/FDR/BG स्वरूपात स्विकारण्यास हरकत नाही. कंत्राटदाराने लिफाफा क्र.१ व मध्ये लिफाफा क्र.२ मध्ये विहित नमुन्यात Additional Performance Security Deposit सादर केले असल्याचे शपथपत्र सादर करणे आवश्यक आहे.

कंत्राटदाराने समाधानकारकरित्या काम पूर्ण केल्यानंतर Additional Performance Security Deposit परत करण्यात यावे. कंत्राटदाराने समाधानकारकरित्या काम पूर्ण केले असल्याबाबत संबंधीत कार्यकारी अभियंता यांनी अभिलेखीत करावे. यासाठी कंत्राटदाराच्या स्वतंत्र मागणी अर्जाची आवश्यकता नाही.

L-१ व L-२ यांना वगळून अन्य कंत्राटदारांचे Additional Performance Security Deposit कामाचा आर्थिक लिफाफा क्र.२ उघडल्यावर त्वरीत परत करण्यात यावे. L-२ यांचे Additional Performance Security Deposit लिफाफा क्र.२ उघडल्यानंतर ३० कार्यालयीन दिवस अथवा L-१ यांना कार्यारंभ आदेश दिनांक यापैकी जे नंतर असेल त्या दिनांकाला परत करण्यात यावे.

५.१.२ निविदेच्या विधीग्राह्यता कालावधी - (Validity Period)

निविदेतील कंत्राटदाराने भरलेल्या दरासाठी विधीग्राह्यता कालावधी कार्यकारी अभियंता/अधीक्षक अभियंता/मुख्य अभियंता/शासन यांच्या पातळीवरील निविदांसाठी अनुक्रमे ६० दिवस, ७५ दिवस, ९० दिवस व १२० दिवस असावा.

५.१.३ ई- निविदा उघडण्याची प्रक्रिया कार्यालयीन वेळेत करणे. - ई-निविदा प्रक्रिया ही शासनाने मंजूर केलेल्या ऑनलाईन प्रणालीव्दारे प्रदर्शित करण्यात येते. सदर प्रक्रियामध्ये निविदा कार्यालयीन वेळेत न उघडणे, कंत्राटदाराचे अनुपस्थितीत उघडणे अशा तक्रारी होऊ नयेत म्हणून ज्या कंत्राटदारानी निविदा सादर केल्या आहेत अशा बहुसंख्य कंत्राटदारांसमोर निविदा उघडण्याची कार्यवाही करण्यात यावी व अशा निविदा कार्यालयीन वेळेतच उघडण्यात याव्यात. काही अपवादात्मक परिस्थितीत सदरच्या निविदा कार्यालयीन वेळेत उघडणे शक्य नसल्यास संबंधित निविदाधारकास आगाऊ सूचना देऊन अशा निविदा कार्यालयीन वेळेनंतर उघडण्यात याव्यात. कार्यालयीन वेळेनंतर निविदा उघडण्याच्या प्रक्रियेमध्ये संबंधित निविदाधारकांची किंवा किमान २ स्वतंत्र व्यक्तींची उपस्थिती अनिवार्य राहिल. यामुळे निविदा उघडण्याच्या प्रक्रियेमध्ये पारदर्शकता राहिल.

५.१.४ निविदा पडताळणी समिती (Evaluation Committee)

१) रु. १ कोटी पर्यंतच्या कामांसाठी

१	संबंधीत कार्यकारी अभियंता	अध्यक्ष
२	संबंधीत मंडळाचे सहाय्यक अधीक्षक अभियंता	सदस्य
३	संबंधीत विभागाचा उपकार्यकारी अभियंता	सदस्य सचिव

२) रु. १ कोटी पेक्षा जास्त रकमेच्या ते रु.१०० कोटीपर्यंतच्या निविदांसाठी.

१	संबंधीत अधीक्षक अभियंता	अध्यक्ष
२	दक्षता व गुण नियंत्रण मंडळातील कार्यकारी अभियंता/ उपअभियंता व ते उपलब्ध नसल्यास संबंधीत मंडळाचे सहाय्यक अधीक्षक अभियंता	सदस्य
३	संबंधीत कार्यकारी अभियंता	सदस्य
४	संबंधीत विभागाचा उपकार्यकारी अभियंता	सदस्य सचिव

३) रु.१०० कोटीपेक्षा जास्त रकमेच्या निविदांसाठी.

१	मुख्य अभियंता	अध्यक्ष
२	अधीक्षक अभियंता	सदस्य
३	अधीक्षक अभियंता (दक्षता व गुण नियंत्रण मंडळ)	सदस्य
४	संबंधीत कार्यकारी अभियंता	सदस्य
५	संबंधीत विभागाचा उपकार्यकारी अभियंता	सदस्य सचिव

संबंधीत विभागाचे लेखाधिकारी सर्व समितीचे सदस्य असतील व त्यांनी आर्थिक विश्लेषण पूर्णपणे तपासणे अनिवार्य राहिल.

५.१.५ निविदा स्विकृतीचे अधिकार

कार्यकारी अभियंता समिती	:	रु. १ कोटी पर्यंत रकमेच्या निविदा (EE, DE, DAO)
अधीक्षक अभियंता समिती	:	रु.१ कोटी पेक्षा जास्त ते रु.२.५० कोटी पर्यंत रकमेच्या निविदा (SE, EE, DAO)
मुख्य अभियंता समिती	:	रु.२.५० कोटी पेक्षा जास्त ते रु.१५.०० कोटी पर्यंत किमतीच्या निविदा. (CE, SE, SE VQCC, DAO)

५.१.६ शासन स्तरावर निविदा स्विकृती संदर्भात अनुसरण्याच्या सुधारित मार्गदर्शक सूचना

(अ) रु.१५ कोटी पेक्षा जास्त रकमेच्या निविदा शासनस्तरावर स्विकृत होतील.

(ब) रु. १५ कोटी पेक्षा जास्त ते ३० कोटी किंमती पर्यंतच्या. जास्त दराच्या निविदा अथवा स्विकृतीबाबत:-

रस्ते व पूलांची कामे :

१.	सचिव (रस्ते) सा.बां.विभाग, मंत्रालय	अध्यक्ष
२.	सचिव (बांधकामे) सा.बां.विभाग, मंत्रालय	सदस्य
३.	आंतरवित्तीय सल्लागार व उपसचिव, सा.बां.विभाग, मंत्रालय	सदस्य
४.	संबंधीत उपसचिव (रस्ते/इमारती)	सदस्य सचिव

इमारतींची कामे :

१.	सचिव (बांधकामे) सा.बां.विभाग, मंत्रालय	अध्यक्ष
२.	सचिव (रस्ते) सा.बां.विभाग, मंत्रालय	सदस्य
३.	आंतरवित्तीय सल्लागार व उपसचिव, सा.बां.विभाग, मंत्रालय	सदस्य
४.	संबंधीत उपसचिव (रस्ते/इमारती)	सदस्य सचिव

- निविदा स्विकृतीच्या प्रस्तावाबाबत आठवड्याच्या दर मंगळवारी अथवा सोयीच्या दिवशी आवश्यकतेनुसार समितीची बैठक आयोजित करण्यात येईल.
- सदर बैठकीत सर्व सदस्य निविदा स्विकृती प्रस्तावावर विचार विनिमय करून निर्णय घेतील.
- सदर बैठकीत तपासणी करण्याबाबतची तपासणीसूची सोबत प्रपत्र - २ प्रमाणे जोडण्यात आली आहे.

(क) रुपये ३० कोटीपेक्षा जास्त किंमतीच्या सर्व निविदा स्विकृतीबाबत

१.	अपर मुख्य सचिव/प्रधान सचिव, वित्त विभाग, मंत्रालय	अध्यक्ष
२.	अपर मुख्य सचिव/प्रधान सचिव, नियोजन विभाग, मंत्रालय	सदस्य
३.	अपर मुख्य सचिव/प्रधान सचिव, सा.बां.विभाग, मंत्रालय	सदस्य
४.	अपर मुख्य सचिव/प्रधान सचिव, जलसंपदा विभाग, मंत्रालय	सदस्य

सदर समिती आवश्यक असल्यास अन्य अधिकाऱ्यांना आमंत्रित करेल व कमी/ जास्त दरांबाबत सर्वकष विचार करून निविदा स्विकृतीविषयी निर्णय घेईल.

५.२ निविदा स्विकृती संदर्भातील कालमर्यादा :

जाहिरात प्रसिध्द केल्या नंतर निविदा प्राप्त करून घेणे, उघडणे, कागदपत्रांची पडताळणी करणे, प्राप्त तक्रारींचे निवारण करणे, मंजूर करणे व कंत्राटदारास कार्यारंभ देणे इत्यादी कार्यवाहीस वेळेचे बंधन असणे आवश्यक आहे. क्षेत्रीय अधिकाऱ्यांनी ही कार्यवाही खाली दिलेल्या तक्त्यानुसार पूर्ण करावी.

अ.क्र.	कार्यवाही	कमाल निविदा व कालावधी (दिवसामध्ये)			
		रु.१ कोटी पर्यन्तच्या निविदा	रु. २.५ कोटी पर्यन्तच्या निविदा	रु. १५ कोटी पर्यन्तच्या निविदा	रु. १५ कोटी पेक्षा जास्त किंमतीच्या निविदा
१.	निविदा प्रसिध्द करुन वृत्तपत्रे प्राप्त करुन घेणे	५	५	५	५
२.	लिफाफा क्र.१ (तांत्रिक लिफाफा) उघडणे	प्रसिध्द केलेल्या निविदेतील वेळ व तारखे प्रमाणे.			
३.	निविदा प्राप्त होणाचा किमान कालावधी SBD निविदासाठी	१५	२५	२५	४५
४.	निविदा पूर्व बैठकीचा दिनांक (निविदा प्रसिध्द झाल्यानंतर)	५	१०	१०	१०
५.	CSD अपलोड करणे	३	३	३	३
६.	लिफाफा क्र.१ ची समिती मार्फत पडताळणी करणे	७	१०	१०	१०
७.	निविदाधारकाच्या उपस्थित मुद्यांचे निराकरण करणे व अंतिम पात्र निविदाधारकांची यादी करणे	३	५	१०	१०
८.	लिफाफा क्र.२ (वित्तीय लिफाफा) उघडणे	३	३	०	०
९.	निविदा मंजूरीचा प्रस्ताव तयार करुन सक्षम अधिका-याकडे मंजूरीसाठी सादर करणे.	७	७	५	५
१०.	निविदा मंजूरीची कार्यवाही करणे.	१२	१२	१२	२७
११.	ठेकेदारास प्रतिपूर्ती रक्कम सादर करण्याचे पत्र पाठविणे	५	५	५	५
१२.	कंत्राटदाराने प्रतिपूर्ती रक्कम निर्धारित वेळेत न भरल्यास त्याची निविदा रद्द करुन द्वितीय निविदा धारकासमवेत शहानिशा करुन पुढील कार्यवाही करावी कालावधीत कोणताही --- वाढ देणार नाही.	१०	१०	१०	१०
	एकुण	५५ दिवस	८५ दिवस	९५ दिवस	१२० दिवस

५.३ निविदा शुल्क :-

सर्व निविदा online प्रसिध्द करण्यात येत असल्याने निविदा शुल्क खालीलप्रमाणे आकारण्यात यावी.

अ.क्र.	निविदा रक्कम	निविदा शुल्क
१	रु. ३.०० लक्ष पर्यंत	रु.२०० + वस्तु व सेवा कर
२	रु. ३ ते रु.५० लक्ष पर्यंत	रु.५०० + वस्तु व सेवा कर
३	रु. ५० लक्ष ते रु.२ कोटी पर्यंत	रु.१००० + वस्तु व सेवा कर
४	रु. २ कोटी ते रु.५ कोटी पर्यंत	रु.२००० + वस्तु व सेवा कर
५	रु. ५ कोटी ते रु.१०० कोटी पर्यंत	रु.३००० + वस्तु व सेवा कर
६	रु. १०० कोटी ते रु.५०० कोटी पर्यंत	रु.५००० + वस्तु व सेवा कर
७	रु. ५०० कोटी पेक्षा जास्त	रु.१०००० + वस्तु व सेवा कर

५.४ वस्तु व सेवा कर (GST):-

- १) वस्तु व सेवा करासंबंधी कंत्राटदारांनी त्यापृष्ठयर्थ परिपूर्ण कागदपत्रे सादर केल्यानंतर कार्यकारी अभियंता यांनी VAT/Excise या बाबी आवश्यकतेनुसार वगळून देयकांची छाननी करुन ३० दिवसांमध्ये संबंधीत देयके कंत्राटदारास अदा करावीत.
- २) राज्य दरसुचीमधील विविध बाबीचे दर हे वस्तु व सेवा कर वगळून असावेत. अंदाजपत्रके तयार करताना प्रचलित वस्तु व सेवा कर Recupulation Sheet मध्ये अंतर्भुत करावा.
- ३) कामांच्या निविदा वस्तु व सेवा कर वगळून अंदाजपत्रकाच्या किंमतीवर आधारित मागविण्यात याव्यात.

५.५ यंत्रसामुग्री:-

- १) यंत्रसामुग्रीसाठी स्वतःच्या मालकीच्या जागेची अट टाकण्यात येऊ नये.
- २) कामांसाठी नवीन यंत्रसामुग्रीचे आयुर्मान १५ वर्षे गृहीत धरण्यात यावे.
- ३) पहिल्या १० वर्षाकरीता अधीक्षक अभियंता (यांत्रिकी) यांच्या योग्यता प्रमाणपत्राची आवश्यकता नाही.
- ४) १० वर्षांनंतर प्रतिवर्षी अधीक्षक अभियंता (यांत्रिकी) यांचे योग्यता प्रमाणपत्र आवश्यक राहिल.
- ५) रु.१.५० कोटी रकमेच्या कामांसाठी तसेच सुशिक्षित बेरोजगार अभियंत्यांच्या कामांसाठी Hot Mix Plant/Batch Mix Plant/Machinery यांच्या मालकी हक्काबाबतची अट निविदेमध्ये समाविष्ट करण्यात येऊ नये. यासाठी स्वसाक्षांकित भाडे प्रमाणपत्राची अट टाकण्यात यावी.

६. या शासन निर्णयाद्वारे महाराष्ट्र शासन सार्वजनिक बांधकाम विभागाची नियम पुस्तिका सहावी आवृत्ती १९८४ आणि यापूर्वी निविदा विषयक निर्गमित करण्यात आलेले विविध शासन निर्णय/परिपत्रके हे अधिक्रमित करण्यात येत आहेत. महाराष्ट्र शासन सार्वजनिक बांधकाम नियम

पुस्तिकेतील संहितेमध्ये विहित कलमे यथावकाश सुधारित करून प्रसिद्ध करण्यात येतील. या बाबतीतील निविदा विषयक अन्य शासन निर्णय/परिपत्रके यातील आदेश यामुळे आपोआपच रद्द होतील.

७. या शासन निर्णयाचे काटेकोरपणे पालन होईल याची दक्षता सर्व संबंधित कार्यकारी अभियंता/ अधीक्षक अभियंता स्वतः जातीने लक्ष घालून घ्यावी. अन्यथा संबंधित अधिकारी, कर्मचारी यांच्यावर निर्णयातील दिरंगाई बाबत शिस्तभंगाची कारवाई करण्यात येईल. तसेच Standard Bidding Document मध्ये कंत्राटदारास compensation देण्याची तरतूद आहे. क्षेत्रीय अधिकाऱ्यांनी कंत्राटदारास compensation देण्याची बाब उद्भवू नये याची दक्षता घ्यावी.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आला असून त्याचा संकेतांक २०१८०९२७१७५३०६०४१८ असा आहे. हा आदेश डिजिटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

Sachin Manikrao
Chivate

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DN: cn=Sachin Manikrao Chivate, ou=Public Works Department,
postalCode=400032, st=Maharashtra,
c=IN, email=Sachin.Manikrao.Chivate@maharashtra.gov.in,
serialNumber=40a6a722cd0d0eaa1b574eb37a2eddb133093093bd197a
e0a55c88a27a, email=Sachin.Manikrao.Chivate
Date: 2018.07.27 18:07:42 +05'30'

(सचिन चिवटे)

अवर सचिव (इमारती), महाराष्ट्र शासन

प्रति,

१. मा.मुख्यमंत्री यांचे प्रधान सचिव, मुख्यमंत्री कार्यालय, मंत्रालय, मुंबई
२. मा.मंत्री (सार्वजनिक बांधकाम) यांचे खाजगी सचिव, मंत्रालय, मुंबई
३. मा.राज्यमंत्री (सार्वजनिक बांधकाम) यांचे खाजगी सचिव, मंत्रालय, मुंबई
४. मुख्य सचिव, महाराष्ट्र राज्य, मंत्रालय, मुंबई,
५. अपर मुख्य सचिव/प्रधान सचिव/सचिव,
६. सार्वजनिक बांधकाम विभाग/वित्त विभाग/ग्राम विकास विभाग
७. महालेखापाल-१, मुंबई
८. महालेखापाल-२, नागपूर
९. अधिदान व लेखाअधिकारी, मुंबई/नागपूर
१०. प्रत, महासंचालक, माहिती व प्रसिध्दी महासंचालनालय, मुंबई यांना प्रसिध्दीसाठी
११. प्रत, माहिती व आवश्यक कार्यवाहीसाठी,
१२. सर्व मुख्य अभियंते, सार्वजनिक बांधकाम प्रादेशिक विभाग, (विद्युत्सह)
१३. मुख्य वास्तुशास्त्रज्ञ, सार्वजनिक बांधकाम विभाग, मुंबई
१४. संचालक, उद्याने व उपवने, मुंबई
१५. सर्व अधीक्षक अभियंते, सार्वजनिक बांधकाम विभाग, (विद्युत् / यांत्रिकी)
१६. अधीक्षक अभियंता यांनी आपल्या अधिनस्त विभागातील कार्यालयांना सदर शासन निर्णयाची प्रत अग्रेषित करावी.
१७. मुख्य अभियंता / अधीक्षक अभियंता, पोलीस गृहनिर्माण व कल्याण महामंडळ, वरळी, मुंबई
१८. सर्व सहसचिव/उपसचिव/अवर सचिव/कार्यासन अधिकारी, सा.बां.वि., मंत्रालय, मुंबई
१९. कार्यासन इमारती-२ (निवड नस्ती)

सार्वजनिक बांधकाम विभागाच्या ई-निविदा
संदर्भातील दिनांक २७/९/२०१८ च्या शासन
निर्णयातील तरतूदींवर स्पष्टीकरण.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्रमांक सीएटी/२०१७/प्र.क्र.८/इमा-२
मंत्रालय, मुंबई ४०० ०३२ .
दिनांक : २२ ऑक्टोबर, २०१८.

वाचा :- सार्वजनिक बांधकाम विभाग शासन निर्णय क्रमांक सीएटी-२०१७/प्र.क्र.८/इमा-२
दिनांक २७/०९/२०१८.

प्रस्तावना:-

सार्वजनिक बांधकाम विभागाच्या ई-निविदा प्रक्रियेअंतर्गत निविदा प्रसिध्दी, तपासणी, स्विकृती व इतर अनुषंगीक बाबीसंदर्भात संदर्भान्वये दि.२७/९/२०१८ रोजी सविस्तर शासन निर्णय निर्गमित करण्यात आलेला आहे. सदर शासन निर्णयातील काही तरतूदीसंदर्भात क्षेत्रीय स्तरावरून मार्गदर्शन/ स्पष्टीकरणाबाबत विचारणा करण्यात येत आहे. तसेच दि.८/१०/२०१८ रोजी सर्व मुख्य अभियंता, अधीक्षक अभियंता व कार्यकारी अभियंता यांच्या मुंबई येथे झालेल्या बैठकीत काही मुद्दे उपस्थित झाल्यानुसार खालीलप्रमाणे खुलासा करण्यात येत आहे.

शासन परिपत्रक :-

दि.२७/०९/२०१८ च्या शासन निर्णयातील परि.क्र.६ अन्वये त्यापूर्वी निविदाविषयक निर्गमित करण्यात आलेले विविध शासन निर्णय/परिपत्रके अधिक्रमीत करण्यात आलेले आहेत अशी स्पष्ट तरतूद केलेली आहे, त्यामुळे त्यापूर्वीची सर्व परिपत्रके/शासन निर्णय रद्द झालेली आहेत.

१. दि.२७/०९/२०१८ च्या शासन निर्णयातील तरतूदीनुसार रु.१५ कोटी पर्यंतच्या कामांसाठी ब-१ निविदाचा वापर करावयाचा असून रु.१५ कोटीपेक्षा जास्त रकमेच्या निविदांसाठी SBD वापरावयाचा असून त्यात पूर्वीप्रमाणे निविदा खंड-३८ चा समावेश करण्यात यावा. अंदाजपत्रकीय परिमाणापेक्षा एखाद्या बाबीचे परिमाणात वाढ होत असल्यास शासन परिपत्रक क्र.संकीर्ण-२००४/ प्र.क्र.८५/रस्ते-१, दि. ११/०६/२००४ नुसार कार्यवाही करण्यांत यावी.
२. शासन पत्र दि.३०/६/२०१७ व शासन परिपत्रक दिनांक १९/०९/२०१७ अन्वये निविदा खंड-३८ निविदेतून वगळण्यात आला होता. त्यानंतर आलेल्या निविदांसंदर्भात जास्तीच्या परिमाणाबाबतीत (ज्या निविदामध्ये खंड-३८ चा समावेश नाही अशा निविदा) सा.बां. विभागाच्या दि.३/८/२०१८ च्या शासन परिपत्रकानुसार कार्यवाही करण्यात यावी.

३. संदर्भित शासन निर्णयातील पृ.क्र.७ परि.क्र.१.१ मधील कामाची किंमत रु.५० लक्ष ऐवजी रु.५०० लक्ष वाचावी व त्याप्रमाणे सुधारणा करावी.
४. पृष्ठ क्र.८वरील परिच्छेद क्रमांक २.१ मधील अ.क्र. १ करिता निविदा प्रसिध्दीचा किमान कालावधी रु. ३ लक्ष ते रु.५० लक्ष ऐवजी रु.३ लक्ष ते रु.५ कोटी वाचावे तसेच अ.क्र.२ करिता रु.५० लक्ष ते रु. २५ कोटी ऐवजी रु. ५ कोटी ते रु. २५ कोटी असे वाचावे.
५. पृष्ठ क्र.११ वरील परिच्छेद क्र.२.९ मधील अ.क्र. ड मधील कंत्राटदाराची निविदा भरण्याची सक्षमता (बीड कॅपॅसिटी) अ- गेल्या ५ (पाच) वर्षांतील कमीत कमी वार्षिक उलाढाल (चालू दराने) गेल्या ५ (पाच) वर्षांतील जास्तीत जास्त वार्षिक उलाढाल (चालू दराने) असे वाचावे.
६. पृ.क्र.१३ वरिल परि.क्र.२.९.५ ऐवजी २.१० वाचावा व त्या प्रमाणे सुधारणा करावी.
७. क्षेत्रीय स्तरावर यापूर्वी वापरात असलेल्या बी-१, SBD व EPC निविदा नमुन्यात मुख्य अभियंता यांनी आवश्यक सुधारणा कराव्यात.

सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आले असून त्याचा संकेतांक २०१८१०२२१५०२५२४९१८ असा आहे. हे परिपत्रक डिजीटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.

**Sachin Manikrao
Chivate**

Digitally signed by Sachin Manikrao Chivate
DN: cn=Sachin Manikrao Chivate, ou=Public Works Department,
postalCode=400032, st=Maharashtra,
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3,
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1d8622a, cn=Sachin Manikrao Chivate
Date: 2018.10.22 15:07:28 +05'30'

(सचिन चिवटे)

अवर सचिव (इमारती) महाराष्ट्र शासन

प्रति,

१. सार्वजनिक बांधकाम विभाग/वित्त विभाग/ग्राम विकास विभाग
२. महालेखापाल-१, मुंबई
३. महालेखापाल-२, नागपूर
४. अधिदान व लेखाधिकारी, मुंबई/नागपूर
५. महासंचालक, माहिती व प्रसिध्दी महासंचालनालय, मुंबई यांना प्रसिध्दीसाठी

प्रत, माहिती व आवश्यक कार्यवाहीसाठी,

६. सर्व मुख्य अभियंते, सार्वजनिक बांधकाम प्रादेशिक विभाग, (विद्युतसह)
७. मुख्य वास्तुशास्त्रज्ञ सार्वजनिक बांधकाम विभाग, मुंबई
८. संचालक, उद्याने व उपवने, मुंबई
९. सर्व अधीक्षक अभियंते, सार्वजनिक बांधकाम विभाग, (विद्युत/यांत्रिकी)
१०. अधीक्षक अभियंता यांनी आपल्या अधिनस्त विभागातील कार्यालयांना सदर शासन निर्णयाची प्रत अग्रेषित करावी.
११. मुख्य अभियंता /अधीक्षक अभियंता, पोलीस गृहनिर्माण व कल्याण महामंडळ, वरळी, मुंबई
१२. सर्व सहसचिव/उपसचिव/अवर सचिव/कार्यासन अधिकारी, सा.बां.वि., मंत्रालय, मुंबई
१३. कार्यासन (इमारती-२) निवड नस्ती

सार्वजनिक बांधकाम विभागाच्या निविदा प्रक्रिये अंतर्गत निविदा
तपासणी, स्विकृती, देयके अदा करणे व निविदा अंतिम
झाल्यानंतर दोषदायित्व कालावधी व काम अंतिम करण्यापर्यंत
अधिकारी/ कर्मचाऱ्यांच्या उत्तरदायित्वाबाबत सुधारित सूचना

महाराष्ट्र शासन,
सार्वजनिक बांधकाम विभाग
शासन निर्णय क्रमांक : सीएटी/२०१८/प्र क्र १२७/इमा-२
मंत्रालय, मुंबई ४०० ०३२
दिनांक : २८ नोव्हेंबर, २०१८

- वाचा :** (१) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्रमांक : सीएटी/२०१७/प्र.क्र.८/इमा-२,
दिनांक १२ एप्रिल, २०१७.
(२) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्रमांक : सीएटी/२०१७/प्र.क्र.८/इमा-२,
दिनांक २७ सप्टेंबर, २०१८.

प्रस्तावना :-

सार्वजनिक बांधकाम विभागामध्ये रस्ते, पूल बांधकाम, परिरक्षण व दुरुस्ती तसेच इमारती बांधकाम परिरक्षण व दुरुस्तीच्या अनुषंगाने विविध प्रकारच्या निविदा मागविताना व सक्षम स्तरावर स्विकृती करून कामे पूर्ण करण्याबाबत विविध सूचना यापूर्वी शासनाने संदर्भान्वये निर्गमित केलेल्या आहेत. सा.बां.विभागांतर्गत निश्चित करण्यात येणाऱ्या सर्व निविदांमध्ये निविदा सोबत कंत्राटदाराने केलेल्या कामाची देयके व मोजमापे तसेच देयके व अन्य पत्रव्यवहारात जोडलेली सर्व कागदपत्रे सत्य / खरी असल्याबाबतचे शपथपत्र जोडणे बंधनकारक केलेले आहे. या शपथपत्रानुसार निविदा सोबत तसेच देयका सोबत जोडलेली कागदपत्रे खोटी / बनावट निघाल्यास कंत्राटदार स्वतः जबाबदार असून सदर बाबतीत ते योग्य त्या कारवाईस पात्र असतात.

२. सा.बां.विभागांतर्गत काही ठिकाणी कार्यारंभ आदेशापूर्वी किंवा कार्यारंभ आदेश दिल्या नंतर कंत्राटदाराने निविदे सोबत जोडलेली काही कागदपत्रे खोटी असल्याची बाब निदर्शनास आलेली आहे. कंत्राटदाराने नोंदणीसाठी सादर केलेली कागदपत्रेही खोटी / बनावट असल्याचे निदर्शनास आले आहे. सा.बां. विभागाकडे असलेले मर्यादित मनुष्यबळ, असलेल्या कामाचा व्याप, ई-निविदेमुळे कंत्राटदारांमार्फत अपलोड केल्या जाणाऱ्या मोठ्या संख्येतील कागदपत्रे इत्यादी बाबींमुळे निविदेसोबत जोडलेल्या सर्वच कागदपत्रांची छाननी करून सत्यता पडताळणी (Forensic तपासणी) करणे सा.बां.विभागाच्या अधिकार्यांना शक्य होत नाही. तथापि, सदर बाबतीत क्षेत्रीय स्तरावरील अधिकार्यांना विभागीय चौकशी तसेच भारतीय दंड विधानानुसार पोलिस कारवाईसाठी जबाबदार धरण्यात येत असल्याबाबतची बाब शासनाच्या निदर्शनास आलेली असून या अनुषंगाने या सर्व प्रकरणी शासन स्तरावरही विविध प्रकरणांच्या सखोल अभ्यासाअंती या सर्व बाबींचा सर्वंकष अभ्यास करून खालील बाबींवर सविस्तर सूचना या शासन निर्णयाद्वारे प्रस्तुत करण्यात येत आहेत :-

(१) आता यापूढे रु.३ लक्ष आतील स्थानिक व रु.३ लक्ष वरील किंमतीच्या e (ई) निविदेसोबत जोडलेली (अपलोड केलेली) सर्व कागदपत्रे खरी असल्याबाबतचे प्रतिज्ञापत्र (परिशिष्ट-१) ५००/- रुपयाच्या स्टॅम्प पेपरवर लिफाफा क्र.१ मध्ये जोडणे कंत्राटदारास बंधनकारक करण्यात येत आहे. त्यानुसार निविदा कागदपत्रात आवश्यक बदल कार्यकारी / अधीक्षक / मुख्य अभियंता यांनी तात्काळ करावेत. निविदेतील लिफाफा क्र.१ मध्ये तसेच निविदा मंजुरी व नंतर देयके अदा करताना जोडलेली कागदपत्रे खोटी व बनावट असल्याची बाब निविदा उघडल्यानंतर निदर्शनास आल्यास कंत्राटदार पूर्णपणे जबाबदार राहतील. सा.बां.विभागाचे अधिकारी जबाबदार असणार नाहीत याबाबतचा स्पष्ट उल्लेख निविदेत करावा.

(२) निविदा लिफाफा क्र.१ उघडल्यानंतर कंत्राटदाराने निविदेसोबत जोडलेल्या कागदपत्रातील कोणतीही कागदपत्रे खोटी असल्याचे आढळून आल्यास संबंधित अभियंता यांनी लिफाफा क्र.२ न उघडता सदर कंत्राटदाराची निविदा अपात्र ठरवावी. संबंधित कंत्राटदार नोंदणीकृत असल्यास त्यास काळ्या यादीत टाकणेची प्रक्रीया विहित नियमानुसार कंत्राटदारास स्पष्टीकरण देण्याची संधी देणारी नोटीस देऊन व त्याचे स्पष्टीकरण विचारात घेऊन व तपासून त्यास अंतिमतः काळ्या यादीत टाकणेचा प्रस्ताव शासनास सादर करावा. कंत्राटदार नोंदणीकृत नसल्यास त्यास न्यायालयात Caveat दाखल करून व कंत्राटदारास १५ दिवसांची नोटीस देऊन त्यावर कंत्राटदाराचे उत्तर प्राप्त करून घ्याव्याती कंत्राटदारास काळ्या यादीत टाकणे बाबतचा प्रस्ताव शासनास सादर करावा. ही बाब महाराष्ट्र शासनाच्या अन्य सर्व विभागांना तसेच शासनाच्या इतर उपक्रमांना कळविण्याची कार्यवाही त्वरीत करावी.

(३) निविदा स्विकृती पूर्वी निविदेसोबत जोडलेल्या कागदपत्रात, कार्यारंभ आदेश स्तरावर व ते निर्गमित केल्यानंतर अथवा निविदा कालावधी, दोषदायित्व कालावधी व पत्रव्यवहार यात व देयक अदा करताना कोणतीही कागदपत्रे खोटी असल्याचे आढळून आल्यास संबंधित अभियंता यांनी भा.दं.वि.सं. अंतर्गत कंत्राटदाराविरुद्ध फौजदारी गुन्हा दाखल करण्याची कार्यवाही तातडीने करावी.

(४) शासनाने रु.१५० लक्ष रकमेपेक्षा जास्त रकमेच्या निविदांसाठी कंत्राटदाराच्या नोंदणीची अट काढून टाकलेली असल्यामुळे सदर बाबतीत निविदा सादर करणाऱ्या कंत्राटदार, व्यक्ती, भागीदारी संस्था, संस्था चालक, कंपनी व्यवस्थापक इ.विरुद्ध संबंधित कार्यकारी अभियंता यांनी भा.दं.वि.सं. अंतर्गत कंत्राटदाराविरुद्ध फौजदारी गुन्हा दाखल करण्याची कार्यवाही तातडीने करावी.

(५) सा.बां.विभागात निविदेसोबत जोडलेल्या बऱ्याचश्या कागदपत्रांची तपासणी महालेखापालांचे स्वतंत्र प्रतिनिधी म्हणून निविदा लिपीक, विभागीय लेखाधिकारी, उप कार्यकारी अभियंता तसेच कार्यकारी अभियंता यांचेकडून केली जाते. पूर्वी याबाबत नियमात स्पष्टता नव्हती, आता या शासन निर्णयानुसार निविदेसोबत जोडलेल्या खोट्या कागदपत्रांसंदर्भात संपूर्णपणे निविदा सादर करणारे कंत्राटदार जबाबदार राहतील. सार्वजनिक बांधकाम विभागाचे निविदा छाननी करणारे अधिकारी जबाबदार राहणार नाहीत.

(६) निविदा स्विकृती कार्यकारी अभियंता, अधीक्षक अभियंता, मुख्य अभियंता तसेच शासन स्तरावरील विविध समित्या यांच्या स्तरावर केली जाते. निविदा स्विकृती नंतर कंत्राटदाराने सादर केलेली कागदपत्रे खोटी आढळल्यास त्यासाठी संबंधित निविदा स्विकृत करणारे अधिकारी/समिती जबाबदार राहणार नाहीत. खोट्या / बनावट कागदपत्रांसाठी कंत्राटदार जबाबदार राहतील व त्यांचेवर भारतीय दंड विधान संहिते नुसार कार्यकारी अभियंता यांनी फौजदारी गुन्हा दाखल करावा.

(७) कार्यारंभ आदेश दिल्यानंतर कंत्राटदारांमार्फत सादर होणाऱ्या देयकांसोबत जोडण्यात आलेली कागदपत्रे खोटी आढळल्यास त्यासाठीही संबंधित कंत्राटदार भारतीय दंड संहितेच्या विविध कलमा प्रमाणे कारवाईस पात्र राहतील, अशा निविदेतील कामे प्रारंभिक स्तरावर असल्यास निविदा रद्द करावी व कंत्राटदारास उपरोक्तप्रमाणे काळ्या यादीत टाकणेत येईल, अशी अट निविदेत समाविष्ट करण्यात यावी व सदर बाबतही वरीलप्रमाणे कार्यवाही करण्यात यावी.

(८) निविदा अंतिम करताना व दोष दायित्व कालावधीत मुळ निविदा व त्या नंतरचा पत्रव्यवहार, कंत्राटदाराची देयके व त्यासोबतची साहित्य खरेदीची व अन्य बाबींची पूर्तता कागदपत्रे, चाचणी अहवाल इ. गुणवत्ता विषयक कागदपत्रे बनावट आढळल्यास त्यास कंत्राटदार संपूर्णतः जबाबदार राहिल. यासाठी सा.बां.विभागाचे अधिकारी / कर्मचारी तसेच विभागीय लेखाधिकारी जबाबदार असणार नाहीत.

(९) या सुचना पूर्वलक्षी प्रभावाने लागू राहतील.

३. या शासन निर्णयाचे काटेकोरपणे पालन होईल याची दक्षता सर्व संबंधित कार्यकारी अभियंता/अधीक्षक अभियंता/ मुख्य अभियंता यांनी स्वतः जातीने लक्ष घालून घ्यावी व याबाबत परिशिष्ट-२ मध्ये नमूद केलेल्या विवरणपत्रात आर्थिक वर्ष संपल्यानंतर पुढील वर्षात मुख्य अभियंता यांनी १ एप्रिल ते १५ एप्रिल पर्यंत व जास्तीत जास्त उशीरा ३० एप्रिल पर्यंत वार्षिक अहवाल सादर करावा.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या वेबसाईटवर प्रसिध्द करण्यात आला असून त्याचा संकेतांक क्रमांक २०१८११२८१३२७०८८८१८ असा आहे. हा आदेश डिजिटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

Sachin
Manikrao
Chivate

Digitally signed by Sachin Manikrao Chivate
DN: c=IN, o=Government Of Maharashtra,
ou=Public Works Department,
postalCode=400032, st=Maharashtra,
2.5.4.70=ef10f55a8b0fdaa577e9ee46d1b79
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serialNumber=40a8432c80c3e4ea1b574-b37
82ed6c133b938933bd197ed5a1551d8622a,
cn=Sachin Manikrao Chivate
Date: 2018.11.28 13:35:01 +05'30'

सोबत : (१) परिशिष्ट-१ - रु.५००/- च्या स्टॅम्प पेपर वर कंत्राटदाराने

द्यावयाचा शपथपत्राचा नमूना मराठी व इंग्रजी

(२) परिशिष्ट-२

(सचिन चिवटे)

अवर सचिव, महाराष्ट्र शासन

प्रति,

- १) मा.मुख्यमंत्री यांचे प्रधान सचिव, मुख्यमंत्री कार्यालय, मंत्रालय, मुंबई
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- ४) मुख्य सचिव, महाराष्ट्र राज्य, मंत्रालय, मुंबई,
- ५) मंत्रालयीन सर्व विभागातील अपर मुख्य सचिव/प्रधान सचिव/सचिव,
- ६) अपर मुख्य सचिव (गृह विभाग)

यांना विनंती करण्यात येते की, सदरच्या शासन निर्णयातील सूचनांचे पालन करण्याबाबत आपल्या अधिपत्याखालील सर्व संबंधितांना कळविण्यात यावे.

- ७) उपाध्यक्ष तथा व्यवस्थापकीय संचालक, महाराष्ट्र राज्य रस्ते विकास महामंडळ, मुंबई.
- ८) महालेखापाल-१, मुंबई
- ९) महालेखापाल-२, नागपूर
- १०) अधिदान व लेखाधिकारी, मुंबई/नागपूर
- ११) प्रत, महासंचालक, माहिती व प्रसिध्दी महासंचालनालय, मुंबई यांना प्रसिध्दीसाठी

प्रत, माहिती व आवश्यक कार्यवाहीसाठी,

- १) सर्व मुख्य अभियंते, सार्वजनिक बांधकाम प्रादेशिक विभाग, (विद्युतसह)
- २) मुख्य वास्तुशास्त्रज्ञ, सार्वजनिक बांधकाम विभाग, मुंबई
- ३) संचालक, उद्याने व उपवने, मुंबई
- ४) सर्व अधीक्षक अभियंते, सार्वजनिक बांधकाम विभाग, (विद्युत / यांत्रिकी) / सर्व कार्यकारी अभियंते.
- ५) अधीक्षक अभियंता यांनी आपल्या अधिनस्त विभागातील कार्यालयांना सदर शासन निर्णयाची प्रत अग्रेषित करावी.
- ६) मुख्य अभियंता / अधीक्षक अभियंता, पोलीस गृहनिर्माण व कल्याण महामंडळ, वरळी, मुंबई
- ७) सर्व सहसचिव/उपसचिव/अवर सचिव/कार्यासन अधिकारी, सा.बां.वि., मंत्रालय, मुंबई
- ८) कार्यासन इनारती-२ (निवड नस्ती).

परिशिष्ट -१

(१) मराठी

नमुना सत्यप्रतिज्ञापत्र (रु.५००/- च्या स्टॅम्प पेपरवर)

सत्यप्रतिज्ञापत्र (Affidavit)

मी ----- वय वर्षे ----- राहणार ----

----- या सत्यप्रतिज्ञा पत्राव्दारे लिहून देतो की, मी ----- या फर्मचा/ कंपनीचा मालक असून ----- या कामासाठी निविदा सादर करीत आहे. त्या निविदेच्या लिफाफा क्र.१ मध्ये जी कागदपत्रे सादर केली आहेत ती खरी, बरोबर व पूर्ण आहेत, त्यामध्ये कोणत्याही त्रुटी, चुका नाहीत, याची मी खात्री केलेली असून असे शपथपूर्वक खालील अटी व शर्तीसह मान्य करीत आहे. या कागदपत्रांमध्ये काही चुकीची, दिशाभूल करणारी, खोटी व तसेच अपूर्ण माहिती आढळल्यास मी भारतीय दंडसंहिता अंतर्गत कायदेशीर कार्यवाहीस पात्र राहीन.

१. जर कंत्राट कालावधीदरम्यान, मी, माझ्या कार्यालयाने किंवा माझ्या कर्मचा-यांनी सार्वजनिक बांधकाम विभागाला कोणतीही खोटी माहिती किंवा देयकासमवेत तसेच पत्रव्यवहारात खोटी / बनावट साहित्य खरेदीची कागदपत्रे सादर केली असल्यास, मी भारतीय दंडसंहिता अंतर्गत कायदेशीर कार्यवाहीस पात्र राहीन.

२. जर कंत्राट कालावधीदरम्यान आणि काम समाप्ती नंतर, अंतिम देयक देण्याच्या तारखेपर्यंत सादर केलेले कोणतेही कागदपत्रे खोटी / बनावट किंवा फसवी आढळल्यास, मी भारतीय दंडसंहिता अंतर्गत कायदेशीर कार्यवाहीस पात्र राहीन.

३. जर काम समाप्तीनंतर दोष दायित्व कालावधी दरम्यान किंवा त्यानंतर कोणत्याही वेळी, कोणतीही माहिती किंवा कागदपत्रे खोटी/बनावट, फसवी किंवा दिशाभूल करणारी आढळल्यास, मी भारतीय दंडसंहिता अंतर्गत कायदेशीर कार्यवाहीस पात्र राहीन.

कंत्राटदाराची सही/शिक्का

(2) English

Affidavit (on Rs.500/- Stamp Paper)

I age address

..... (Authorized signatory to sign the contract), hereby submit, vide this affidavit in truth, that I am the owner of the contracting firm / authorized signatory and I am submitting the documents in envelope no.1 for the purpose of scrutiny of the contract. I hereby agree to the conditions mentioned below :-

1. I am liable for action under Indian Penal Code for submission of any false / fraudulent paper / information submitted in envelope no.1.

2. I am liable for action under Indian Penal Code if during contract period and defect liability period, any false information, false bill of purchases supporting proof of purchase, proof of testing submitted by my staff, subletting company or by myself, I will be liable for action under Indian Penal Code.

3. I am liable for action under Indian Penal Code if any paper are found false / fraudulent during contract period and even after the completion of contract (finalisation of final bill).

(Signature of contractor)
(seal of company)

परिशिष्ट - २

खोटी व बनावट कागदपत्रे सादर करणाऱ्या कंत्राटदारावर करण्यात आलेल्या कारवाईचा
तपशील, प्रादेशिक विभाग

अ.क्र	प्रादेशिक विभाग / जिल्हा / सा.बां.मंडळ	खोटी / बनावट कागदपत्रे सादर करणारे कंत्राटदार/ सु. बे. अ. कंत्राटदार / मजूर सहकारी कंत्राटदार संस्था / पूरवठा कंत्राटदारांचे नाव	प्रकरणांचा तपशील व बनावट कागदपत्रे आढळल्याचा दिनांक	कंत्राटदारावर गुन्हा दाखल केल्याचा दिनांक, गुन्हाचा तपशील FIR सह	शेरा
	एकत्रित एकूण				

स्वाक्षरी
(मुख्य अभियंता)

* आर्थिक वर्षात दाखल एकूण प्रकरणांपैकी दोष सिद्ध प्रकरणांची संख्या

निविदा करारपत्रातील कामातील
उणीवांच्या दुरुस्तीचा कालावधी (Defect
Liability Period) निश्चित करणे.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन निर्णय क्रमांक : संकीर्ण-२०१८/प्र.क्र.१५१/इमारती-२,
मंत्रालय, मुंबई - ४०० ०३२,
दिनांक : १४ जानेवारी, २०१९

वाचा - सार्वजनिक बांधकाम विभाग, शासन निर्णय क्रमांक-सीएटी-१०८७/सीआर-९४/इमारती-२,
मंत्रालय, मुंबई - ४०० ०३२, दिनांक : १४ जून, १९८९

प्रस्तावना :-

सार्वजनिक बांधकाम विभागामध्ये करण्यात येणाऱ्या रस्ते, पूल, इमारतींच्या मूळ तसेच दुरुस्तीच्या विविध बांधकामांसाठी संदर्भित परिपत्रकाद्वारे सन १९८९ मध्ये दोष दायित्व कालावधी (Defect Liability Period) निर्धारित करण्यात आला असून त्यानंतर त्यामध्ये सुधारणा करण्यात आलेल्या नाहीत. सन १९८९ नंतर गेल्या तीस वर्षांच्या कालावधीत बांधकाम साहित्याचे प्रकार तसेच बांधकामाच्या तंत्रज्ञानामध्ये मोठ्या प्रमाणात आमुलाग्र बदल झाले आहेत, तसेच बांधकामासाठी वापरण्यात येणाऱ्या साहित्यांचा दर्जा व विविधतेत मोठ्या प्रमाणावर बदल होत आहेत.

सार्वजनिक बांधकाम विभागामध्ये सर्वसाधारणपणे भारतीय रस्ते महासभा यांची मानके व रस्ते वाहतूक व महामार्ग मंत्रालयाच्या विनिर्देशानुसार रस्ते व पुलांची बांधकामे करण्यात येतात. रस्ते व पूल यांची बांधकामे करणारी रस्ते वाहतूक व महामार्ग मंत्रालयाने त्यांचे बांधकामांसाठी दोष दायित्व कालावधी नव्याने निर्धारित केले आहेत.

वाहतूक क्षेत्रात होत असणाऱ्या प्रचंड वाहतुकीची वाढ व त्यानुसार बदलत्या बांधकाम क्षेत्रातील कार्यपद्धती यांचा विचार करता बांधकाम खात्रीने दोषरहित होणे व टिकाऊ होणे व यादृष्टीने करारनाम्यातील दोष दायित्व / उणीवांच्या दुरुस्तीचा कालावधी (Defect Liability Period) सुधारीत करण्याची बाब शासनाच्या विचाराधीन होती.

शासन निर्णय :-

सार्वजनिक बांधकाम विभागामध्ये करण्यात येणाऱ्या रस्ते, पूल, इमारतींच्या मूळ तसेच दुरुस्तीच्या विविध बांधकामांसाठी खालीलप्रमाणे दोष दायित्व कालावधी (Defect Liability Period) निर्धारित करण्याचा निर्णय घेण्यात आला आहे.

अ.क्र.	बांधकामाचा प्रकार	प्रस्तावित दोष दायित्व कालावधी
अ) इमारती		
१.	मूळ बांधकामे	
	१.१) आर.सी.सी. फ्रेमचे बांधकाम	१० वर्षे
	१.२) लोड बेअरींगचे बांधकाम	१० वर्षे
	१.३) जल प्रतिबंधक उपाय योजना	७ वर्षे
२.	दुरुस्ती	
	२.१) विविक्षित / भांडवली स्वरुपाची दुरुस्ती (SDR/CTR)	५ वर्षे
	२.२) विशेष दुरुस्ती (Special Repairs)	२ वर्षे
	२.३) किरकोळ दुरुस्ती (Current Repairs)	१ वर्षे
ब) रस्ते		
१.	डांबरीकरण / Flexible Pavement	
	१.१) संकल्पनानुसार पूर्ण तरतूद करून बांधकाम	५ वर्षे
	१.२) मजबूतीकरण / पूर्ण लांबीमध्ये किमान दोन थर - MPM/ BM	३ वर्षे
	१.३) DBM चा १ थर व त्यावर B.C. / O.G.C. चा थर किंवा संकल्पनानुसार पहिल्या टप्प्याचे बांधकाम (Stage Construction)	३ वर्षे
	१.४) फक्त डांबरी नुतनीकरण - पूर्ण लांबीमध्ये एक थर	२ वर्षे
	१.५) भागाभागात patches of MPM/ BM/DBM चा १ थर व त्यावर पूर्ण लांबीत B.C. / O.G.C. चा थर	२ वर्षे

२.	कॉन्क्रीटीकरण / Rigid Pavement	
	२.१) संकल्पनानुसार ३० से.मी. किंवा त्यापेक्षा जास्त जाडी	१० वर्षे
	२.२) संकल्पन न करता केलेल्या पायवाटा, गावांतर्गत रस्ते व अन्य रस्ते	३ वर्षे
	२.३) कॉन्क्रीट पेव्हर ब्लॉक वापरून केलेली कामे	५ वर्षे
३.	रस्ते खडीकरण	१ वर्ष
४.	रस्ते किरकोळ दुरुस्ती	१ वर्ष
	४.१) डांबर मिश्रित खडीने खड्डे भरणे, चुना गेरू रंगविणे.	(डिसेंबर ते जुन) नजिकच्या पावसाळ्या पर्यंत
	४.२) आय.आर.सी. मानकानुसार बसविलेले फलक	५ वर्षे
	४.३) मार्गिका दर्शक व इतर थर्मोप्लास्टिक पेंट	३ वर्षे
क) पूल व मोऱ्या		
१.	मूळ बांधकाम	
	१.१) पूलाचे बांधकाम	२० वर्षे
	१.२) स्लॅब ड्रेन व पाईप मोऱ्या	१० वर्षे
	१.३) कॉन्क्रीटच्या बांधीव गटारी Built Up Gutter	१० वर्षे
२.	दुरुस्ती	
	२.१) विशेष दुरुस्ती - बेअरींग बदलणे, प्रसरण सांधे बदलणे, पॅरापेट वॉलची पुनर्बांधणी करणे, पाईप रेलींग बसविणे, पिअर/ अबटमेंटला जॅकेटींग करणे, इत्यादी.	५ वर्षे
	२.२) पुलावरील बेअरींग कोर्स	५ वर्षे
	२.३) पुलाचे इपॉक्सी पेंटने पेंटिंग करणे व तत्सम दुरुस्ती करणे	३ वर्षे

पूर्ण करण्यात आलेल्या बांधकामांची दोष दायित्व कालावधीत वर्षातून किमान दोनदा (सर्वसाधारणपणे पावसाळ्यापूर्वी व पावसाळ्यानंतर) पाहणी करण्याची जबाबदारी संबंधित उप विभागीय अभियंता यांची राहिल.

दोष दायित्व कालावधीत कामामधील उणीवा बारकाईने तपासाव्यात. जर आढळलेल्या उणीवा ह्या दुरुस्ती करण्याच्या आवाक्याबाहेर असल्यास / पूर्ण कामच नव्याने करावयाची आवश्यकता असल्यास त्याप्रमाणे पुन्हा बांधकाम करण्यासाठी कंत्राटदारास सूचना देऊन तीन महिन्यामध्ये काम नव्याने करून घेण्यात यावे. या बाबतीत काही वाद उद्भवल्यास मुख्य अभियंता यांना अहवाल सादर करून त्यांचेकडून निर्णय घेण्यात यावा. मुख्य अभियंता यांचा निर्णय हा अंतिम व कंत्राटदारास बंधनकारक राहिल अशा स्वरूपाची भर निविदेत नमूद करावी.

उपविभागीय अभियंता यांनी दोष दायित्व कालावधीमध्ये वरीलप्रमाणे पाहणी केल्यानंतर कामामध्ये दोष / उणीवा आढळल्यास कंत्राटदाराकडून त्या त्या वेळी आवश्यक दुरुस्ती / पुनर्बांधणी करून घेण्यात यावी. दोष दायित्व कालावधी संपण्याच्या किमान तीन महिने आधी कार्यकारी अभियंता व उप अभियंता यांनी एकत्रितपणे कामाची पाहणी करून त्या अनुषंगाने कंत्राटदाराने केलेल्या दुरुस्तीबाबतचा आढावा घ्यावा ६०० मीटरपेक्षा जास्त लांबीच्या पुलांची व १००० स्क्वे.फु.मी. जोते क्षेत्रफळापेक्षा जास्त जोते क्षेत्रफळ असलेल्या इमारतीचे दुरुस्ती कामांचे पूर्वनिरीक्षण अधीक्षक अभियंता यांनी दर सहामाही करावे.

२. निविदेमधील प्रपत्रामध्ये विविध प्रकारच्या कामांसाठी उणीवा दुरुस्तीचा कालावधी उपरोक्त तक्त्यामध्ये नमूद केल्याप्रमाणे ठेवण्यात यावा. तसेच निविदा प्रपत्रामध्ये दोष दायित्व कालावधीत करावयाच्या पाहणी व दुरुस्तीबाबत उपरोक्त परिच्छेदात नमूद बाबी निविदेमधील कलमांमध्ये अंतर्भूत करण्यात याव्यात.
३. यापूर्वीच्या परिपत्रकातील या संदर्भात देण्यात आलेल्या सर्व सूचना अधिक्रमीत करून या सूचना प्रसिध्द होण्याच्या दिनांकापासून लागू राहतील.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या वेबसाईटवर प्रसिध्द करण्यात आला असून त्याचा संकेतांक क्रमांक २०१९०११४९२३७१७३५१८ असा आहे. हा आदेश डिजीटल स्वाक्षरीने साक्षांकित करुन काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

Salunke
Bapurao
Popatrao

Digitally signed by Salunke Bapurao Popatrao
DN: cn=Salunke Bapurao Popatrao, o=Government Of Maharashtra,
ou=Public Works Department,
serialNumber=7530eace1b9c2035e21cb89045
80475fe6821c388c831b3e5c024de70c81,
cn=Salunke Bapurao Popatrao
Date: 2019.01.14 12:46:58 +05'30'

(बी.पी. सालुंके)

उप सचिव, महाराष्ट्र शासन

प्रति,

- १) सर्व मुख्य अभियंते, सार्वजनिक बांधकाम प्रादेशिक विभाग (विद्युतसह)
- २) मुख्य वास्तुशास्त्रज्ञ, सार्वजनिक बांधकाम विभाग, मुंबई
- ३) सर्व अधीक्षक अभियंते, सार्वजनिक बांधकाम विभाग (विद्युत/यांत्रिकी)
- ४) सर्व कार्यकारी अभियंते
- ५) कार्यासन इमारती २-(निवडनस्ती).

प्रत्यक्षपणे पार पडलेल्या बांधकामासाठी
करावयाच्या आगाऊ प्रदानाची तरतूद रद्द
करणेबाबत..

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग,
शासन निर्णय क्र.संकीर्ण-२०१८/प्र.क्र.१५०/इमारती-२
मंत्रालय, मुंबई ४०० ०३२
दिनांक : १६ जानेवारी, २०१९

प्रस्तावना :-

महाराष्ट्र सार्वजनिक बांधकामे लेखासंहितेमध्ये परिच्छेद क्र. २.१.१ मध्ये आगाऊ रक्कमे देणे बाबत नमूद केले आहे. आगाऊ रक्कम देणे या संज्ञेचा अर्थ कंत्राटदारास त्याने केलेल्या परंतू न मोजलेल्या कामाबद्दल चालू खात्यावर दिलेली रक्कम असा होतो. महाराष्ट्र सार्वजनिक बांधकामे लेखासंहितेमध्ये परिच्छेद क्र. १०.२.२१ मध्ये नियमाप्रमाणे कंत्राटदारास आगाऊ रकमा देण्यास मनाई आहे. तथापि, खालील अपवादात्मक परिस्थितीमध्ये कंत्राटदारांना आगाऊ रक्कम देण्याची बाब नमूद आहे.

१) कंत्राटदाराचे कंत्राट तयार बांधकामाचे आहे, अशा कंत्राटदाराच्या बाबतीत जागेवर आणलेल्या सामानांच्या प्रतिभूतीवर कंत्राटदारास आगाऊ रक्कम मंजूर करता येण्याची बाब नमूद आहे.

२) भारतीय विद्युत अधिनियम, १९१० अन्वये विद्युत पूरवठा उपक्रमास आगावू रक्कम देणे.

तसेच महाराष्ट्र सार्वजनिक बांधकामे लेखासंहितेमध्ये परिच्छेद क्र. १०.२.२२ मध्ये “ प्रत्यक्षपणे पार पडलेल्या बांधकामासाठी करावयाचे आगाऊ प्रदान हे बांधकामाच्या ज्या परिमाणाबद्दल पैसे दिले आहेत अशा अर्थाच्या (उपविभागीय अधिकाऱ्याच्या दर्जापेक्षा कमी दर्जा नसलेल्या) जबाबदार अधिकाऱ्याच्या प्रमाणपत्रावर करता येईल. आणि असे प्रमाणपत्र देणाऱ्या अधिकाऱ्यास परिणामतः त्या बांधकामावर कोणतेही अतिप्रदान झाल्यास व्यक्तीशः जबाबदार धरण्यात येईल. तथापि, कोणत्याही परिस्थितीत तपशिलवार मोजणीशिवाय अंतिम प्रदान करण्यात येणार नाही.” अशी बाब नमूद आहे.

उपरोक्त तरतूदीनुसार क्षेत्रीय स्तरावर कंत्राटदारास आगाऊ रक्कम देण्याबाबत कार्यवाही करण्यात येत आहे. तथापि, आता शासनाच्या निदर्शनास आले आहे की, महाराष्ट्र सार्वजनिक बांधकाम लेखासंहितेतील कंत्राटदारास आगाऊ रक्कम देण्याच्या तरतूदींचा गैरवापर होत आहे. त्यास अनुसरून खालीलप्रमाणे सुचना देण्यात येत आहेत :-

शासन निर्णय :

१) महाराष्ट्र सार्वजनिक बांधकाम लेखासंहितेतील परिच्छेद क्र. १०.२.२२ मधील प्रत्यक्षपणे पार पडलेल्या बांधकामासाठी करावयाचे आगाऊ प्रदानाची तरतूद यापुढे रद्द करण्यात येत आहे. त्यानुसार यापुढे प्रत्यक्षपणे पार पडलेल्या बांधकामाचे प्रदान पूर्णपणे मोजमापे घेवून सार्वजनिक बांधकाम विभागाच्या नियमपुस्तिकेतील तरतूदी पूर्ण केल्यानंतरच करण्यात यावे. यापुढे स्थापत्य, विद्युत अथवा अन्य कामांची प्रत्यक्ष झालेल्या कामाचे सविस्तर मोजमापे घेतल्याशिवाय (Work done but not measured) देयके कोणत्याही परिस्थितीत प्रदान करण्यात येवू नये.

२) ज्या कंत्राटदाराचे कंत्राट तयार बांधकामाचे आहे अशा कंत्राटदाराच्या बाबतीत जागेवर आणलेल्या साहित्या प्रतिभूतीवर (Security advance) देतेवेळी महाराष्ट्र सार्वजनिक बांधकाम लेखासंहितेतील परिच्छेद क्र. १०.२.२१ मधील तरतूदींचे काटेकोरपणे पालन करण्यात यावे. साहित्याचे फोटो अशांश रेखांशासह घेणेत यावेत व ते सार्वजनिक बांधकाम विभागाच्या संकेत स्थळावर Upload केल्यानंतर व कार्यकारी अभियंता यांनी स्वतः संकेत स्थळावर पाहिल्यानंतर देयक अदा करावे व तसे प्रमाणपत्र देयकासोबत जोडावे. मार्च महिन्यात Secured advance देण्यात येवू नये. हे आदेश B-१, SBD, C या कंत्राटांना लागू असतील. EPC व HAM कंत्राटांना हया तरतुदी लागू होणार नाहीत.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या वेबसाईटवर प्रसिध्द करण्यात आले असून त्याचा सांकेतांक क्रमांक २०१९०११६१११६२१५०१८ असा आहे. हा आदेश डिजीटल स्वाक्षरीने साक्षांकित करुन काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.

**Sachin Manikrao
Chivate**

Digitally signed by Sachin Manikrao Chivate
DN: CN = Sachin Manikrao Chivate, C = IN,
S = Maharashtra, O = Government Of
Maharashtra, OU = Public Works
Department
Date: 2019.01.16 11:27:25 +05'30'

(सचिन चिवटे)

अवर सचिव, महाराष्ट्र शासन

प्रति,

- १) सर्व मुख्य अभियंते, सार्वजनिक बांधकाम प्रादेशिक विभाग (विद्युतसह)
- २) मुख्य वास्तुशास्त्रज्ञ, सार्वजनिक बांधकाम विभाग, मुंबई
- ३) महालेखापाल, (लेखापरिक्षा), महाराष्ट्र-१, मुंबई/नागपूर
- ४) महालेखापाल, (लेखा व अनुज्ञेयता), महाराष्ट्र-२, मुंबई/नागपूर
- ५) संचालक, उद्याने व उपवने, मुंबई
- ६) सर्व अधीक्षक अभियंते, सार्वजनिक बांधकाम विभाग (विद्युत/यांत्रिकी)
- ७) सर्व कार्यकारी अभियंते
- ८) कार्यासन इमारती-२ (निवडनस्ती)

सार्वजनिक बांधकाम विभागाच्या ई-निविदा
संदर्भातील दिनांक २७-०९-२०१८ च्या शासन
निर्णयातील तरतूदीबाबत स्पष्टीकरण...

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्र. सीएटी-२०१७/प्र.क्र.८/इमा-२
मादाम कामा रोड, हुतात्मा राजगुरु चौक,
मंत्रालय, मुंबई - ४०० ०३२
दिनांक : २९-०९-२०१९

- वाचा :- १. सार्वजनिक बांधकाम विभाग, शासन निर्णय क्र.सीएटी-२०१७/प्र.क्र.०८/इमा-२ दि.२७-०९-२०१८.
२. सार्वजनिक बांधकाम विभाग-शासन परिपत्रक क्र.सीएटी-२०१७/प्र.क्र.०८/इमा-२ दि.२२-१०-२०१८.
३. सार्वजनिक बांधकाम विभाग, शासन परिपत्रक क्र.सीएटी-२०१७/प्र.क्र.०८/इमा-२ दि.२६-११-२०१८.
४. सार्वजनिक बांधकाम विभाग, शासन परिपत्रक क्र.संकीर्ण-२०१८/प्र.क्र.१५१/इमा-२ दि.१४-०१-१८.

प्रस्तावना :-

सार्वजनिक बांधकाम विभागाच्या ई-निविदा प्रक्रीयेंतर्गत निविदा प्रसिध्दी, निविदा लिफाफे उघडणे आणि निविदा तपासणी व इतर अनुषांगिक बाबींबाबत सविस्तर शासन निर्णय दि. २७-०९-२०१८ निर्गमित करण्यात आला आहे. सदर शासन निर्णयातील काही तरतूदीसंदर्भात दि. २२-१०-२०१८ च्या परिपत्रकानुसार स्पष्टीकरण देण्यात आले आहे. त्यास अनुसरून शासन निर्णयातील काही तरतूदीबाबत क्षेत्रीय स्तरावर संभ्रम निर्माण होत असल्याचे मुख्य अभियंता यांनी शासनाच्या निदर्शनास आणले असून याबाबत खालीलप्रमाणे स्पष्टीकरण करण्यात येत आहे :-

१. दि.२७-०९-२०१८ च्या शासन निर्णयातील परिच्छेद ४.३ व परिच्छेद ४.४ मधील तरतूदीबाबत विसंगती दूर करण्यात येत असून परिच्छेद ४.३ मध्ये नमूद केल्याप्रमाणे प्रथम मागणीवेळी दोनच पात्र निविदा प्राप्त झाल्यास नियमानुसार लिफाफा क्र.२ (आर्थिक देकार) उघडून पुढील आवश्यक ती कार्यवाही करावी. प्रथम बोलीवेळी प्राप्त निविदांमध्ये तीन पात्र निविदा असण्याची आवश्यकता नाही.
२. दि.२७-०९-२०१८ शासन निर्णयातील परिच्छेद क्र.२.९ (क) मधील देय कामासाठी मागील ५ वर्षांपैकी कोणत्याही एका वर्षात ज्या महत्वाच्या परिमाणाच्या बाबी करावयाच्या असून त्याचे कमीत कमी परिमाण ३० % अपेक्षित आहे. असे करताना, प्राधान्यानुसार फक्त पाच महत्वाच्या बाबींसाठी परिमाण नमूद करावे.
३. दि.२७-०९-२०१८ च्या शासन निर्णयातील परिच्छेद क्र. २.२ व परिच्छेद क्र. २.९.१ (क) मधील तरतूदींच्या अनुषंगाने स्पष्ट करण्यात येते की, ज्या पूलांचा पाया निश्चित आहे अशा पूलांच्या रु. ५० कोटी किंमतीपर्यंतच्या निविदा EPC पध्दतीवर मागविण्यात याव्यात. इमारत बांधकामासाठी रु.१५ कोटी ते रु. २५० कोटी पर्यंतच्या निविदा SBD द्वारे व रु.२५० कोटी वरील रकमेच्या निविदा EPC पध्दतीने मागवाव्यात. अन्य बाबतीत दि. २७-०९-२०१८ मधील शासन निर्णयानुसार कार्यपध्दती अवलंबिण्यात यावी.

४. दि.२७-०९-२०१८ शासन निर्णयातील परिच्छेद २.८ मध्ये सुरक्षा ठेव रक्कम (Security Deposit) बाबत नमूद केले आहे. संदर्भ ४ वरील शासन निर्णयानुसार कामातील उणीवांच्या दुरुस्तीचा कालावधी (Defect Liability Period) निश्चित करण्यात आलेला आहे. उणीवांच्या दुरुस्तीच्या कालावधीत वाढ करण्यात आल्यामुळे सुरक्षा ठेव रक्कम कंत्राटदारास परत करण्याबाबत खालीलप्रमाणे सूचना देण्यात येत आहेत. सदरच्या सूचना संदर्भ-४ च्या शासन निर्णयाच्या दिनांकापासून लागू राहतील.

४.१ दोष दायित्व कालावधी पूर्ण झाल्यानंतर कामाची गुणवत्ता तपासणी करून संपूर्ण सुरक्षा ठेव रक्कम परत करावी.

४.२ दोष दायित्व कालावधी दोन वर्षापेक्षा जास्त असल्यास, काम पूर्ण झाल्यापासून दोन वर्षांच्या कालावधीनंतर एकूण सुरक्षा ठेव रक्कमेच्या ९०% रक्कम कंत्राटदारास परत करावी, व १०% रक्कम कोणत्याही राष्ट्रीयकृत बँकेच्या DD / FDR / BG च्या स्वरूपात घ्यावी व त्याचा कालावधी निविदेनुसार दोष दायित्व कालावधी संपल्यानंतर एक महिना कालावधीपर्यंत असावा. दोष दायित्व कालावधी पूर्ण झाल्यानंतर कामाची गुणवत्ता तपासणी करून सदरची रक्कम परत करावी.

५. दि.२७-०९-२०१८ शासन निर्णयातील परिच्छेद ५.५ मध्ये यंत्रसामुग्रीबाबत नमूद केले आहे. यामध्ये (२) अंतर्गत कामांसाठी नवीन यंत्रसामुग्रीचे आयुर्मान १५ वर्षे गृहीत धरण्यात येण्याबाबत सूचना दिलेल्या आहेत. तथापि, परिवहन विभागाने १५ वर्षांपुढील सुस्थितीतील वाहनांना परवाना दिल्यास सदरची यंत्रसामुग्री ग्राह्य धरण्यात यावी.

६. ब-याचदा आढळून आले आहे की, एकाच निविदा सूचनेतील बहुसंख्य अथवा सर्व कामांकरीता एकच कंत्राटदार निविदा सादर करतात. अशावेळी कंत्राटदाराचा आर्थिक देकार उघडल्यानंतर बीड कॅप्सिटीच्या पात्रतेनुसार बीड कॅप्सिटी रक्कमेपर्यंतच्या कामासाठी कंत्राटदारास पात्र ठरविले जाते. ज्यावेळी अशी बाब निदर्शनास येईल त्यावेळी संबंधित कंत्राटदाराने संबंधित प्रादेशिक विभागात सादर केलेल्या सर्व निविदा विचारात घेऊन बीड कॅप्सिटी परिगणित करून कंत्राटदाराकडून प्रथम प्राधान्यक्रम घेवून त्यानुसार बीड कॅप्सिटीच्या मर्यादेपर्यंतच निविदांचे आर्थिक देकार उघडण्यात यावेत.

७. अन्य बाबतीत असेही आढळून आहे आहे की, काही कंत्राटदार निविदा सादर केल्यानंतर म्हणजेच Bid lock झाल्यानंतर तांत्रिक लिफाफा उघडताना त्यांचा लिफाफा क्र.२ उघडण्यात येऊ नये असे लेखी पत्राव्दारे निविदा समितीत/संबंधितांस कळवितात. त्यामुळे कंत्राटदारांचे संगनमत (Cartel Formation) झाले असण्याची शक्यता नाकारता येत नाही. अशावेळी संबंधित कंत्राटदाराचा लिफाफा क्र.२ उघडण्यात यावा व आर्थिक देकार उघडल्यानंतर संबंधित

कंत्राटदार पात्र ठरल्यास कार्यारंभ आदेश देण्यासंदर्भात नियमानुसार कार्यवाही करण्यात यावी. जर कंत्राटदाराने काम करण्यास असमर्थता दर्शविल्यास त्याची अनामत रक्कम जप्त करण्यात येऊन अशा कंत्राटदारास संबंधित प्रादेशिक विभागातील सर्व निविदा प्रक्रीयेत भाग घेण्यास एका वर्षासाठी प्रतिबंध करण्यात यावा. यासंबंधी संबंधित प्रादेशिक विभागातील मुख्य अभियंता यांना पूर्ण अधिकार राहतील. अशा निविदा प्रक्रीयेमध्ये अल्प कालावधीची फेरनिविदा मागवून पुढील आवश्यक कार्यवाही करावी.

सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आले असून त्याचा संकेतांक २०१९०१३०१०४३५८६४१८ असा आहे. हे परिपत्रक डिजीटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.

Chandrashekhar
Prabhakar Joshi

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Department, postalCode=400032, st=Maharashtra,
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7f8219a1968860a131f89, cn=Chandrashekhar Prabhakar Joshi
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(चंद्रशेखर जोशी)

सचिव (रस्ते), महाराष्ट्र शासन

प्रत--

- १) मा.मुख्यमंत्री यांचे सचिव सर्व मंत्री राज्यमंत्री यांचे खाजगी सचिव
- २) प्रधान सचिव, वित्त विभाग, मंत्रालय, मुंबई.
- ३) प्रधान सचिव, जलसंपदा विभाग, मंत्रालय, मुंबई-४०० ०३२
- ४) महालेखापाल, (लेखापरिक्षा), महाराष्ट्र-१, मुंबई.
- ५) महालेखापाल, (लेखा व अनुज्ञेयता), महाराष्ट्र-१, मुंबई.
- ६) महालेखापाल, (लेखापरिक्षा), महाराष्ट्र-२, नागपूर.
- ७) महालेखापाल, (लेखा व अनुज्ञेयता), महाराष्ट्र-२, नागपूर.
- ८) निवासी लेखापरीक्षा अधिकारी, मुंबई.
- ९) अधिदान व लेखाअधिकारी, मुंबई.
- १०) सर्व मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग.
- ११) सर्व अधिक्षक अभियंता, सार्वजनिक बांधकाम मंडळ.
- १२) सर्व कार्यकारी अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग.
- १३) सार्वजनिक बांधकाम विभाग, कार्यासन इमारती-१,२,३, मंत्रालय, मुंबई.

रस्त्याच्या डांबरीकरणामध्ये वापरण्यात येणारे
डांबरीकरणांच्या देयकांच्या व त्यात जोडण्यात
आलेल्या डांबर खरेदीच्या बीजकांच्या
पारदर्शकतेबाबत सुचना.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्र.संकीर्ण - २०१९/प्र.क्र.४८/रस्ते-१
मंत्रालय, मुंबई -४०० ०३२.
दिनांक: २१ फेब्रुवारी, २०१९

वाचा: रस्ते देखभाल दुरुस्ती संदर्भातील शासन परिपत्रक क्र. २०१९/प्र.क्र. ४६७ दि. २१/११/२०१९

प्रस्तावना:-

रस्त्यांच्या डांबरीकरणामध्ये वापरण्यात येणारे डांबर हे निरनिराळ्या मुख्य उत्पादक रिफायनरीकडून खरेदी करण्याबाबत शासनाने यापुर्वीच सूचना निर्गमित केलेल्या आहेत. मा.लोकआयुक्त यांच्याकडे एका डांबरीकरणाच्या कामाच्या तक्रारीच्या सुनावणी दरम्यान मा.लोकआयुक्त यांनी डांबर खरेदीची बीजके कंत्राटदाराने त्यांना मिळालेल्या निरनिराळ्या कामांमध्ये वापरताना सार्वजनिक बांधकाम विभागाच्या शाखा अभियंता, उपअभियंता आणि कार्यकारी अभियंता यांनी घ्यावयाच्या दक्षतेबाबत परिपत्रक निर्गमित करावे असे आदेश दिले आहेत. त्यामुळे सार्वजनिक बांधकाम विभागाच्या माहिती अधिकार कायद्याखाली माहिती प्राप्त करून घेऊन तक्रार करणाऱ्या निरनिराळ्या तक्रारदारांना तक्रार करण्यास वाव राहणार नाही, असे त्यांनी सुनावणी दरम्यान स्पष्ट केले आहे. अशाच प्रकारे निरनिराळ्या प्रादेशिक विभागातील निरनिराळ्या तक्रारी मा.लोकआयुक्त यांच्याकडे सुनावणीसाठी प्रलंबित आहेत. या सर्व प्रकरणी विभागातील कार्यकारी अभियंतांकडे उपलब्ध असलेल्या डांबरीकरणांच्या देयकांच्या व त्यात जोडण्यात आलेल्या डांबर खरेदीच्या बीजकांच्या अभ्यास करून खालील सूचना निर्गमित करण्यात येत आहेत. कृपया या सूचनांचे काटेकोरपणे पालन व्हावे जेणेकरून कामामध्ये पारदर्शकता येईल व तक्रारीस वाव राहणार नाही.

आदेश:-

- १) डांबराची खरेदी कंत्राटदार विशिष्ट कामासाठी करीत असल्यामुळे हॉटमिक्स प्लॉट अथवा कामाच्या जागी डांबर प्राप्त झाल्यानंतर त्याच्या बिटुमन बीजकांच्या मुळ प्रतीवर कामाचे नाव संबंधित शाखा अभियंता यांनी नोंदविणे आवश्यक आहे व त्यावर उपअभियंता यांनी स्वाक्षरी करून प्राप्त झालेल्या डांबरास वापर करण्याची परवानगी आहे, असे नमूद करणे आवश्यक आहे.
- २) सर्वसाधारणतः पुंजीत डांबर १० टन, १५ टन आणि २० टन अशा निरनिराळ्या डांबरवाहक टँकरच्या क्षमतेनुसार प्राप्त होत असते. शक्यतो एका कामावर जेवढे आवश्यक आहे तितकेच डांबर त्या कामासाठी खरेदी करण्यात यावे, असे कंत्राटदारास सुचित करण्यात यावे. मात्र काही ठिकाणी काही प्रमाणात डांबर निश्चितच शिल्लक राहते असे शिल्लक असलेले डांबर त्याच कंत्राटदाराच्या दुसऱ्या

कामावर वापरण्यास परवानगी देताना ते काम ज्या शाखा अभियंता आणि उपअभियंताच्या अधिपत्याखालील आहे त्यांनी त्या डांबराच्या मुळ बीजक प्रतीवर एका कामावरचा वापर, शिल्लक राहणाऱ्या डांबराचे परिमाण आणि त्याचा दुसऱ्या कामावरचा वापर यासंदर्भातील विवरणाच्या (Allocation) स्पष्ट नोंदी लाल रंगाच्या शाईच्या पेनने करून त्याप्रमाणे विवरणपत्र उर्वरित तीनही प्रतीवर नोंदविलेले पाहिजे. जेणेकरून एकच बीजक दोन निरनिराळ्या कामांच्या कंत्राटांच्या देयकांसमवेत जोडले असले तरी त्यात स्पष्टता राहिल.

- ३) यापुढे अशारितीने एकच बीजक सार्वजनिक बांधकाम विभागाच्या अधिपत्याखालील निरनिराळ्या विभागांमध्ये चालू असलेले कामांच्या देयकांमध्ये आढळल्यास व त्यात स्पष्टपणे उपरोक्त विवरण व आकडेमोड लाल शाईने लिहिलेली नसल्यास कंत्राटदाराची अशी देयके वरीलप्रमाणे स्पष्ट नोंदी केल्याशिवाय अदा केली जाऊ नयेत. याची जबाबदारी विभागीय लेखापाल आणि कार्यकारी अभियंता यांची राहिल. अशा बीजकांची फोटो प्रत मोजमाप पुस्तकात चिकटविण्यात यावी व नंतरच देयक अदा करावे.
- ४) उपरोक्त सुचनांचे पालन न झाल्यास संबंधीत शाखा अभियंता व उपअभियंता हे शिस्तभंग कार्यवाहीस पात्र राहतील.

सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आला असून त्याचा संकेतांक २०१९०२२११५२४३७८११८ असा आहे. हा आदेश डिजिटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

**Chandrashekhar
Prabhakar Joshi**

Digitally signed by Chandrashekhar Prabhakar Joshi
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Date: 2019.02.21 15:27:52 +05'30

(चंद्रशेखर जोशी)

सचिव (रस्ते), महाराष्ट्र शासन

प्रत माहितीसाठी व पुढील कार्यवाहीसाठी:-

१. मा.मंत्री (सा.बां.) यांचे खाजगी सचिव, मंत्रालय, मुंबई
२. मा.राज्यमंत्री (सा.बां.) यांचे खाजगी सचिव, मंत्रालय, मुंबई
३. महालेखापाल-१, मुंबई
४. महालेखापाल-२, नागपूर
५. अधिदान व लेखा अधिकारी, मुंबई/नागपूर
६. सचिव (रस्ते/बांधकामे) यांचे स्वीय सहायक, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई
७. सर्व मुख्य अभियंते, सार्वजनिक बांधकाम प्रादेशिक विभाग
८. सर्व अधीक्षक अभियंता/ कार्यकारी अभियंता/ उपअभियंता सार्वजनिक बांधकाम विभाग
९. कार्यासन रस्ते-१ (निवड नस्ती)

सार्वजनिक बांधकाम विभागांतर्गत हाती घ्यावयाच्या
रस्ते, इमारती व पुलांच्या प्रकल्पाकरिता सल्लागाराची
नेमणूक करणे - सुधारित सूचना

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन शुद्धीपत्रक क्रमांक: खाक्षेस-२०१८/प्र.क्र.७५/रस्ते-९अ
मादाम कामा मार्ग, हुतात्मा राजगुरु चौक,
मंत्रालय, मुंबई
दिनांक : २५ फेब्रुवारी, २०१९

वाचा :- शासन निर्णय, सार्वजनिक बांधकाम विभाग, शासन निर्णय क्रमांक खाक्षेस-२०१८/प्र.क्र.७५/रस्ते-९अ,
दिनांक २५.०१.२०१९

शुद्धीपत्रक

संदर्भाधीन शासन निर्णयामधील परिच्छेद क्र.२.२ “जाहिर निविदेद्वारे सल्लागाराची नियुक्ती” या शिर्षका
अंतर्गत शेवटच्या परिच्छेद या पद्धतीनुसार सल्लागाराची नेमणूक करण्याचे अधिकार खालीलप्रमाणे असतील या
शिर्षकाखालील तक्त्यामधील पृष्ठ १२ पैकी ६ पानावरील दुसरी ओळ म्हणजेच “हायब्रीड ॲन्युईटी वगळता
अन्य प्रकरणी” ऐवजी “हायब्रीड ॲन्युईटी अंतर्गत कामांकरिता (डी.पी.आर., स्वतंत्र अभियंता नियुक्ती व
हायब्रीड ॲन्युईटी अंतर्गत अन्य कामांसाठी)” असे वाचावे.

सदर शासन शुद्धीपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर
उपलब्ध करण्यात आले असून त्याचा संकेतांक २०१९०२२५११४३२८७९१८ असा आहे. हे शुद्धीपत्रक
डिजीटल स्वाक्षरीने साक्षांकित करुन काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.

Sachin Manikrao
Chivate

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postalCode=400032, st=Maharashtra,
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Date: 2019.02.25 11:45:41 +05:30

(सचिन चिवटे)

अवर सचिव (इमारती), महाराष्ट्र शासन

प्रत,

१. अपर मुख्य सचिव (वित्त विभाग), मंत्रालय, मुंबई.
२. महालेखापाल, महाराष्ट्र राज्य-१, मुंबई.
३. महालेखापाल, महाराष्ट्र राज्य-२, नागपूर.
४. सर्व मुख्य अभियंते, सा.बां.प्रादेशिक विभाग
५. मुख्य अभियंता व सहसचिव, सा.बां.विभाग, मुंबई
६. सर्व अधीक्षक अभियंते, सा.बां.मंडळ/ विशेष प्रकल्प मंडळ.
७. सर्व कार्यकारी अभियंते, सा.बां.विभाग/ जिल्हा परिषद बांधकाम विभाग,
८. सर्व तांत्रिक अधिकारी, सा.बां.विभाग, मंत्रालय, मुंबई.
९. निवडनस्ती (रस्ते ९-अ)

सार्वजनिक बांधकाम विभागाच्या ई-निविदा
संदर्भातील शासन निर्णयातील तरतूदींवर
स्पष्टीकरण..

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्रमांक सीएटी/२०१७/प्र.क्र.०८/इमा-२
मंत्रालय, मुंबई-४०० ०३२.
दिनांक: ०७ मार्च, २०१९.

- वाचा : १) सार्वजनिक बांधकाम विभाग, शासन निर्णय क्र.सीएटी/२०१७/प्र.क्र.०८/इमा-२,
दि.२७/०९/२०१८.
२) सार्वजनिक बांधकाम विभाग, शासन निर्णय क्र.सीएटी/२०१७/प्र.क्र.०८/इमा-२,
दि.२२/१०/२०१८.
३) शासन परिपत्रक क्रमांक सीएटी/२०१७/प्र.क्र.०८/इमा-२, दि.२६/११/२०१८.

परिपत्रक :

उपरोक्त संदर्भाधीन शासन निर्णय अन्वये सार्वजनिक बांधकाम विभागाच्या ई-निविदा प्रक्रीयेतर्गत एकत्रित सुधारीत सूचना निर्गमित करण्यात आल्या आहेत. तसेच संदर्भीय शासन परिपत्रकानुसार काही तरतूदीबाबत स्पष्टीकरणही देण्यात आले आहे. उपरोक्त दोनही सूचनांद्वारे ई-निविदेसंदर्भात विस्तृत सूचना देण्यात आल्या आहेत.

परंतु महाराष्ट्र राज्य कंत्राटदार महासंघ यांच्या मागणीनुसार ई-निविदेतील अतिरिक्त सुरक्षा ठेव रकमेच्या बाबतीत खालीलप्रमाणे सुधारित सूचना देण्यात येत आहेत :-

- १) दि.२६/११/२०१८ च्या शासन निर्णयातील परिच्छेद क्र.३ मध्ये नमूद रक्कम डीडी द्वारे सादर करणे अनिवार्य होते. तथापि, सदर Additional Performance Security Deposit ची रक्कम कोणत्याही राष्ट्रीयकृत बँकेच्या DD/FDR/BG स्वरूपात स्विकारण्यात यावी.
- २) ब-याचदा लगतच्या पूर्व कालावधीत पात्र ठरलेला कंत्राटदार किंवा एखादी निविदा उघडण्यावेळी पात्र असलेल्या कंत्राटदार त्याच निविदा सूचनेतील उघडण्यात आलेल्या/येणा-या दुस-या निविदावेळी अपात्र ठरविण्यात येतो, अशा कंत्राटदारांची निविदा किरकोळ कारणास्तव (जसे की, PTC, Machinery, आयकर कागदपत्रे, Similar work condition इ.) अपात्र करू नये. अशा कंत्राटदारांनी त्यांची पूर्वीच्या Online निविदांची कागदपत्रे उपलब्ध केल्यास ती पडताळून पात्र ठरविण्याबाबत कळवावे व आर्थिक लिफाफा क्र. २ उघडावा. याबाबत अशा आशयाचे आदेश मा.उच्च न्यायालयाने सुध्दा निर्गमित केले आहेत.

सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आले असून त्याचा संकेतांक २०१९०३०७१७३२५०५४९८ असा आहे. हे परिपत्रक डिजीटल स्वाक्षरीने साक्षांकित करून काढण्यात आले आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.

**Sachin Manikrao
Chivate**

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(सचिन चिवटे)

अवर सचिव (इमारती), महाराष्ट्र शासन

प्रति,

१. सार्वजनिक बांधकाम विभाग/वित्त विभाग/ग्रामविकास विभाग
२. महालेखापाल-१, मुंबई/महालेखापाल-२, नागपूर
३. अधिदान व लेखाधिकारी, मुंबई/नागपूर
४. महासंचालक, माहिती व प्रसिध्दी महासंचालनालय, मुंबई यांना प्रसिध्दीसाठी.
५. सर्व मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग,
६. मुख्य वास्तुशास्त्रज्ञ, सार्वजनिक बांधकाम विभाग, मुंबई.
७. संचालक, उद्याने व उपवने, मुंबई
८. सर्व अधीक्षक अभियंता, सार्वजनिक बांधकाम मंडळ (विद्युत/यांत्रिकी)

अधीक्षक अभियंता यांनी आपल्या अधिनस्त असलेल्या कार्यालयांना सदर शासन परिपत्रकाची प्रत अग्रेषित करावी.

९. मुख्य अभियंता/अधीक्षक अभियंता, पोलीस गृहनिर्माण व कल्याण महामंडळ, वरळी, मुंबई
१०. सर्व सहसचिव/उपसचिव/अवर सचिव/कार्यासन अधिकारी, सा.बां.विभाग, मंत्रालय, मुंबई
११. कार्यासन (इमारती-२) निवडनस्ती.

AM-28

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राज्यातील (Hybrid) यांची सुधारणा Hybrid
Annuity व Equity व Mobilization
Advance यांच्या सुधारणा.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन निर्णय क्र. संकीर्ण २०१८/प्र.क्र.४१३/२०१८
मादाम कामा मार्ग, हुतात्मा राजगुरु चौक
मंत्रालय, मुंबई - ४०० ०३२.
दिनांक - ०९ जानेवारी, २०१९

- वाचा : १. शासन निर्णय, सा.बां.विभाग क्र. संकीर्ण २०१८/प्र.क्र.४१३/२०१८/शिकाना/नियोजन-१अ
दि.०२.०८.२०१८
२. शासन पत्र, सा.बां.विभाग क्र. संकीर्ण २०१८/प्र.क्र.४१३/२०१८/शिकाना/नियोजन-१अ,
दि.१०.०८.२०१८
३. शासन पत्र क्र. संकीर्ण २०१८/प्र.क्र.४१३/रस्ते-१, दि.२१.१२.२०१८

प्रस्तावना -

राज्याच्या रस्त्याच्या सर्वांगीण विकासासाठी राबविण्यात येणाऱ्या हायब्रीड अॅन्युईटी प्रकल्पांतर्गत ज्या उद्योजकांची स्वतःची आर्थिक क्षमता आहे. त्यांना ४० टक्के Equity देण्यात येण्याने Escrow Account मध्ये जमा करण्याबाबत परवानगी देण्यात आली आहे. तदनुषंगाने शा.नि. क्र.३ अन्वये परवानगी देण्यात आली असून, या संदर्भात उद्योजकांच्या प्राप्त झालेल्या आणि मुख्य अभियंता यांनी शासनासमोर मांडलेल्या अडचणी विचारात घेवून दि. ०१ नोव्हेंबर, २०१८ रोजी निर्गमित करण्यात आलेल्या शासन निर्णयात हायब्रीड अॅन्युईटी योजनेमधील अडचणी सोडविण्यासाठी मा. मंत्री मंडळाच्या उपसमितीने दि. ०८ जानेवारी, २०१९ रोजी दिलेल्या मान्यतेनुसार खालील अंशतः बदल करण्यात येत आहेत :-

- १) उपरोक्त शासन निर्णयात तक्ता क्र. १ मध्ये उद्योजकाने जमा करावयाची Equity ८ टक्के इतकी दर्शविण्यात आली आहे. यामध्ये मुख्य अभियंता यांनी केलेल्या सिफारशीनुसार ज्या उद्योजकांनी कामाच्या जागेवर प्रत्यक्ष काम सुरु केले आहे व त्यात स्वतःची रक्कम खर्च केली आहे, अशा कामांच्या बाबतीत उद्योजकाने केलेल्या कामाची किंमत ही कार्यकारी अभियंता यांनी मोजमापे प्रमाणित करून प्रचलित दरसूचीवर आधारित निश्चित करण्यात यावी. या किंमतीला उद्योजकांची Equity म्हणून गृहीत धरण्यात यावे. अशा ठिकाणी उद्योजकाने Performance Bank Guarantee ५ टक्के, आणि Mobilization Advance ची Bank Guarantee १ टक्का इतकी जमा केल्यानंतर Escrow Account मध्ये उद्योजकाने ८ टक्के Equity जमा करण्याची अट शिथील करण्यात येत आहे. उद्योजकाने प्रत्यक्ष साईटवर काम सुरु केले असल्यास त्यास Mobilization Advance चा प्रथम हप्ता (५ टक्के) Escrow Account मध्ये जमा करण्यास या शासन निर्णयाद्वारे परवानगी देण्यात येत आहे.
- २) Equity ची रक्कम Escrow Account मध्ये जमा केलेली असल्यास उद्योजकाने सुरु केलेल्या कामाची किंमत १० टक्के (बीड प्रोजेक्ट कॉस्टच्या १० टक्के) इतके काम झाल्यानंतर त्यास Mobilization Advance चा द्वितीय हप्ता देण्यात यावा. तसेच Equity ची रक्कम Escrow Account मध्ये जमा करण्यास उद्योजकास सुट दिल्यानंतर उद्योजकाने सुरु केलेल्या कामाची

किंमत १० टक्के व ८ टक्के (Equity) असे एकूण किमान १८ टक्के इतके काम झाल्याशिवाय १st mile stone installment चे पेमेंट अदा करण्यात येवू नये. असे एकूण १८% काम पूर्ण झाल्यानंतरच त्यास Mobilization Advance चा द्वितीय हप्ता (५%) देण्यात यावा. उद्योजकाने ५% Mobilization Advance घेतल्यानंतर Escrow Account मध्ये पुढील कामाचा खर्च Equity म्हणून करा करणेस व Escrow Account मधूनच खर्च करणेस त्यास आदेशित करण्यात यावे.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेत स्थळावर उपलब्ध करण्यत आला असून, त्याचा संकेतांक २०१९०१०११५२८४७४३१८ असा आहे. हा आदेश डिजीटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

Prashant
Vinayakrao Patil

Digitally signed by Prashant Singh, DN: cn=Prashant Singh, o=Ministry of Home Affairs, ou=Ministry of Home Affairs, email=prashant.singh@mah.nic.in, c=IN, postalCode=110002, postalAddress=Ministry of Home Affairs, New Delhi 110002, serial=1436144650, version=1, reason=I am the author of this document, date=2019.01.09 15:34:02 +05'30'

(प्रशांत पाटील)

अवर सचिव, महाराष्ट्र शासन

प्रति

१. मा. राज्यपाल, महाराष्ट्र राज्य यांचे सचिव
२. मा. मुख्यमंत्री, महाराष्ट्र राज्य यांचे अप्पर मुख्य सचिव
३. मा. मंत्री (सा.बां.) यांचे खाजगी सचिव, मंत्रालय, मुंबई
४. मा. मंत्री (वित्त व नियोजन) यांचे खाजगी सचिव, मंत्रालय, मुंबई
५. मा. मंत्री (उर्जा, नवीन व नवीकरणीय ऊर्जा) यांचे खाजगी सचिव, मंत्रालय, मुंबई
६. मा. मंत्री (रोहयो व पर्यटन) यांचे खाजगी सचिव, मंत्रालय, मुंबई
७. मा. राज्यमंत्री (सा.बां.) यांचे खाजगी सचिव, मंत्रालय, मुंबई
८. मुख्य सचिव यांचे सह सचिव, मंत्रालय, मुंबई
९. ज.मु.स. (नियोजन) यांचे स्वीय सहायक, नियोजन विभाग, मंत्रालय, मुंबई
१०. ज.मु.स. (वित्त) यांचे स्वीय सहायक, वित्त विभाग, मंत्रालय, मुंबई
११. प्रधान सचिव, सार्वजनिक बांधकाम विभाग यांचे स्वीय सहायक, मंत्रालय, मुंबई
१२. सचिव (रस्ते), सार्वजनिक बांधकाम विभाग यांचे स्वीय सहायक, मंत्रालय, मुंबई
१३. सर्व मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग
१४. उप सचिव (रस्ते) सार्वजनिक बांधकाम विभाग यांचे स्वीय सहायक, मंत्रालय, मुंबई
१५. सर्व अधीक्षक अभियंता, सार्वजनिक बांधकाम मंडळ
१६. निवड नस्ती, रस्ते - ५/नियोजन-१३, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई

ई-निविदा सादर करतांना सादर केलेल्या तांत्रिक लिफाफा व आर्थिक लिफाफा माहितीची छाननी विविध अधिकाऱ्यांच्या निर्णयातील विसंगती दूर करणे व शासनाच्या सर्व अधिकारांचे निर्णय समन्यायी तत्वावर आधारीत असणे..

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग,
शासन परिपत्रक क्र.सीएटी-२०१९/प्र.क्र. १२०/इमारती-२
मंत्रालय, मुंबई ४०० ०३२
दिनांक : १७ सप्टेंबर, २०१९

- संदर्भ :** १) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्र. सीएटी-२०१७/प्र.क्र. ०८/इमा-२ दि. १२/०४/२०१७.
- २) सार्वजनिक बांधकाम विभाग, शासन निर्णय, क्र. सीएटी-२०१७/प्र.क्र. ०८/इमा-२ दि. २७/०९/२०१८.
- ३) सार्वजनिक बांधकाम विभाग, शासन परिपत्रक, क्र. सीएटी-२०१७/प्र.क्र.०८/इमा-२ दि. २२/१०/२०१८.
- ४) सार्वजनिक बांधकाम विभाग, शासन परिपत्रक, क्र. सीएटी-२०१७/प्र.क्र. ०८/इमा-२ दि. २६/११/२०१८.
- ५) सार्वजनिक बांधकाम विभाग, शासन परिपत्रक, क्र. सीएटी-२०१७/प्र.क्र. ०८/इमा-२ दि. २९/०१/२०१९.
- ६) सार्वजनिक बांधकाम विभाग, शासन परिपत्रक, क्र. सीएटी-२०१७/प्र.क्र. ०८/इमा-२ दि. ०७/०३/२०१९.

शासनाने निविदा प्रक्रियेत सुलभता साध्य करण्यासाठी व निविदा छाननी व मंजुरी पूर्वी आढळून आलेले गैरप्रकार व अनियमितता पूर्णपणे थांबविण्यासाठी खालील महत्वाचे निर्णय घेतले आहेत.

- १) रु. ३ लक्ष पेक्षा जास्त किंमतीच्या कामांकरीता ई-निविदा प्रक्रिया राबवणे.
- २) निविदा छाननी करतांना किरकोळ कारणास्तव निविदा न उघडण्यास प्रतिबंध.
- ३) स्पर्धात्मक दर प्राप्त होण्यासाठी निविदा प्रपत्रांमध्ये जाचक अटी नमूद न करणे.
- ४) कंत्राटदाराचे पंजीकरणामुळे (रजिस्ट्रेशन) विशिष्ट कामांसाठी स्पर्धा न होणे टाळण्यासाठी रु. १.५० कोटी पेक्षा जास्त क्षमतेबाबत रजिस्ट्रेशन प्रक्रिया रद्द करणे.
- ५) देशातील कोणत्याही कंत्राटदारांकडे आर्थिक व तांत्रिक क्षमता असेल त्यास निविदा भरता येईल अशी तरतूद करणे.
- ६) निविदेच्या तांत्रिक लिफाफ्यातील माहितीचे निराकरण कंत्राटदारास पूर्ण संधी देऊन जास्तीची माहिती मागवून व त्यात कंत्राटदार पात्र ठरत असल्यास ही माहिती अभिलेखावर ठेवून आर्थिक निविदा लिफाफा उघडणे व स्पर्धात्मक दर प्राप्त होण्यास वाव निर्माण करणे.
- ७) निविदेची सर्वदूर व जास्तीत जास्त प्रसिध्दी करणे.

असे असूनही निविदा छाननीमध्ये अनियमितता असणे व पारदर्शीपणा नसणे या स्वरूपाच्या तक्रारी वारंवार प्राप्त होत आहेत व काही प्रकरणात शासन मान्यतेने दोषारोप निश्चित करून शिस्तभंगाची कारवाई करावी लागली आहे. काही प्रकरणात न्यायालयीन निर्णय शासनाच्या विरुद्ध लागले आहेत तसेच काही प्रकरणी नव्याने निविदा मागवून कालापव्यय होत आहे. या सर्व बाबींचा व प्राप्त सर्व प्रकरणांचा सखोल अभ्यास करून शासन पुनश्च एकदा सर्व कार्यकारी / अधीक्षक / मुख्य अभियंत्यांसाठी खालील प्रमाणे आदेश निर्गमित करीत आहे. आदेशांचे पालन न झाल्यास शिस्तभंगाची कारवाई करण्यात येईल याची नोंद सर्व संबंधितांनी घ्यावी.

- १) तांत्रिक लिफाफ्यातील माहिती अथवा जोडलेल्या विवरणामध्ये काही शंका असल्यास संबंधीत कंत्राटदाराकडून त्यांचे स्पष्टीकरण घ्यावे, अशा प्रकरणी पूरक विवरणे / प्रमाणपत्रे तसेच जास्तीची माहिती प्राप्त करून ती अभिलेखावर ठेवावी व तांत्रिक लिफाफ्यातील माहिती अपुरी आहे या कारणास्तव कंत्राटदारास अपात्र ठरवू नये. तांत्रिक लिफाफ्यातील माहिती अपूर्ण असल्यास ती वरील प्रमाणे विशिष्ट कालावधीत (८ / १५ दिवस) उपलब्ध करून देण्याची संधी देण्यात यावी व याकरीता कंत्राटदार असमर्थ ठरल्यास नंतर त्यास अपात्र ठरवावे व तसे त्यास लेखी कळवून नंतर अन्य निविदा उघडण्याची कार्यवाही करावी. निविदेच्या तांत्रिक लिफाफ्यातील माहितीची छाननी करतांना निविदेच्या गाभ्यातील महत्वाच्या अटींचे पालन होत आहे हे पहावे. स्पर्धात्मक दर प्राप्त होणेसाठी छाननीची मध्यवर्ती कल्पना स्पर्धात्मक दर मिळविणे (True spirit of competition to get competitive rates) हे असावे.
- २) तांत्रिक लिफाफ्याच्या पडताळणी अंती पात्र कंत्राटदाराने “माझा आर्थिक देकार उघडण्यात येवू नये” अथवा “मी स्पर्धेतून माघार घेत आहे” असे कळविल्यास ते स्पष्टपणे नाकारण्यात येवून त्याचा आर्थिक देकार उघडण्यात यावा.
- ३) कंत्राटदार एकमेकां विरुद्ध तक्रार करत असतील अथवा हरकती (Objections) घेत असतील तर रु. १५ कोटी किंमतीपर्यंतच्या कामांसाठी मुख्य अभियंता व रु. १५ कोटी पेक्षा जास्त किंमतीच्या कामासाठी निविदा स्विकृतीस सक्षम अधिकारी यांचेकडे आवश्यक कागदपत्रासह संदर्भ करून निर्णय घ्यावा. निविदा स्विकृती प्राधिकाऱ्यांचा निर्णय दोन्ही बाजूंस अंतिम व बंधनकारक राहील अशी अट निविदेत समाविष्ट करण्यात यावी.
- ४) जे निविदा प्रपत्र Portal वर upload केले आहे व विहीत प्रक्रियेनंतर निविदा प्रपत्र विचलनाची (Common set of deviations) सक्षम प्राधिकाऱ्याने (रु. १५ कोटी किंमतीपर्यंत मुख्य अभियंता, रु. १५ कोटी पेक्षा जास्त किंमतीकरीता शासन स्तरावरील सक्षम प्राधिकारी) मान्य केलेल्या व upload केलेल्या CSD व निविदा अटी व शर्ती प्रमाणेच छाननी करावी. कोणत्याही परिस्थितीत अटी व शर्ती, CSD Upload केल्यानंतर समाविष्ट करू नये. एखादी महत्वाची अट / शर्त Uploaded निविदा प्रपत्रात नजरचुकीने अथवा अनावधानाने समाविष्ट करावयाची राहिल्यास, निविदा पूर्व बैठकी आधी अथवा निविदा पूर्व बैठकीचे वेळी “ Correction Addendum”, जास्तीचे सुधारणा प्रपत्र म्हणून निविदा प्रपत्र विचलन (Common set of Deviation) मध्ये सक्षम प्राधिकाऱ्याच्या मान्यतेने तात्काळ समाविष्ट करावे. Correction Addendum अथवा CSD मध्ये आवश्यक अट समाविष्ट करणे शक्य झाले नाही तर त्या अटी शिवाय निविदा प्रक्रिया पूर्ण करावी. कोणत्याही परिस्थितीत निविदा प्रक्रिया रद्द करू नये.

- ५) आर्थिक देकार उघडल्यानंतर, निविदा प्रक्रियेत निविदा प्राप्त कंत्राटदाराने अथवा अन्य कंत्राटदारांनी खोटी / बनावट कागदपत्रे तांत्रिक लिफाफ्यास जोडून निविदा मिळवण्याचे / निविदा प्रक्रियेत भाग घेतल्याचे निदर्शनास आल्यास तात्काळ ह्या कंत्राटदारास / कंत्राटदार भागीदारीस अथवा कंपनीस / संयुक्त कंपनी (JV / LLP / Pvt Ltd / Public Limited Company) असल्यास संबंधीत कंपनीस १५ दिवसांनी नोटीस देऊन काळ्या यादीत टाकण्याच्या परिपत्रकाचे प्रारूप शासनास सादर करावे व मंजूर करून घेऊन त्यास web site वर वृत्तपत्रीय प्रसिध्दी देऊन, प्रथम ३ वर्षांचे कालावधीकरीता, महाराष्ट्र शासन सार्वजनिक बांधकाम विभागाच्या काळ्या यादीत समाविष्ट करावे व परिपत्रक निर्गमनाच्या दिनांकापासून ३ वर्षे सार्वजनिक बांधकाम विभागाच्या निविदा प्रक्रियेत भाग घेण्यास प्रतिबंध राहील, ही अट कंपनीचा मालक / संचालक / भागीदार यांना संयुक्त व स्वतंत्रपणे (Combined & several independent liability) लागू राहील. या स्वरूपाची अट निविदा प्रपत्रात समाविष्ट करावी.
- ६) अनेक वेळा कंत्राटदार निविदा प्रक्रियेत पात्र होण्यासाठी शासनाचे इतर विभाग / केन्द्र शासनाचे विभाग / नगर पालिका / नगर परिषदा / सनदी लेखापाल / खाजगी वास्तुशास्त्रज्ञ / प्राचार्य / सार्वजनिक उपक्रम इ. अनेक संस्थांकडून प्रमाणपत्रे (work done or experience certificate) प्राप्त करीत असल्याचे निदर्शनास येत आहे. अश्या वेळेस प्राप्त प्रमाणपत्रातील माहितीची खातरजमा (Verification) व सत्यता प्रमाणपत्र देणाऱ्या अधिकाऱ्यावरील अधिकाऱ्यांकडून प्रमाणित करून घ्यावी. (उदा. MSRDC च्या EE / SE नी contracts दिले असल्यास व त्याविषयी शंका असल्यास CE- MSRDC अथवा JMD- MSRDC यांचे कडून खात्री करून चुकीचे / दिशाभूल करणारे प्रमाणपत्र प्राप्त झाल्यास व त्याची पडताळणी न केल्यास संबंधीत कंत्राटदारावर दंडनीय कारवाई न केल्यास संबंधित निविदा उघडणाऱ्या कार्यकारी अभियंता / अधीक्षक अभियंता यांचेवर शिस्तभंगाची कारवाई करण्यात येईल याची नोंद घ्यावी.
- ७) एकच कंत्राटदार, एकाच विभागातील, एकाच निविदा नोटीस मधील अनेक कामे निम्नतर देकार भरून कामे मिळवत असल्याचे निदर्शनास आले आहे. ही बाब विचारात घेता रु. ३ लक्ष पेक्षा जास्त किंमतीच्या सर्वच निविदा मध्ये Bid Capacity ची अट समाविष्ट करावी. त्यासंदर्भात अट परिशिष्ट १ मध्ये दिल्याप्रमाणे [(अ x एन x २)- बी] ऐवजी [(अ x एन x १.५)- बी] समाविष्ट करावी. शासन निर्णय दिनांक २७/०९/२०१८ मधील परिच्छेद २.९ ड मध्ये सुधारणा करण्यात आली आहे असे वाचावे.
- ८) ऑन लाईन निविदा सादर झाल्यानंतर ७२ तासांच्या आत त्याच निविदेची Hard Copy व Bid Security मूळ प्रतीत सादर करणे अनिवार्य करावे, तथापि आता ह्या बाबतीत मूळ प्रत Hard Copy सादर केली / दिली नाही तरी कंत्राटदारांच्या कमी दराची निविदा भरून स्पर्धा टाळण्याची Hard Copy सादर न करण्याची प्रवृत्ती लक्षात घेता सर्व प्राप्त निविदा उघडण्यात याव्यात.
- ९) निविदा उघडणे प्रक्रियेबाबत कंत्राटदारांच्या तक्रारी प्राप्त झाल्यास अश्या रु. १५ कोटी किंमती पर्यंतच्या कामासाठी मुख्य अभियंता तपासणी करतील व त्यांचे निर्णय अंतिम राहील. रु. १५ कोटी पेक्षा जास्त किंमतीच्या कामांसाठी संबंधित उपसचिव निविदा तक्रारीची छाननी करतील व अ. मु. स. (सा. बां. वि.) यांचेकडे अहवाल सादर करतील. अश्या प्रकरणाबाबत अ.मु.स. (सा. बां. वि.) यांचा निर्णय अंतिम राहील.

- १०) निविदा उघडणे प्रक्रियेत शासन स्तरावर / मुख्य अभियंता स्तरावर सर्वसाधारण व्यक्ती / लोक प्रतिनिधी यांची तक्रार प्राप्त झाल्यास त्याचे गांभिर्य लक्षात घेऊन मुख्य अभियंता यांनी छाननी करून अ. मु. स. (सा. बां.) यांना अहवाल सादर करावा. प्रत्येक प्रकरणी अ. मु. स. (सा. बां. वि.) यांचा निर्णय अंतिम राहिल व त्याप्रमाणे पुढील कारवाई करण्यात यावी.
- ११) निविदा उघडणे प्रक्रियेबाबत वृत्तपत्रे / समाजमाध्यमे / दृकश्राव्यत माध्यमे / टी.व्ही. यावर वृत्त प्रसिध्द झाल्यास संबंधीत वृत्ताची संबंधीत अधीक्षक अभियंता यांनी तात्काळ दखल घ्यावी व १२ तासांचे आत अ.मु.स. (सा. बां.) यांना थेट सत्यासत्यता अहवाल सादर करावा व वृत्तपत्रे / माध्यमे यातील तक्रार खोटी व विपर्यस्त असल्यास ह्याचा तात्काळ खुलासा करावा.
- १२) शासन लवकरच सर्व निविदा प्रपत्रांचा (B-1 / B-2 / SBD / C / EPC / HAM) Standard Format स्वतंत्र शासन परिपत्रकांद्वारे प्रसिध्द करित आहे त्याच अटी व शर्ती समाविष्ट कराव्यात. त्यापेक्षा कोणतीही वेगळी अट विभाग / मंडळ / प्रादेशिक स्तरावर समाविष्ट करण्यात येणार नाही याची दक्षता घ्यावी.
- १३) शासनस्तरावर सादर निविदा माहितीमध्ये अचूकता असावी व विहीत प्रपत्रावर छाननी करून नंतरच मुख्य अभियंता यांनी स्वतः स्वाक्षरी करावी. सर्व चेकलिस्टवर मुख्य अभियंता यांनी प्रत्येक पानावर स्वाक्षरी करून नंतरच शासनास प्रस्ताव सादर करावेत.

सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या वेबसाईटवर प्रसिध्द करण्यात आले असून त्याचा सांकेतांक क्रमांक २०१९०९१७१८०३४००९१८ असा आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.

**Chandrashekar
Prabhakar Joshi**

Digitally signed by Chandrashekar Prabhakar Joshi
DN: c=IN, o=Government Of Maharashtra, ou=Public Works
Department, postalCode=400032, st=Maharashtra,
2.5.4.20=2c8893d1513ab2ea4a7f8c612a31ac748bd05ab00efd5e2f2d2
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serialNumber=423be4ff70a89bfc945ec5e481b972d568094459d7ff8219
a1f968860a431f89, cn=Chandrashekar Prabhakar Joshi
Date: 2019.09.17 18:16:18 +05'30'

(चंद्रशेखर जोशी)

सचिव (रस्ते), महाराष्ट्र शासन

प्रति,

- १) मा. मुख्यमंत्री यांचे खाजगी सचिव.
- २) मा. मंत्री (सा. बां.) यांचे खाजगी सचिव.
- ३) मा. राज्यमंत्री (सा. बां.) यांचे खाजगी सचिव.
- ४) सर्व मुख्य अभियंते, सार्वजनिक बांधकाम प्रादेशिक विभाग (विद्युतसह)
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- ७) सर्व अधीक्षक अभियंते, सार्वजनिक बांधकाम विभाग (स्थापत्य / विद्युत/यांत्रिकी)
- ८) सर्व कार्यकारी अभियंते / सर्व उपअभियंते
- ९) कार्यासन इमारती-२ (निवडनस्ती)

डांबरीकरणासाठी पुरवठा करण्यात येत असलेल्या डांबराची प्रत (Grade) निश्चित करणेबाबत.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग,
शासन परिपत्रक क्रमांक - संकिर्ण-२००५ / प्र.क्र.-१८७ / रा.म.-२.
मंत्रालय, मुंबई - ४०० ०३२.
दिनांक- ०८ ऑक्टोबर, २००७.

परिपत्रक -

रस्त्यांच्या डांबरीकरणाच्या कामात रिफायनरीतून प्राप्त होणाऱ्या डांबराची प्रत कामावर वापरण्यापूर्वी पूनश्च तपासून खातरजमा करणे अत्यावश्यक आहे. याबाबतची कार्यपद्धती निश्चित करण्याची बाब शासनाच्या विचाराधिन होती. या परिपत्रकाद्वारे शासन असे निर्देश देत आहे की, डांबरीकरणाच्या कामामध्ये वापरण्यात येणाऱ्या डांबराची प्रत (Grade) तपासण्यासाठी खालीलप्रमाणे कार्यपद्धती अवलंबविण्यात यावी.

- अ) ज्या कामासाठी ठेकेदार (Contractor) डांबर रिफायनरीतून प्राप्त करणार आहे अशा डांबर प्राप्तीचे वेळापत्रक (Schedule of arrival of bouzers) क्षेत्रिय अधिकाऱ्यांना देणे ठेकेदारास बंधनकारक राहील. डांबराचे प्रापण (Procurement) सरकारी तेल कंपनीच्या रीफाइनरी मधूनच करण्यात यावे. तसेच प्लान्टवर प्राप्त झालेल्या डांबराची प्रत (Grade) तपासणीसाठी आवश्यक उपकरणे, साहित्य इत्यादींनी युक्त प्रयोगशाळा उपलब्ध करून देणे ठेकेदारास बंधनकारक राहील.
- ब) वरील 'अ' प्रमाणे सूचनांचा अंतर्भाव निवीदा प्रारूप प्रपत्रात करण्यात यावा. रिफायनरीमधून डांबराचा बाऊझर ठेकेदाराचे प्लान्टवर पोहोचल्यानंतर संबंधित क्षेत्रिय अधिकाऱ्यांनी रिफायनरीकडून प्राप्त चलन व डिलिव्हरी मेमोच्या मूळ प्रती वरून डांबराची प्रत लेखी स्वरूपात (मोजमाप पुस्तकात) नोंदविणे आवश्यक आहे. तसेच क्षेत्रिय अधिकाऱ्यांनी प्लान्टवर आलेल्या डांबराच्या बाऊझरमधील डांबराचे चाचणी नमुने गोळा करून डांबराची प्रत तपासून ती लेखी स्वरूपात नोंदवावी.
- क) रिफायनरीमधून निर्गमित झालेल्या बाऊझरमधील डांबराची प्रत वरीलप्रमाणे चाचणी अहवालानुसार जुळत असल्याची खात्री झाल्यावर संबंधित ठेकेदार अथवा त्याचा अधिकृत प्रतिनिधी यांचे उपस्थितीमध्ये डांबराचा बाऊझर प्लान्टवर रिकामा करण्याची लेखी परवानगी

(कु.मा.प.)

क्षेत्रीय अधिकारी देतील, त्यानंतर बाऊझर रिकामा करावा. अन्यथा हे डांबर कामासाठी न वापरण्याबाबतदेखील ठेकेदारास लेखी निर्देश देतील.

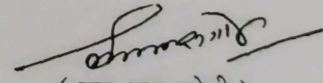
- ड) प्रत्येक कामनिहाय प्लान्टवर एक नोंदवही ठेवावी. त्यामध्ये बाऊझर क्रमांक, चलन क्रमांक, डिलीव्हरी मेमो क्रमांक, डांबराचे वजन, ग्रेड तपासणी व चाचणी अधिकाऱ्यांचे नांव इत्यादी तपशिल ठेवावा.
- इ) वरीलप्रमाणे क्षेत्रीय अधिकाऱ्यांकडून बाऊझरमधील डांबराची प्रतवारी (Grade of Bitumen) प्रत्यक्ष तपासणीसाठी खालीलप्रमाणे मानकानुसार कार्यवाही करण्याची जबाबदारी क्षेत्रीय अधिकाऱ्याची राहिल.

अ.क्र.	अधिकारी	चाचणीचे प्रमाण (एकूण परिमाणाच्या)
१)	कनिष्ठ अभियंता / शाखा अभियंता / सहा. अभियंता (श्रेणी-२)	१०० टक्के
२)	सहा. कार्यकारी अभियंता / सहा. अभियंता (श्रेणी-१) / उपविभागीय अभियंता / उपविभागीय अधिकारी	२५ टक्के
३)	कार्यकारी अभियंता	५ टक्के

फ) कार्यकारी अभियंता यांनी डांबरीकरणाच्या कामाच्या तपासणी दौऱ्यात प्लान्ट साईटवरील डांबराच्या ग्रेडची तपासणी करून त्याची नोंद नोंदवहीत करावी.

क्षेत्रीय अधिकाऱ्यांनी वरीलप्रमाणे कार्यपद्धतीची अमलबजावणी करावी.

२. सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या वेबसाईटवर प्रसिध्द करण्यात आला असून त्याचा संगणक संकेतांक २००७१००९१६४०४९००९ असा आहे.



(एस. एस. जोशी)

उप सचिव (रा.म.), महाराष्ट्र शासन

प्रत,

स्वीय सहाय्यक, सचिव (बांधकामे), सा. बां. विभाग, मंत्रालय, मुंबई.

स्वीय सहाय्यक, सचिव (रस्ते), सा. बां. विभाग, मंत्रालय, मुंबई.

मुख्य अभियंता व सह सचिव, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई,

मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग, मुंबई / पुणे / नाशिक / औरंगाबाद / नागपूर / अमरावती.

मुख्य अभियंता, विशेष प्रकल्प (सा.बां.) विभाग, मुंबई,

मुख्य अभियंता, राष्ट्रीय महामार्ग (सा.बां.) विभाग, कोकण भवन, नवी मुंबई.

सर्व अधीक्षक अभियंते, सार्वजनिक बांधकाम मंडळे,

सर्व कार्यकारी अभियंते, सार्वजनिक बांधकाम विभाग,

सर्व तांत्रिक अधिकारी, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई.

कार्यासन अधिकारी, सेवा-६, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई.

सार्वजनिक बांधकाम विभागांतर्गत रस्त्याच्या
डांबरीकरणाच्या कामांसाठी पुरवठा करण्यात
येणा-या डांबराच्या चलनांची खातरजमा
करण्याबाबत.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्रमांक- संकिर्ण -२०१७/प्र.क्र.१९/यं.बा.सा.
मंत्रालय, मुंबई ४००० ०३२
दिनांक- १२ एप्रिल, २०१७.

वाचा :- शासन परिपत्रक क्र. संकिर्ण -२००५/प्र.क्र.१८७/रा.म.-२ दि. ८/१०/२००७.

प्रस्तावना :-

सार्वजनिक बांधकाम विभागांतर्गत रस्त्याच्या विविध प्रकारच्या डांबरीकरणाच्या कामात शासनाच्या अंगीकृत असलेल्या तेल कंपन्यांच्या रिफायनरीकडून प्राप्त होणारे डांबर आणि प्रत्यक्ष कामाच्या ठिकाणी वापरण्यात येणारे डांबर यांच्या प्रतीची खातरजमा करण्यासाठी संदर्भाधीन परिपत्रक निर्गमित करण्यात आलेले आहे. असे असूनही डांबराच्या प्रतीत तफावत आढळून येणे, कंत्राटदाराकडून प्रत्यक्षात निकृष्ट दर्जाच्या डांबराचा वापर करून शासन अंगीकृत तेल कंपन्यांच्या रिफायनरीकडील डांबराची बनावट चलने सादर करणे अशा घटना घडत असल्याची बाब निदर्शनास आल्यामुळे या सर्व बाबींवर नियंत्रण ठेवण्यासाठी आणि अशा गैरप्रकारांना आळा घालण्यासाठी शासन अंगीकृत तेल कंपन्यांच्या रिफायनरीकडून प्राप्त होणाऱ्या डांबराच्या चलनांची खातरजमा करण्यासाठी रिफायनरीच्या साहाय्याने कार्यपद्धती निश्चित करण्याची बाब शासनाच्या विचाराधीन होती.

त्या अनुषंगाने संदर्भाधीन परिपत्रकामध्ये निर्गमित केलेल्या सुचनांव्यतिरिक्त पुढीलप्रमाणे अतिरिक्त मार्गदर्शक सूचना निर्गमित करण्यात येत आहेत.

परिपत्रक :-

सार्वजनिक बांधकाम विभागांतर्गत रस्त्याच्या विविध प्रकारच्या डांबरीकरणाच्या कामासाठी आवश्यक डांबराचे प्रापण (Procurement) शासन अंगीकृत तेल कंपन्यांच्या रिफायनरीकडूनच करण्यात यावे. ही बाब पुनः अघोरेखित करण्यात येत आहे.

तसेच डांबराच्या चलनांची खातरजमा करण्यासाठी खालिलप्रमाणे कार्यपद्धती निश्चित करण्यात येत आहे.

१. प्रत्येक महिन्याभरात केलेल्या कामासाठी कंत्राटदाराने वापरलेल्या डांबराची चलने व मोजमाप पुस्तकातील नोंदी संबंधित सार्वजनिक बांधकाम उपविभागाने पुढील महिन्यात ५ तारखेपर्यंत संबंधित सार्वजनिक बांधकाम विभागाच्या कार्यकारी अभियंता यांना सादर कराव्यात.
२. संबंधित सार्वजनिक बांधकाम विभागाच्या कार्यकारी अभियंता यांनी सर्व सार्वजनिक बांधकाम उपविभागाकडून प्राप्त झालेल्या डांबराच्या चलनांचे शासन अंगीकृत तेल कंपनीनुसार वर्गीकरण करून सदरील चलने संबंधित शासन अंगीकृत तेल कंपनीच्या रिफायनरीकडे त्या महिन्यातील १५ तारखेपर्यंत तपासणी व खातरजमा करण्यासाठी पाठवावीत.

- ३.संबंधित शासन अंगीकृत तेलकंपनीच्या रिफायनरीने त्या चलनांची खातरजमा करून त्याबाबतचा अहवाल कार्यकारी अभियंता यांना त्या महिन्याच्या २५ तारखेपर्यंत online पाठवावा.
- ४.संबंधित शासन अंगीकृत तेल कंपनीच्या रिफायनरीकडून प्राप्त online अहवालाच्या आधारे शासन अंगीकृत तेल कंपनीच्या रिफायनरीने खातरजमा केलेल्या चलनांची मोजमापे कार्यकारी अभियंता यांनी ग्राह्य धरावीत.
- ५.शासन अंगीकृत तेल कंपनीने नाकारलेली / डांबराची खोटी चलने वापरून कंत्राटदाराने केलेले काम संबंधित सार्वजनिक बांधकाम विभागाच्या कार्यकारी अभियंता यांचेकडून नाकारण्यात यावे व त्यापोटी झालेल्या खर्चाची कोणत्याही स्वरूपाची देयके कंत्राटदारास अदा करण्यात येवू नयेत. अशी डांबराची खोटी चलने वापरून केलेल्या कामाची देयके अदा केलेली आढळल्यास त्यासाठी संबंधित कार्यकारी अभियंता यांच्यावर जबाबदारी निश्चित करण्यात यावी आणि संबंधित कंत्राटदाराविरुद्ध फौजदारी कार्यवाही करण्यात यावी.
- ६.अधीक्षक अभियंता यांनी त्यांच्या सार्वजनिक बांधकाम मंडळाच्या अंतर्गत असलेल्या सार्वजनिक बांधकाम विभागामधील कामासाठी वापरलेल्या डांबराच्या चलनांच्या सत्यतेबाबत तिमाही आढावा घ्यावा.डांबराची खोटी चलने वापरून कामाचे देयक अदा केल्याचे आढळल्यास संबंधित कार्यकारी अभियंत्यावर शिस्तभंगविषयक कारवाई करण्याचा प्रस्ताव अधीक्षक अभियंता यांनी मुख्य अभियंता यांचेमार्फत शासनास सादर करण्याची कार्यवाही करावी. वरील सूचनांचे काटेकोरपणे पालन करण्यात यावे.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आला असून त्याचा संकेतांक २०१७०४१२१५१९०७४३१८ असा आहे. हा आदेश डिजिटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

**Pradeep E
Dalvi**

Digitally signed by Pradeep E Dalvi
DN: c=IN, o=Government Of Maharashtra, ou=PWD
Department, postalCode=400032, st=Maharashtra,
2.5.4.20=716d09513325160a8ae457d38bdb1108a8
05f4db1fec141f11bc887b7810d338, cn=Pradeep E
Dalvi
Date: 2017.04.12 15:21:24 +05'30'

(प्रदीप दळवी)

अवर सचिव, महाराष्ट्र शासन

प्रत :

- १.प्रधान सचिव, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई यांचे स्वीय सहाय्यक.
- २.सचिव (बांधकामे)/ सचिव (रस्ते), सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई यांचे स्वीय सहाय्यक.
- ३.मुख्य अभियंता व सह सचिव, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई यांचे स्वीय सहाय्यक.
- ४.आंतरवित्तीय सल्लागार तथा उप सचिव, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई यांचे स्वीय सहाय्यक.
- ५.सर्व मुख्य अभियंता, सार्वजनिक बांधकाम प्रादेशिक विभाग .
- ६.मुख्य अभियंता (विद्युत), बांद्रा (पूर्व), मुंबई-४०० ०५१.
- ७.मुख्य वास्तुशास्त्रज्ञ, मुंबई.
- ८.सर्व उप सचिव, सार्वजनिक बांधकाम विभाग, मंत्रालय, मुंबई-३२.

CONDITIONS FOR PROCUREMENT OF MATERIALS

- 1) The contractor shall make his own arrangement for supply of materials including bitumen 60/70 grade, 30/40 grade, 80/100 grade & emulsion and RCC pipes, collars. The contractor shall be responsible for all transportation and storage of the materials at site and shall bear all the related costs. The Engineer shall be entitled at any time, to inspect or examine all such materials. The contractor shall provide reasonable assistance for such inspection or examination as may be required.
- 2) The contractor shall keep an accurate record of use of materials like bitumen 60/70 grade, 30/40 Grade, 80/100 Grade bitumen, cement and steel used in the works in a manner prescribed by the Engineer and as per I.R.C. specifications.
- 3) After receiving the bitumen the authorized challan/gate pass should be obtained from the refinery mentioning the quantity of bitumen, grade of bitumen, date and time of delivery etc. and it should be handed over to Department for each consignment.
- 4) While transportation by Bouzer, transport pass should be obtained from the Corporation / Municipality through which the Bouzer is passed and the same shall be handed over to the authorized person of Department.
- 5) If there is any doubt regarding the materials received the same should be got tested from the Govt. laboratory at the cost of the contractor, and if the results are sub standard, the materials or the work executed with such materials will be rejected.
- (6) The day-today record of the receipt/utility/balance of materials should be kept by the contractor at plant site/site of work/store and the same will be checked by the Engineer-in-Charge or authorized Engineer at any time.
- (7) The testing charges shall be borne by the contractor.

Email

AG Audit II Maharashtra Nagpur

Audit of Centrally Sponsored Schemes/ Central Sector Schemes and their Reporting to State Legislature/ Parliament**From :** Priyanka z <priyanka1.pjb.ae@cag.gov.in>

Thu, Dec 29, 2022 02:32 PM

Subject : Audit of Centrally Sponsored Schemes/ Central Sector Schemes and their Reporting to State Legislature/ Parliament

1 attachment

To : PAG AUDIT II GUJARAT AHMEDABAD <pagau2gujarat@cag.gov.in>, AG Audit II Maharashtra Nagpur <agaumaharashtra2@cag.gov.in>, AG AU Goa <agaugoa@cag.gov.in>, A.G.Audit.II.Rajasthan Jaipur <agaurajasthan2@cag.gov.in>, PAG Audit I Rajasthan Jaipur <agaurajasthan1@cag.gov.in>, PAG Audit I Maharashtra Mumbai <agaumaharashtra1@cag.gov.in>, PAG Audit I Gujarat Rajkot <pagau1gujarat@cag.gov.in>

Cc : Nidhi Sharma <aao4wr@cag.gov.in>, RS (WR) Anil Kumar AAO <aao2rswr@cag.gov.in>, Shekhar Kumar Sharma <ao3rswr@cag.gov.in>, AMIT SACHDEVA <aorswr@cag.gov.in>, Sandeep Kumar Vashist <aaowr@cag.gov.in>, Lalit Kumar <aao1rswr@cag.gov.in>, Rajinder Kumar <donruk@cag.gov.in>, Surjeet Singh <sao5wr@cag.gov.in>, Harish Chander Panthri <saoca2d7@cag.gov.in>

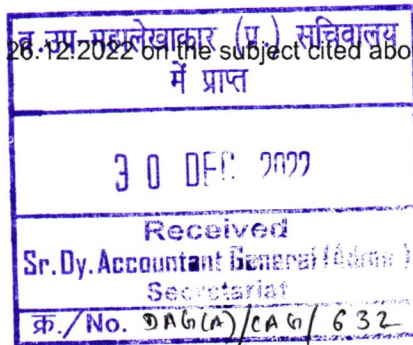
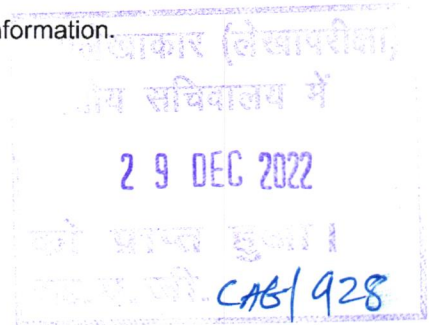
AG
Go. Affairs (Coord. for
circulating)
30/12
29/12

Respected Sir/ Madam,

Please find attach PPG's wing letter dated 26.12.2022 on the subject cited above for information.

--
Regards

Asstt. Admn. Officer
Western Region Wing
O/o the CAG of India,
New Delhi
Ext No. 7223



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174 KB

SAO/Coordn.
MAO/Coordn.
30/12

AG/CAG/109
30/12/2022

Professional Practices Group

No. 284/14-PPG/2022

Dated: 26.12.2022

Subject: Audit of Centrally Sponsored Schemes/ Central Sector Schemes and their Reporting to State Legislature/ Parliament

Reference were received from State audit offices on the scope, reporting of findings emerging from All India Performance Audits, including timing of the tabling of such reports in the Legislature. This circular examines the issue in the light of CAG's (DPC) Act 1971 and other guidances.

2. All India Performance Audits entail an examination of activities and processes relating to implementation of a scheme at each of the three levels of the Governance viz. Union, State and Local levels, based on the structure of the scheme. Typically, these involve a horizontal audit across various States/UTs, which affords comparability of programme implementation across the States/UTs while providing the Union Government a feedback.

3. The objectives and scope of All India Performance Audit determines the audit, including data collection, tasked to various field offices. The selection of findings featured in a Central Report depends on their materiality and significance; some major State specific findings are typically organized in Annexures. Similarly, the decision on featuring the State specific findings in the respective State Reports would have to be based on the objectives, scope of audit pursued by State AG Audit Offices and the materiality of findings.

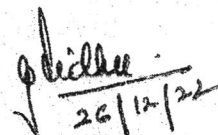
4. Based on the above, the following is clarified:

- i. The nature, scope, extent and quantum of Audit including the form and content of audit report is decided by the CAG;
- ii. State Audit Offices may whilst carrying out audit for all India PAs based on the guidelines issued centrally, pursue additional audit objectives or adopt an enlarged scope of examination (in terms of sampling or additional audit objectives);
- iii. Pursuing additional objectives or wider scope whilst conducting all India PAs may be decided by the State AG in consultation with the Functional Wing in Headquarters;
- iv. The substantial State specific findings that may emerge from the AIPA may be considered material for featuring separately in the State Report. Featuring of audit findings in the State Audit Reports under the relevant types (i.e. PA or CA) is to be examined and determined by the State AG in consultation with the Functional Wing in Headquarters; and
- v. The materiality parameters (including money value, nature of audit and audit product etc.) of All India PAs tabled in Parliament are different and contextual to overarching issues pertaining to Union Ministries. As seen from experience, it takes a much longer

time to coordinate, examine, moderate and compile an all India PA report; whereas State Audit Reports emanating from such studies may take a relatively shorter time to fructify. Tabling of the Audit Reports in the State Legislature and Parliament after completion of the relevant audits may be decided independently by the Functional Wings as they are not to be treated as inter-linked unless otherwise specifically directed.

5. This supersedes the Reports Central Circular letter CAG UO No. 120/02/Rep (C)/ 2016 Volume III dated 09.11.2016

6. This issues with the approval of DAI (HR, IR & Coord.).


26/12/22

(Gurveen Sidhu)

Director General (PPG & SMU)

All DAIs/ADAI

DG & Secretary to CAG

Copy to DG, North Eastern Region with reference to their letter No 175/RS (NER)/2021/AAP/ 2022-23 / 72 dated 28.09.2022 on Topics of All India Performance Audits featuring in State Audit Reports

दैनंदिन कामकाजाची कार्यपद्धत अनुसरण्यासाठी सुधारणा समिती

प्रतिनि-२०१५/दैनंदिन कामकाज अनुसरण/ ६९७ /प्रशा

1 JUL 2015

विमा संचालनालय,
महाराष्ट्र राज्य, मुंबई

विषय - कार्यादेशातील कंत्राटी कामाच्या मुल्यामध्ये वाढ/कंत्राटी कामाची मुदत विस्तारीत झाल्यास विमाहप्ता रक्कम कपातीबाबत कार्यपद्धत निश्चित करणेबाबत.

- संदर्भ - १) महाराष्ट्र शासन, वित्त विभाग, शासन निर्णय क्र.विमासं-१०९८/ प्र.क्र. २८/ शासन हमी दि. १९.०८.१९९८.
२) महाराष्ट्र शासन, नगर विकास विभाग, पत्र क्र. जीईएन १०९८/१३५३/प्र. क्र. १६६/९८/नवि-२४ दि.३.११.२००३.

प्रस्तावना - निरनिराळे शासकीय विभाग, निमशासकीय विभाग, महामंडळे, मंडळे, सार्वजनिक उपक्रम इ. संस्थामधील शासनाचे आर्थिक हितसंबंध सुरक्षित राहण्याच्या उद्देशाने अशा सर्व प्रकर्ता/संस्थांच्या कंत्राटी कामाचे विमा विषयक व्यवहार शासकीय विमानिधीमार्फत हाताळण्यात येतात. कंत्राटी कामाचा विमा हाताळण्याबाबत शासकीय विमानिधीमध्ये सुधारित कार्यपद्धत दि. ०१.०४.२०१५ पासून अंमलात आणलेली आहे. या सुधारित कार्यपद्धतीनुसार विविध प्रकर्ता हे त्यांच्या कंत्राटी कामाचा विमा शासकीय विमानिधीकडे उतर्बित आहेत.

कंत्राटी कामाच्या प्रशुल्कामध्ये विमापत्रकाचा कालावधी संपल्यानंतर विमापत्रकाचा कालावधी विस्तारीत करण्याची तरतूद/कार्यपद्धत विहीत केलेली आहे. तथापि, प्रकर्ता यांच्याकडून संदर्भाधीन शासन परिपत्रकानुसार विमाहप्ता रक्कम जमा झाल्यानंतर कंत्राटी कामाच्या मुल्यामध्ये वाढ अथवा कंत्राटी कामाचा कालावधी विस्तारित झाल्यास आकारण्यात येणाऱ्या विमाहप्ताबाबत शासकीय विमानिधीमध्ये कार्यपद्धत निश्चित करण्यात आलेली दिसून येत नाही. या कारणाने निश्चित दराने किंवा ढोबळ मानाने कंत्राटी कामाच्या बाढीव मुल्याचे/विस्तारीत कालावधीकरिता किती रक्कम कपात करावी, याबाबत राज्यातील विविध प्रकर्ता विचारणा करीत आहेत.

या अनुषंगाने दैनंदिन कामकाज कार्यपद्धत अनुसरण्यासाठी सुधारणा समिती व विमाहप्ता दर निर्धारण समिती यांची संयुक्त बैठक दि.२०.०६.२०१५ रोजी आयोजित करण्यात आलेली होती. सदर बैठकीत झालेल्या चर्चेनुसार खालीलप्रमाणे कार्यपद्धत निश्चित करण्यात येत आहे.

यांनी कंत्राटदाराच्या देयकातून ०.५०/१ टक्केप्रमाणे विमाहप्त्या रक्कम जमा केली.

जर कंत्राटदाराने शासकीय विमानिधीकडे कंत्राटी कामाचा विमा उतरविल्याचा पुरावा म्हणून विमापत्रक/विमास्विकारपत्र प्रकर्ता यांना सादर न केल्यास, कंत्राटदाराच्या प्रथम देयकातून शासन परिपत्रकानुसार विमाहप्त्याची रक्कम कपात करून शासकीय विमानिधीकडे जमा केली असेल व त्यानंतर कंत्राटीकामाचा कालावधी विस्तारीत झाला असेल तर, विस्तारित कालावधीकरिता विमाछत्राचा लाभ देण्यासाठी खालील कोष्टकात नमूद करण्यात आलेल्या दरानुसार एकूण कंत्राटी मुल्यावर रक्कम कपात करून शासकीय विमानिधीकडे विहित पध्दतीने जमा करण्यात यावी.

अनु क्र	विस्तारित कालावधी	रक्कम कपात करावयाचा दर
१	१ महिन्यापर्यंत	०.२६८% अधिक प्रचलित सेवाकर
२	२ महिन्यापर्यंत	०.२८३% अधिक प्रचलित सेवाकर
३	३ महिन्यापर्यंत	०.३०२% अधिक प्रचलित सेवाकर
४	६ महिन्यापर्यंत	०.३३६% अधिक प्रचलित सेवाकर
५	९ महिन्यापर्यंत	०.३७९% अधिक प्रचलित सेवाकर
६	१२ महिन्यापर्यंत	०.३९७% अधिक प्रचलित सेवाकर
७	१५ महिन्यापर्यंत	०.४१७% अधिक प्रचलित सेवाकर
८	१८ महिन्यापर्यंत	०.४३६% अधिक प्रचलित सेवाकर
९	२१ महिन्यापर्यंत	०.४५५% अधिक प्रचलित सेवाकर
१०	२४ महिन्यापर्यंत	०.४७४% अधिक प्रचलित सेवाकर

(६) कंत्राटी कामाच्या मुल्यामध्ये वाढ झाल्यास, कंत्राटी कामाच्या वाढीव मुल्यावर शासन परिपत्रकानुसार ०.५०/१ टक्के तसेच विस्तारित कालावधीकरिता वरील कोष्टकात नमूद करण्यात आलेल्या दरानुसार एकूण कंत्राटी मुल्यावर (वाढीसह) रक्कम जमा करण्यात यावी.

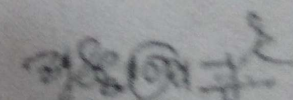
२. कंत्राटदाराने कंत्राटी कामाचा विमा शासकीय विमा निधीकडे उतरविला असल्यास

कंत्राटदाराने कंत्राटी कामाचा विमा शासकीय विमा निधीकडे उतरविल्याबाबतचा पुरावा म्हणून शासकीय विमानिधीने निर्गमित केलेले विमापत्र/विमास्विकारपत्र प्रकर्ता यांना सादर केले आहे. अशा कंत्राटी कामाचा मुल्यामध्ये वाढ झाली असेल किंवा कामाचा कालावधीत विस्तारीत झाला असेल, तर संबंधित कंत्राटदाराला वाढीव मुल्याचा/कालावधी विमा उतरविण्यासाठी प्रकर्ता यांनी निर्देश निर्गमित करावेत. जर, संबंधित कंत्राटदार यांनी याबाबतचा पुरावा प्रकर्ता यांना सादर केला नाही, अशा प्रसंगी प्रकर्ता यांनी कंत्राटदाराच्या देयकातून परिच्छेद १ (अ) व (ब) मधील कोष्टकांमध्ये

नमुद करण्यात आलेल्या दरानुसार रक्कम कपात करून शासकीय विमानिधीकडे जमा करण्यात यावी.

वरीलप्रमाणे कपात करण्यात आलेली विमाहप्त्याची रक्कम खालील विवरणपत्रातील तपशिलासह २ प्रतीत शासकीय विमानिधीकडे "विमा संचालक, महाराष्ट्र राज्य, मुंबई" यांच्या नावे धनादेश/धनाकर्ष अथवा ग्रास संगणक प्रणालीत (GRAS-Government Receipt Accounting System) प्रकटा यांनी जमा करणे आवश्यक आहे. त्यानुसार, विवरणपत्रनिहाय सामाईक विमापत्रक/पृष्ठांकन निर्गमित करण्यात येईल.

अनु. क्र.	कंत्राटदाराचे नाव	कंत्राटीकामाचा तपशील	कार्यादेश क्र. व दिनांक	कंत्राटीकामाचा विस्तारीत कालावधी	कंत्राटी कामाचे मुल्य	कपात केलेली विमाहप्त्याची रक्कम
१	२	३	४	५	६	७


कनिष्ठ तांत्रिक अधिकारी
महाराष्ट्र राज्य, मुंबई

या बाब विभागाकडील कामात अंदाजपत्रकीय
परिमाणापेक्षा परव्याघा बाबींचे परिमाणात
भरमराठ वाढ होणे व त्याकरीता उपाय योजना

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग,

शासन परिपत्रक क्र. संकीर्ण-२००४/प्र.क्र.८५/रस्ते १.

दिनांक २२-६-२००४.

॥३१॥

संदर्भ-१) शासन परिपत्रक क्र. बोडोजी-१०८७/सोआर-३२/इ-२, दि.७-१-१९८९

२) शासन परिपत्रक क्र. संकीर्ण-२००२/प्र.क्र.३७५/रस्ते-५, दि. ६-८-२००२

परिपत्रक

१. संदर्भ क्र.१ च्या परिपत्रकान्वये वास्तववादी अंदाजपत्रके तयार करण्याबाबतच्या सविस्तर सुचना निर्गमित करण्यात आल्या आहेत. तसेच संदर्भ क्र.२ च्या परिपत्रकान्वये सुधारित प्रशासकिय मान्यतेसाठीच्या अंदाजपत्रकातील त्रुटीबाबत मुळ अंदाजपत्रक तयार करतानाच अशा बाबींचा विचार करण्याच्या सुचना देण्यात आल्या आहेत. तथापी सुचनांचे तंतोतंत पालन क्षेत्रीय स्तरावरून होत नसल्याचे निदर्शनास आले आहे.

२. काही विशिष्ट प्रकरणी शासनाचे असे निदर्शनास आले आहे की क्षेत्रीय स्तरावर कामांच्या काही बाबींचे विशेष करून खोदकाम, पायव्याचे काम, भरावाचे काम, इत्यादी बाबींचे अंतिम परिमाण हे निविदेमधील संबंधित बाबींच्या परिमाणाशी सुसंगत राहात नाही. किंबहुना अशा बाबींच्या परिमाणात प्रचंड प्रमाणात वाढ होते. परिणामी मंजूर अंदाजपत्रक व करण्यात आलेले काम याचा अर्थाअर्थी संबंध उरत नाही व झालेल्या अतिरिक्त खर्चाबाबत उद्भवणा-या लेखा आक्षेपांच्या अनुषंगाने समर्थनीय खुलासा सादर करणे शक्य होत नाही. प्रसंगी लोक लेखा समितीचे आक्षेपास विभागास सामोरे जाणे भाग पडते किंवा महालेखाकार यांचे परिच्छेद वर्षानुवर्षे प्रलंबित राहतात.

३. उपरोक्त परिस्थिती टाळणेचे दृष्टीने खालीलप्रमाणे अतिरीक्त निर्देश देण्यात येत आहेत.

३.१

बांधकामाची सविस्तर अंदाजपत्रके संपूर्ण संकल्पचित्रासह, भूस्तराचे विस्तृत तपशीलासह व अचूक भूमापन प्लॅट्यासह काळजीपूर्वक रीत्या तयार करण्यात यावीत. तसेच अशी अटोखने, संकल्पचित्रे, काटछेद इत्यादि मुख्यत्वेकरून प्रस्तावित बांधकामाच्या प्रस्तुतिष्ठ परिस्थितीवर आधारित असावीत. अंदाजपत्रकास तांत्रिक मान्यता प्रदान करणाऱ्या सक्षम अधिकार्याने या बाबतीत सर्वतोपरी काळजी घेऊन व त्या दृष्टीने सखोल तपासणी करूनच तांत्रिक मान्यता प्रदान करावी.

अधिकाऱ्यांनी महाराष्ट्र सा.बां.नियमावलीतील परिच्छेद १९८ (१३) मधील तरतुदीनुसार प्रमाणपत्र द्यावे.

३.३

कामाशी संबंधित उप विभागीय स्तरावरील अधिकाऱ्याने निविदेप्रमाणे बांधकामातील बाबी कार्यान्वित करीत असतांना अशा बाबींची प्रत्यक्षातील परिमाणाची निविदेमधील परिमाणासोबत तुलना करून परिमाणे अनुज्ञेय मर्यादे बाहेर वाढत आहेत किंवा कसे याची वेळोवेळी तपासणी करावी. कामाची देयके तयार करताना या बाबीकडे विशेष लक्ष देणे त यावे. तसेच विभागीय स्तरावर देयके मंजूर करताना ज्या बाबीमध्ये अश्याप्रकारची वाढ झाली आहे, त्याची माहिती उपविभाकडून त्वरीत मागविण्यात यावी.

३.४

वरीलप्रमाणे तपासणीत एखाद्या बाबीच्या निविदेमधील परिमाणात २% टक्केपेक्षा जास्त होणे अटळ असल्याचे उप विभागीय स्तरावर निदर्शनास येताच त्याबाबतचा सविस्तर प्रस्ताव सावधानीय कारणांमांसह कार्यकारी अभियंता यांना तात्काळ सादर करावा.

३.५

- अनुज्ञेय मर्यादेपेक्षा अधिक परिमाणाचे काम करणे अपरिहार्य असेल तेव्हा
- अ) तांत्रिक मंजूरी प्रदान करणाऱ्या अधिकाऱ्याच्या (अधीक्षक अभियंता व मुख्य अभियंता) निदर्शनास ही बाब तात्काळ आणून पूर्व मंजूरी प्राप्त करणे आवश्यक आहे.
- ब) अंदाजपत्रकातील त्रुटींचे संशोधन कार्यकारी अभियंता यांनी करणे बंधनकारक राहील.

३.६

कार्यकारी अभियंता यांनी त्याचेकडे असे प्रस्ताव प्राप्त झाल्याच अंदाजपत्रकातील अपुरी तरतूद व प्रत्यक्ष बांधकामात वाढणारे परिमाण यातील तफावत कोणत्या करणारस्तव उद्भवली याबाबत परिस्थितीजन्य अहवाल तयार करावा. तसेच वाढीव परिमाणाचा कामाचे मंजूर किंमतीवर होणारा एकत्रित परिणाम याबाबत पडताळणी करावी.

३.७

कार्यकारी अभियंता यांनी निवीदा कलम ३७/३८ अन्वये वरीलप्रमाणे अभिप्रायासह प्रस्ताव अधीक्षक अभियंता यांचे मंजूरीस्तव विनाविलंब सादर करावा. तसेच अशा प्रकरणी सुधारित प्रशासकीय मान्यता प्राप्त करणे अपरिहार्य ठरत असल्यास महाराष्ट्र सा.बां.नियमावलीतील परिच्छेद क्र. १३४ अन्वये सुधारित प्रशासकीय मान्यतेकरीता अंदाजपत्रके सक्षम अधिकाऱ्याकडे विनाविलंब सादर करणेची दक्षता घ्यावी.

३.८

अधीक्षक अभियंता किंवा सक्षम प्राधिकाऱ्याने अधिक परिमाणाकरिता दर निश्चित करताना विहित प्राधिकाराची नोंद दर विश्लेषणावर आवजून ठेवावी जेणेकरून दर निश्चिती प्राधिकारबाबत संप्रम निर्माण होणार नाही. तसेच अधीक्षक अभियंता यांनी संबंधित बाबींची पाहणी करून त्याबाबतची वाढीची कारणांमांसा तपासून

- अ) योग्य समर्थन असल्यास अभिप्राय तमूद करून लिखित आदेश द्यावेत व

— निविदाकडून मागणीमांसा तपासतांना जर सदोष

अंदाजपत्रक वा अपुरे सर्वेक्षण वासमान कारणांमुळे परिमाण वाढत आहे असे स्पष्ट झाल्यास संबंधितांविरुद्ध आवश्यक प्रशासकीय कारवाई प्रस्तावित करावी व तदनंतरच मंजूरीबाबत कार्यवाही करावी.

३.९

ब-१ नव्याच्या निविदेमधील खंड ३८ खालील प्रस्तावास अधीक्षक अभियंता यांची मंजूरी प्राप्त झालेवरच तसेच सक्षम तांत्रिक मान्यता अधिक यानी मान्यता दिल्यानंतर अशा बाबींचे वाढीव परिमाणाचे काम हाती देण्यात यावे अशा बाबींचे वाढीव परिमाण माव वाढ कलनांतर्गत विचारात घेण्यात येऊ नये अन्तर्जव मर्यादपेक्षा अधिक परिमाणाचे काम मंजूर करारनाम्याखाली कंत्राटदाराकडून करवून घेताना उचित लिखित आदेश देण्यात यावेत.

३.१०

३.११

ब-१/ब-२ निविदा कलम ३८/३९ खाली वाढीव परिमाणाचे भुगतान करणेबाबत शासन निर्देश यापूर्वीच निर्गमित करण्यात आले आहेत. तसेच वेळप्रसंगी काही बाबी अधिक खुलासेवार स्पष्ट करण्यात आल्या आहेत.

३.१२

निविदेमधील परिमाणापेक्षा वाढणाऱ्या परिमाणाबाबतचा मुद्दा अधीक्षक अभियंता यांनी त्यांच्या वेळोवेळी होणाऱ्या कामांचे निरीक्षणाच्या वेळी लक्षात घेऊन निरीक्षण टिपणीमध्ये नोंदवावा. जेणेकरून अशा प्रकरणाचा पुढे पाठपुरावा होऊन हे प्रकरण वेळीच निवळेली निवू शकेल.

उपरोक्त प्रमाणे सूचनांचे काटेकोरपणे पालन करण्यात यावे.

(ना. शा. उमाटे)

अधीक्षक अभियंता व उप सचिव (रस्ते).

प्रत,

व्यवस्थापक रुग्णालय, म.रा.र. वि. महापडळ, नेपियनसी रोड, मुंबई
सर्व मुख्य अभियंता, सा.बा. प्रादेशिक विभाग,
सर्व अधीक्षक अभियंता, सा.बा. महानगर,
सर्व कार्यकारी अभियंता, सा.बा. विभाग,
सर्व अधिकारी/कार्यासन अधिकारी, सा.बा. विभाग, मंत्रालय, मुंबई
ह्यांना माहिती व योग्य कार्यवाहीसाठी



अधीक्षक अभियंता यांचे कार्यालय,
सार्वजनिक बांधकाम मंडळ,
बांधकाम भवन, कॉम्प्लेक्स परिसर,
गडचिरोली - ४४२६०५
दुरध्वनी क्र.०७१३२-२२२४१६

Email:
gadchiroli.se@mahapwd.gov.in

प्र.क्र. अर्थ/परिच्छेद क्र.२/२०१७-१८/२०२२/१४८५

दिनांक- १५/०६/२०२२

प्रति,

✓ वरिष्ठ लेखा अधिकारी, (ए.एम.जी.-II)
महालेखाकार (लेखापरिक्षा)- II
महाराष्ट्र, नागपूर ४४०००१

विषय :-

परिच्छेद क्र.२/२०१७-१८ Execution of Substandard work against IRC specification
Rs.२.७२ Crore.

कार्यकारी अभियंता, सा.बां.विभाग, आलापल्ली कडील परिच्छेदावरील वरिष्ठ कार्यालयाचे
अभिप्राय नोंदवून सादर करणेबाबत.

संदर्भ :-

१. महालेखाकार (लेखापरिक्षा)-II, महाराष्ट्र, नागपूर पत्र No.AMG-II/PWD-Allapalli/IR
२०१९-१० से २०१८-१९, Dated १७.११/२०२१
२. कार्यकारी अभियंता, सा.बां.विभाग, आलापल्ली यांचे पत्र क्र.१५७३/लेवि/वलेली/२०२२
दिनांक ०२.०६.२०२२

संदर्भित पत्रानुसार विषयाकित परिच्छेदावर वरिष्ठ कार्यालयाचे अभिप्राय मागविण्यात आलेले
आहे. तरी कार्यकारी अभियंता, सा.बां. विभाग, आलापल्ली यांनी सादर केलेल्या परिच्छेदावरील दिलेल्या उत्तरावर
या कार्यालयाचे अभिप्राय नोंदवून तसेच आवश्यक कागदपत्रे जोडून आपणाकडे सादर करण्यात येत आहे. तरी
सदर परिच्छेद कृपया निकाली काढण्यास यावा हि विनंती.

सहपत्र :-

परिच्छेद क्र.२/२०१७-१८ व त्याअनुषंगाने आवश्यक कागदपत्रे.

(निता ठाकरे)

अधीक्षक अभियंता,
सार्वजनिक बांधकाम मंडळ,
गडचिरोली

प्रतिलिपी,

कार्यकारी अभियंता, सार्वजनिक बांधकाम विभाग, आलापल्ली यांना संदर्भित पत्राचे अनुषंगाने
माहितीस व पुढील कार्यवाहीस अग्रेषित.

Ord-100
dt: 29/02/22

Sr. No.	Year of I.R.	Audit Para No.	Audit para in detail	Executive Engineer's Reply	Superintending Engineer's Comments																																																																
1	2	3	4	5	6																																																																
4	2018-19	2	<p>PARA 2:- Execution of substandard work against IRC specifications: Rs. 2.72crores.</p> <p>As per the clause 504.5 of IRC specifications, the bituminous Macadam (BM) should be covered either by the next layer of pavement or wearing course within a period of maximum 48 hours. In case of any delay the BM should be covered by a layer of seal coat temporarily and the cost should be borne by the contractor</p> <p>Scrutiny of measurement book of works revealed that the following cases shown below, the BM layer was not covered within the prescribed norms of 48 hours. Thus, leaving the BM costing Rs.2.72 crores exposed to damage by nature as well as vehicular traffic.</p> <table><tr><th>Sr. No</th><th>Agreement No.</th><th>Name of item</th><th>Quantity executed</th><th>Date of execution</th><th>Time limit for execution</th><th>Delay in days</th><th>Amount</th></tr><tr><td>1</td><td>B1 / 97/ DL / 15-16</td><td>BM</td><td>1013.42</td><td>29.01.2016</td><td>2 days</td><td>11</td><td>10686543</td></tr><tr><td></td><td></td><td>OGPMC</td><td>16500.00</td><td>11.02.2016</td><td></td><td></td><td></td></tr><tr><td>2</td><td>B1 / 98/ DL / 15-16</td><td>BM</td><td>1028.99</td><td>03.01.2016</td><td>2 days</td><td>11</td><td>11349760</td></tr><tr><td></td><td></td><td>OGPMC</td><td>16500.00</td><td>16.01.2016</td><td></td><td></td><td></td></tr><tr><td>3</td><td>B1 / 105/ DL / 15-16</td><td>BM</td><td>467.033</td><td>29.09.2016 & 07.10.2016</td><td>2 days</td><td>09</td><td>5218626</td></tr><tr><td></td><td></td><td>OGPMC</td><td>7323.00</td><td>10.10.2016</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>27254929</td></tr></table> <p>Thus, non-observance of technical instruction as per IRC specifications was brought to the notice for comments.</p>	Sr. No	Agreement No.	Name of item	Quantity executed	Date of execution	Time limit for execution	Delay in days	Amount	1	B1 / 97/ DL / 15-16	BM	1013.42	29.01.2016	2 days	11	10686543			OGPMC	16500.00	11.02.2016				2	B1 / 98/ DL / 15-16	BM	1028.99	03.01.2016	2 days	11	11349760			OGPMC	16500.00	16.01.2016				3	B1 / 105/ DL / 15-16	BM	467.033	29.09.2016 & 07.10.2016	2 days	09	5218626			OGPMC	7323.00	10.10.2016											27254929	<p>In this work, the BM is covered by seal coat by contractor. But the delay of few days has been occurred. But Being a state highway road PWD followed the Red book specification volume I-Roads-2012 clause no 504.5. It states that " If there is to be any delay in covering BM, the course shall be covered by seal coat before opening to traffic. The seal coat in such areas shall be considered incidental to the work and shall not be paid separately to the contractor. In our case, being A core Naxal area, it is not possible to cover BM within 48 hours before opening to traffic. The contractor has covered the BM by seal coat by his own expenses. PWD has not paid for that layer to contractor. So, PWD has followed the procedure mentioned in Red book specification volume I-Roads-2012 (clause no 504.5) At present the BM and seal coat both are undamaged. The road is in good condition and BM layer costing Rs. 2.72 crore in not damaged by nature as well as vehicular traffic. Hence, the para may please be dropped. (statement no 04)</p> <p>Executive Engineer Public Works Division Allapalli.</p>	<p>Agree with the EE's Comments</p> <p>(Nita Thakare) Superintending Engineer Public Works Circle Gadchiroli</p>
Sr. No	Agreement No.	Name of item	Quantity executed	Date of execution	Time limit for execution	Delay in days	Amount																																																														
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							27254929																																																														

Sr. No.	Year of I.R.	Audit Para No.	Audit para in detail	Executive Engineer's Reply	Superintending Engineer's Comments
1	2	3	4	5	6
5	2018-19	2	<p>In reply department stated that being a core naxalite affected and forest area BM could not be covered by carpet and liquid seal coat within 48 hours after completion. Therefore while execution, tack coat is firstly applied and sealing is done by carpet and liquid seal coat.</p> <p>Reply is not tenable as no documentary evidence was produced to audit to confirm that tack coat was applied before sealing by carpet and liquid seal coat.</p> <p>Thus due to non-adherence of the procedure as per the IRC specification the works executed was of sub-standard quality.</p> <p>Comments of higher authorities' may be obtained and furnished to audit.</p>	As above	<p><i>(Signature)</i> Executive Engineer Public Works Division Allapalli.</p> <p><i>(Signature)</i> (Nita Thakare) Superintending Engineer Public Works Circle Gadchiroli /</p>

affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with approved anti-stripping agents, as per the manufacturer's recommendations, without additional payment. Before approval of the source, the aggregates shall be tested for stripping.

The aggregates shall satisfy the physical requirements set forth in Table 500-3.

Where crushed gravel is proposed for use as aggregate, not less than 90% by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

504.2.3. Fine aggregates: Fine aggregates shall consist of crushed or naturally occurring material, or a combination of the two, passing 2.36 mm sieve and retained on 75 micron sieve. They shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter.

504.2.4. Aggregate grading and binder content: When tested in accordance with IS: 2386 Part 1 (wet sieving method), the combined aggregate grading for the particular mixture shall fall within the limits shown in Table 500-4 for the grading specified in the Contract. The type and quantity of bitumen, and appropriate thickness, are also indicated for each mixture type.

504.2.5. Proportioning of material: The aggregates shall be proportioned and blended to produce a uniform mixture complying with the requirements of Table 500-4. The binder content shall be within a tolerance of ± 0.3 per cent by weight of total mixture when individual specimens are taken for quality control tests in accordance with the provisions of Section 900.

504.3. Construction Operations

504.3.1. Weather and seasonal limitations: The provisions of Clause 501.5.1 shall apply.

504.3.2. Preparation of the base: The base on which bituminous macadam is to be laid shall be prepared, shaped and compacted to the required profile in accordance with Clauses 501.8 and 902.3 as appropriate, and a prime coat, shall be applied in accordance with Clause 502 where specified, or as directed by the Engineer.

504.3.3. Tack coat : A tack coat in accordance with Clause- 503 shall be applied as required by the Contract documents, or as directed by the Engineer. **504.3.4. Preparation and transportation of the mixture:** The provisions of Clauses 501.3 and 501.4 shall apply.

504.3.5. Spreading: The provisions of Clauses 501.5.3 shall apply.

504.3.6. Rolling: Compaction shall be carried out in accordance with the provisions of Clauses 501.6 and 501.7.

Rolling shall be continued until the specified density is achieved, or where no density is specified, until there is no further movement under the roller. The required frequency of testing is defined in Clause 903.

504.4. Surface Finish and Quality Control of Work: The surface finish of the completed construction shall conform to the requirements of Clause 902. For control of the quality of materials supplied and the works carried out, the relevant provisions of Section 900 shall apply.

504.5. Protection of the Layer

The bituminous macadam shall be covered with either the next pavement course or wearing course, as the case may be, within a maximum of forty-eight hours. If there is to be any delay, the course shall be covered by a seal coat to the requirement of Clause 513 before opening to any traffic. The seal coat in such cases shall be considered incidental to the

work and shall not be paid for separately.

504.6. Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112

504.7. Measurement for Payment

Bituminous macadam shall be measured as finished work in cubic metres, or by weight in metric tonnes, where used as regulating course, or square metres at the specified thickness as indicated in the Contract or shown on the drawings, or as otherwise directed by the Engineer.

504.8. Rate

The contract unit rate for bituminous macadam shall be payment in full for carrying out the required operations as specified. The rate shall include for, all components listed in Clause 501.8.8.2. (i) to (xi).

505. BITUMINOUS PENETRATION MACADAM

505.1. Scope

The work shall consist of construction of one or more layers of compacted crushed coarse aggregates with alternate applications of bituminous binder and key aggregates in accordance with the requirements of these Specifications to be used as a base course on roads, subject to the requirements of the overall pavement design, in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer. Thickness of an individual course shall be 50 mm or 75 mm, or other as specified.

505.2. Materials

505.2.1. Bitumen: The binder shall be paving bitumen of suitable penetration grade within the range of S-35 to S-90 or A-35 to A-90 (30/ 40 to 80/ 100) as per Indian Standards Specifications for "Paving Bitumen" IS :73, or approved outback satisfying the requirements of IS : 217 or 454. The actual grade of bitumen or outback to be used shall be as specified or as directed by the Engineer.

505.2.2. Aggregates: The aggregates shall satisfy the physical requirements set out in Clause 504.2.2. and Table 500-3. The coarse and key aggregates shall conform to the grading given in Table 500-6.

505.2.3. Quantities of materials: The quantities of materials used for this work shall be as specified in Table 500-6.

505.3. Construction Operations

505.3.1. Weather and Seasonal Limitations: The provisions of Clause 501.5.1. shall apply.

505.3.2. Equipment : A mechanical broom, compressor, self propelled or trailed bitumen heater/distributor, mechanical aggregate spreader and 8 to 10 tonne smooth steel wheel roller or vibrating roller are required for the preparation of Penetration Macadam.

505.3.3. Preparation of the base: The base on which the Penetration Macadam Course is to be laid shall be prepared, shaped and compacted to the specified lines, grades and sections to Clauses 501 and 902 as appropriate, or as directed by the Engineer. A prime coat, where specified, shall be applied over the base in accordance with Clause 502 or as directed by the Engineer. A tack coat as per Clause 503 shall be applied.



अधीक्षक अभियंता यांचे कार्यालय,
सार्वजनिक बांधकाम मंडळ,
बांधकाम भवन, कॉम्प्लेक्स परिसर,
गडचिरोली - ४४२६०५
दुरध्वनी क्र.०७१३२-२२२४१६

Email:
gadchiroli.se@mahapwd.gov.in

प्र.क्र. अर्थ/परिच्छेद क्र.२/२०१७-१८/२०२२/१४८५

दिनांक- १५/०६/२०२२

प्रति,

✓ वरिष्ठ लेखा अधिकारी, (ए.एम.जी.-II)
महालेखाकार (लेखापरिक्षा)- II
महाराष्ट्र, नागपूर ४४०००१

विषय :-

परिच्छेद क्र.२/२०१७-१८ Execution of Substandard work against IRC specification
Rs.२.७२ Crore.

कार्यकारी अभियंता, सा.बां.विभाग, आलापल्ली कडील परिच्छेदावरील वरिष्ठ कार्यालयाचे
अभिप्राय नोंदवून सादर करणेबाबत.

संदर्भ :-

१. महालेखाकार (लेखापरिक्षा)-II, महाराष्ट्र, नागपूर पत्र No.AMG-II/PWD-Allapalli/IR
२०१९-१० से २०१८-१९, Dated १७.११/२०२१
२. कार्यकारी अभियंता, सा.बां.विभाग, आलापल्ली यांचे पत्र क्र.१५७३/लेवि/वलेली/२०२२
दिनांक ०२.०६.२०२२

संदर्भित पत्रानुसार विषयाकित परिच्छेदावर वरिष्ठ कार्यालयाचे अभिप्राय मागविण्यात आलेले आहे. तरी कार्यकारी अभियंता, सा.बां. विभाग, आलापल्ली यांनी सादर केलेल्या परिच्छेदावरील दिलेल्या उत्तरावर या कार्यालयाचे अभिप्राय नोंदवून तसेच आवश्यक कागदपत्रे जोडून आपणाकडे सादर करण्यात येत आहे. तरी सदर परिच्छेद कृपया निकाली काढण्यास यावा हि विनंती.

सहपत्र :-

परिच्छेद क्र.२/२०१७-१८ व त्याअनुषंगाने आवश्यक कागदपत्रे.

(निता ठाकरे)

अधीक्षक अभियंता,
सार्वजनिक बांधकाम मंडळ,
गडचिरोली

प्रतिलिपी,

कार्यकारी अभियंता, सार्वजनिक बांधकाम विभाग, आलापल्ली यांना संदर्भित पत्राचे अनुषंगाने माहितीस व पुढील कार्यवाहीस अग्रेषित.

Ord-100
dt: 29/02/22

Sr. No.	Year of I.R.	Audit Para No.	Audit para in detail	Executive Engineer's Reply	Superintending Engineer's Comments																																																																
1	2	3	4	5	6																																																																
4	2018-19	2	<p>PARA 2:- Execution of substandard work against IRC specifications: Rs. 2.72crores.</p> <p>As per the clause 504.5 of IRC specifications, the bituminous Macadam (BM) should be covered either by the next layer of pavement or wearing course within a period of maximum 48 hours. In case of any delay the BM should be covered by a layer of seal coat temporarily and the cost should be borne by the contractor</p> <p>Scrutiny of measurement book of works revealed that the following cases shown below, the BM layer was not covered within the prescribed norms of 48 hours. Thus, leaving the BM costing Rs.2.72 crores exposed to damage by nature as well as vehicular traffic.</p> <table><thead><tr><th>Sr. No</th><th>Agreement No.</th><th>Name of item</th><th>Quantity executed</th><th>Date of execution</th><th>Time limit for execution</th><th>Delay in days</th><th>Amount</th></tr></thead><tbody><tr><td>1</td><td>B1 / 97/ DL / 15-16</td><td>BM</td><td>1013.42</td><td>29.01.2016</td><td>2 days</td><td>11</td><td>10686543</td></tr><tr><td></td><td></td><td>OGPMC</td><td>16500.00</td><td>11.02.2016</td><td></td><td></td><td></td></tr><tr><td>2</td><td>B1 / 98/ DL / 15-16</td><td>BM</td><td>1028.99</td><td>03.01.2016</td><td>2 days</td><td>11</td><td>11349760</td></tr><tr><td></td><td></td><td>OGPMC</td><td>16500.00</td><td>16.01.2016</td><td></td><td></td><td></td></tr><tr><td>3</td><td>B1 / 105/ DL / 15-16</td><td>BM</td><td>467.033</td><td>29.09.2016 & 07.10.2016</td><td>2 days</td><td>09</td><td>5218626</td></tr><tr><td></td><td></td><td>OGPMC</td><td>7323.00</td><td>10.10.2016</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>27254929</td></tr></tbody></table> <p>Thus, non-observance of technical instruction as per IRC specifications was brought to the notice for comments.</p>	Sr. No	Agreement No.	Name of item	Quantity executed	Date of execution	Time limit for execution	Delay in days	Amount	1	B1 / 97/ DL / 15-16	BM	1013.42	29.01.2016	2 days	11	10686543			OGPMC	16500.00	11.02.2016				2	B1 / 98/ DL / 15-16	BM	1028.99	03.01.2016	2 days	11	11349760			OGPMC	16500.00	16.01.2016				3	B1 / 105/ DL / 15-16	BM	467.033	29.09.2016 & 07.10.2016	2 days	09	5218626			OGPMC	7323.00	10.10.2016											27254929	<p>In this work, the BM is covered by seal coat by contractor. But the delay of few days has been occurred. But Being a state highway road PWD followed the Red book specification volume I-Roads-2012 clause no 504.5. It states that " If there is to be any delay in covering BM, the course shall be covered by seal coat before opening to traffic. The seal coat in such areas shall be considered incidental to the work and shall not be paid separately to the contractor. In our case, being A core Naxal area, it is not possible to cover BM within 48 hours before opening to traffic. The contractor has covered the BM by seal coat by his own expenses. PWD has not paid for that layer to contractor. So, PWD has followed the procedure mentioned in Red book specification volume I-Roads-2012 (clause no 504.5) At present the BM and seal coat both are undamaged. The road is in good condition and BM layer costing Rs. 2.72 crore in not damaged by nature as well as vehicular traffic. Hence, the para may please be dropped. (statement no 04)</p> <p>Executive Engineer Public Works Division Allapalli.</p>	<p>Agree with the EE's Comments</p> <p>(Nita Thakare) Superintending Engineer Public Works Circle Gadchiroli</p>
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Sr. No.	Year of I.R.	Audit Para No.	Audit para in detail	Executive Engineer's Reply	Superintending Engineer's Comments
1	2	3	4	5	6
5	2018-19	2	<p>In reply department stated that being a core naxalite affected and forest area BM could not be covered by carpet and liquid seal coat within 48 hours after completion. Therefore while execution, tack coat is firstly applied and sealing is done by carpet and liquid seal coat.</p> <p>Reply is not tenable as no documentary evidence was produced to audit to confirm that tack coat was applied before sealing by carpet and liquid seal coat.</p> <p>Thus due to non-adherence of the procedure as per the IRC specification the works executed was of sub-standard quality.</p> <p>Comments of higher authorities' may be obtained and furnished to audit.</p>	As above	<p><i>(Signature)</i> Executive Engineer Public Works Division Allapalli.</p> <p><i>(Signature)</i> (Nita Thakare) Superintending Engineer Public Works Circle Gadchiroli /</p>

affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with approved anti-stripping agents, as per the manufacturer's recommendations, without additional payment. Before approval of the source, the aggregates shall be tested for stripping.

The aggregates shall satisfy the physical requirements set forth in Table 500-3.

Where crushed gravel is proposed for use as aggregate, not less than 90% by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

504.2.3. Fine aggregates: Fine aggregates shall consist of crushed or naturally occurring material, or a combination of the two, passing 2.36 mm sieve and retained on 75 micron sieve. They shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter.

504.2.4. Aggregate grading and binder content: When tested in accordance with IS: 2386 Part 1 (wet sieving method), the combined aggregate grading for the particular mixture shall fall within the limits shown in Table 500-4 for the grading specified in the Contract. The type and quantity of bitumen, and appropriate thickness, are also indicated for each mixture type.

504.2.5. Proportioning of material: The aggregates shall be proportioned and blended to produce a uniform mixture complying with the requirements of Table 500-4. The binder content shall be within a tolerance of ± 0.3 per cent by weight of total mixture when individual specimens are taken for quality control tests in accordance with the provisions of Section 900.

504.3. Construction Operations

504.3.1. Weather and seasonal limitations: The provisions of Clause 501.5.1 shall apply.

504.3.2. Preparation of the base: The base on which bituminous macadam is to be laid shall be prepared, shaped and compacted to the required profile in accordance with Clauses 501.8 and 902.3 as appropriate, and a prime coat, shall be applied in accordance with Clause 502 where specified, or as directed by the Engineer.

504.3.3. Tack coat : A tack coat in accordance with Clause- 503 shall be applied as required by the Contract documents, or as directed by the Engineer. **504.3.4. Preparation and transportation of the mixture:** The provisions of Clauses 501.3 and 501.4 shall apply.

504.3.5. Spreading: The provisions of Clauses 501.5.3 shall apply.

504.3.6. Rolling: Compaction shall be carried out in accordance with the provisions of Clauses 501.6 and 501.7.

Rolling shall be continued until the specified density is achieved, or where no density is specified, until there is no further movement under the roller. The required frequency of testing is defined in Clause 903.

504.4. Surface Finish and Quality Control of Work: The surface finish of the completed construction shall conform to the requirements of Clause 902. For control of the quality of materials supplied and the works carried out, the relevant provisions of Section 900 shall apply.

504.5. Protection of the Layer

The bituminous macadam shall be covered with either the next pavement course or wearing course, as the case may be, within a maximum of forty-eight hours. If there is to be any delay, the course shall be covered by a seal coat to the requirement of Clause 513 before opening to any traffic. The seal coat in such cases shall be considered incidental to the

work and shall not be paid for separately.

504.6. Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112

504.7. Measurement for Payment

Bituminous macadam shall be measured as finished work in cubic metres, or by weight in metric tonnes, where used as regulating course, or square metres at the specified thickness as indicated in the Contract or shown on the drawings, or as otherwise directed by the Engineer.

504.8. Rate

The contract unit rate for bituminous macadam shall be payment in full for carrying out the required operations as specified. The rate shall include for, all components listed in Clause 501.8.8.2. (i) to (xi).

505. BITUMINOUS PENETRATION MACADAM

505.1. Scope

The work shall consist of construction of one or more layers of compacted crushed coarse aggregates with alternate applications of bituminous binder and key aggregates in accordance with the requirements of these Specifications to be used as a base course on roads, subject to the requirements of the overall pavement design, in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer. Thickness of an individual course shall be 50 mm or 75 mm, or other as specified.

505.2. Materials

505.2.1. Bitumen: The binder shall be paving bitumen of suitable penetration grade within the range of S-35 to S-90 or A-35 to A-90 (30/ 40 to 80/ 100) as per Indian Standards Specifications for "Paving Bitumen" IS :73, or approved outback satisfying the requirements of IS : 217 or 454. The actual grade of bitumen or outback to be used shall be as specified or as directed by the Engineer.

505.2.2. Aggregates: The aggregates shall satisfy the physical requirements set out in Clause 504.2.2. and Table 500-3. The coarse and key aggregates shall conform to the grading given in Table 500-6.

505.2.3. Quantities of materials: The quantities of materials used for this work shall be as specified in Table 500-6.

505.3. Construction Operations

505.3.1. Weather and Seasonal Limitations: The provisions of Clause 501.5.1. shall apply.

505.3.2. Equipment : A mechanical broom, compressor, self propelled or trailed bitumen heater/distributor, mechanical aggregate spreader and 8 to 10 tonne smooth steel wheel roller or vibrating roller are required for the preparation of Penetration Macadam.

505.3.3. Preparation of the base: The base on which the Penetration Macadam Course is to be laid shall be prepared, shaped and compacted to the specified lines, grades and sections to Clauses 501 and 902 as appropriate, or as directed by the Engineer. A prime coat, where specified, shall be applied over the base in accordance with Clause 502 or as directed by the Engineer. A tack coat as per Clause 503 shall be applied.

ठेव स्वरुपातील बांधकामे हाती
घेण्याबाबत सविस्तर सूचना.

महाराष्ट्र शासन
सार्वजनिक बांधकाम विभाग
शासन परिपत्रक क्र. बीडीजी २०१७/प्र.क्र.५०/इमारती-२
मंत्रालय, मुंबई ४०० ०३२
दिनांक :- ०६/०४/२०१७

शासन परिपत्रक:-

ठेव स्वरुपातील बांधकामे हाती घेण्याबाबत महाराष्ट्र सार्वजनिक बांधकाम नियम पुस्तिकेमधील परिच्छेद क्रमांक २९९ ते ३०५ कार्यपद्धती विहित करण्यात आली आहे. सदर कार्यपद्धतीचे पालन क्षेत्रिय स्तरावर काटेकोरपणे होत नसल्याचे शासनाच्या निदर्शनास आले आहे.

२. ठेव स्वरुपातील कामांची अंमजबजावणी व त्यावर नियंत्रण ठेवण्याच्या दृष्टीकोनातून सदरील कामे कार्यान्वित करण्यास क्षेत्रिय स्तरावर खालीलप्रमाणे सविस्तर सूचना निर्गमित करण्यात येत आहेत :-

१) ठेव स्वरुपातील बांधकामे सा.बां. विभागाकडून हाती घ्यावयाची असल्यास सा.बां. नियमपुस्तिका परिच्छेद ३०० मध्ये नमूद परिशिष्ट ४२ अन्वये दिलेल्या अधिकारानुसार सक्षम प्राधिकाऱ्याची पूर्वपरवानगी प्राप्त करुन हाती घ्यावीत. सक्षम प्राधिकाऱ्याच्या पूर्व परवानगीशिवाय कार्यकारी अभियंता यांनी ठेव रक्कम स्विकारु नये.

परिशिष्ट ४२ अ.क्र. ३३ नुसार ठेव घेऊन करावयाची कामे स्वीकारण्यास सक्षम प्राधिकारी

सक्षम प्राधिकारी	कामाची किंमत
कार्यकारी अभियंता	रुपये १०.०० लक्ष पर्यंत
अधीक्षक अभियंता	रुपये १०.०० लक्ष पेक्षा जास्त परंतु रुपये २५.०० लक्ष पर्यंत
मुख्य अभियंता	रुपये २५.०० लक्ष पेक्षा जास्त (पूर्ण अधिकार)

२) सदरील कामांना सक्षम प्राधिकारी यांची मंजूरी प्राप्त झाल्यावर सदर कामांना खालील सूचनांनुसार उपभोक्ता विभागनिहाय जॉब क्रमांक देण्यात यावे :-

जॉब क्रमांक : Y /

a	b	c	d	e
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Y - उपभोक्ता विभागाचे नाव (जसे गृह विभाग, विधी व न्याय विभाग, सार्वजनिक आरोग्य विभाग इ.)

a - प्रस्ताव प्राप्त झाल्याचे वर्ष

b - जिल्हा

c - त्या जिल्ह्यातील विभागाचे नाव (विभागाचे नांव ओळखण्यासाठी सा.बां/वि.प्र/रोहयो/
एकात्मिकृत/अन्य)

d - सदर काम ज्या स्तरावर काम मंजूर करण्यात आले त्या प्राधिकरणाचा स्तर
(जसे मु.अ., अ.अ., का.अ.)

e - जॉब क्रमांक ००१ ते ९९९

वरीलप्रमाणे सांकेतांक देण्याची पद्धत ही मुख्य अभियंता, अधीक्षक अभियंता तसेच कार्यकारी अभियंता स्तरावर प्रत्येक उपभोक्ता विभागनिहाय जसे आरोग्य, गृह इ. मंजूर करावयाच्या कामासाठी समान राहिल.

३) उपभोक्ता विभागाकडून सदर कामांबाबत पूर्वमान्यता प्राप्त करुन घ्यावी. अंशदान ठेव पद्धतीने सा.बां.विभागाने कार्यान्वित करावयाच्या कामांबाबत, म.सा.बां.नियमावली १९८४ (सहावी आवृत्ती) च्या परिच्छेद २९९ ते ३०५ नुसार सदरील मान्यतेमध्ये खालील अटीचा अंतर्भाव असावा. सदर मान्यता झाल्याखेरीज निविदा प्रक्रिया सुरु करण्यात येऊ नये.

(अ) सदर ठेव कामावरील खर्च हा निविदा निश्चितीनंतर प्राप्त निविदेतील किंमतीच्या अनुषंगाने (कमी/अधिक देकारानुसार) करारनाम्याच्या अटी व शर्तीनुसार, कामावर देय भाववाढ, फरक इ. गृहित धरून काम पूर्ण झाल्यावर अंतिम खर्च विभागाद्वारे वेळोवेळी उपभोक्ता विभागास कळविण्यात येईल.

सदर अंतिम खर्च हा ठेव रकमेपेक्षा जास्त असल्यास उपभोक्ता विभागास उर्वरित रक्कम विहित कालावधीत सा.बां. विभागाकडे जमा करणे बंधनकारक राहील. जर ठेव रक्कम ही अंतिम प्रकल्प खर्चापेक्षा कमी असल्यास सा.बां. विभागातर्फे उर्वरित रक्कम उपभोक्ता विभागास परत करण्यात येईल.

(ब) ठेव रक्कम विहित कालावधीत प्राप्त न झाल्यास काम सा.बां. विभागातर्फे सुरक्षित स्थितीत थांबविण्यात येईल. सा.बां. विभाग उर्वरित कामाबाबत कुठलेही दायित्व स्वीकारणार नाही. तसेच निधी न उपलब्ध झाल्यामुळे प्रकल्प किंमतीत होणारी वाढ तसेच अपूर्ण कामास होणारे नुकसान यांस सा.बां. विभाग जबाबदार राहणार नाही.

(क) सदर कामावर होणाऱ्या खर्चाबाबत ठेव रक्कमेच्या अधीन राहून उपयोगिता प्रमाणपत्र तसेच तिमाही मध्ये कार्यकारी अभियंता उपभोक्ता विभागास सादर करेल.

(ड) कामावर होणाऱ्या अतिरिक्त खर्चाबाबत उपभोक्ता विभागास वेळोवेळी अवगत करण्यात येईल व ठेव रकमेपेक्षा जास्त होणारा खर्च चालू राहण्याबाबत वित्त विभागाची मंजूरी मिळविण्याची जबाबदारी ही प्रशासकीय विभागाची राहील.

(इ) बांधकाम पार पाडण्यासंदर्भातील शासनाच्या (सा.बां.विभागाची) जबाबदारीची मर्यादा, ज्यांच्यासाठी बांधकाम करावयाचे आहे त्या उपभोक्ता विभागातील अधिका-यांनी व ज्यांच्याकडे ते बांधकाम सोपविण्यात येणार असेल, त्या सा.बां. विभागाच्या यंत्रणेने पूर्णपणे जाणून घ्यावी. बांधकाम पार पाडण्याच्या ओघात करावा लागणारा सर्व खर्च मग तो बांधकामाशी प्रत्यक्ष किंवा अप्रत्यक्षपणे संबंधित असला तरीही बांधकामाच्याच खर्चातून करण्यात येईल हे स्पष्टपणे विनिर्दिष्ट करावे.

(ई) बांधकाम खूप मोठे असेल किंवा बांधकामासंबंधात कायदेशीर सल्ला घेऊन करार करणे इष्ट ठरेल अशी परिस्थिती असेल तर त्याबाबत कायदेशीर सल्ला घेतल्यानंतरच करार करावा.

(उ) संबंधित प्रशासकीय विभागाकडून लेखी विनंती करण्यात आली तर एका बांधकामासाठीची ठेव जर त्यात बचत झाली असेल तर ती ठेव थकित असलेल्या दुसऱ्या बांधकामा संबंधीतील खर्च भागविण्यासाठी वापरता येईल. बांधकाम प्रगतीत असताना व्याप्तीत बदल अथवा वाढ संभवत असल्यास, प्रशासकीय मान्यता प्रदान करणा-या प्राधिकरणाने केलेल्या विनंतीनुसारच असे बदल कार्यान्वीत करण्यात येतील. तसेच तांत्रिक मंजूरीच्या वावात बदल होत असल्यास, तांत्रिक मंजूरी प्रदान करणा-या प्राधिका-यापेक्षा वरच्या दर्जाच्या प्राधिकरणाची पूर्वसंमती व मंजूरी घेणे अपरीहार्य राहील. याकरिता मुख्य अभियंता हे सर्वोच्च तांत्रिक अधिकारी असतील.

४) ठेव स्वरूपाच्या बांधकामामुळे निर्माण होणारे कोणतेही दायित्व पत्करण्यापूर्वी ठेव रक्कम उपभोक्ता विभागाकडून प्राप्त करून घेण्यात यावी. जर आवश्यक असेल त्यावेळी निधी मिळू शकेल अशी उपभोक्ता/सा.बां. विभागाची खात्री असेल तर, त्याबाबतीत निश्चित तारखांना/वेळापत्रकानुसार उचित हप्त्यावर देय रक्कमेच्या प्राप्तीबाबत प्राधिकारपत्र संबंधित विभागाने देणे बंधनकारक राहील.

५) प्रादेशिक विभागातील सर्व विभागांनी त्यांचे अधिनस्त सुरु असलेल्या ठेव कामांबाबतची वर्षनिहाय अद्ययावत माहिती विवरणपत्र “ब” मध्ये मंडळास विभागीय लेखाधिकारी व कार्यकारी अभियंता यांच्या प्रमाणपत्रासह दर महिन्याच्या ५ तारखेस मंडळास सादर करावी तसेच मंडळामार्फत संकलित माहिती १० तारखेपर्यंत प्रादेशिक कार्यालयास सादर करावी.

६) विभागीय कार्यालयाद्वारे विवरणपत्र “अ” मध्ये व मंडळ कार्यालयातर्फे विवरण “ब” मध्ये विभागनिहाय गोषवान्यासह प्रादेशिक कार्यालयास सादर करण्यात यावी. उपरोक्त माहिती मंडळाकडून दर महिन्याच्या १० तारखेस प्रादेशिक कार्यालयास सादर करण्यात यावी. मुख्य अभियंता यांनी कामनिहाय माहिती व गोषवारा त्यांचे अभिप्रायासहित शासन सा.बां.विभागास सादर करावा.

७) मंत्रालय स्तरावर ही माहिती संकलन व त्याचे मा.प्रधान सचिवांकडे सादरीकरणाची जबाबदारी व ठेव कामे संनियंत्रण बाबीची जबाबदारी उप सचिव (रा.म) यांची राहिल.

वरील सूचनांची काटेकोरपणे अंमलबजावणी करण्यात यावी.

सदर शासन परिपत्रक महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेतस्थळावर उपलब्ध करण्यात आले असून त्याचा संगणक संकेतांक २०१७०४०६१५५७१५९११८ असा आहे. हे परिपत्रक डिजीटल स्वाक्षरीने साक्षांकित करुन काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

सहपत्र :- विवरणपत्र “अ” व “ब”

**Sanjay
Uttarwar**

Digitally signed by Sanjay Uttarwar
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(सं.मु.उत्तरवार)
कार्यासन अधिकारी

प्रत,

१. मा. मुख्य सचिव, महाराष्ट्र शासन
२. अ.मु.स/प्रधान सचिव/सचिव, सर्व मंत्रालयीन विभाग
३. प्रधान सचिव (सा.बां)/सचिव (रस्ते)/सचिव (बांधकामे), सा.बां.विभाग, मंत्रालय
४. सर्व मुख्य अभियंते, सा.बां.प्रा.विभाग व (विद्युत) विभाग
५. मुख्य वास्तुशास्त्रज्ञ, महाराष्ट्र, राज्य, मुंबई
६. सर्व अधीक्षक अभियंते, सा.बां.मंडळ व (विद्युत) मंडळ
७. सर्व कार्यकारी अभियंते, सा.बां.विभाग व (विद्युत) विभाग
८. संचालक, उपवने व उद्याने, मुंबई
९. सह सचिव (सेवा)/उप सचिव (आं.वि.स)/उप सचिव (रस्ते)/उप सचिव (रा.म)/
१०. उप सचिव (इमारती), सा.बां.विभाग, मंत्रालय
११. सर्व अधिकारी व कार्यासन अधिकारी, सा.बां.विभाग, मंत्रालय
१२. निवडनस्ती (इमारती-२ कार्यासन).

વિવરણપત્ર- અ

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प्रमाणापत्र

प्रमाणित करण्यात येते की,विवरणपत्र-अ मध्ये नमूद कामाव्यतिरिक्त ठेव कामे या विभागाकडे घेण्यात आलेली नाही

सही
कार्यकारी अभियंता
सा बा विभाग

सही
विभागीय लेखाधिकारी
सा बा विभाग

विवरणपत्र-ब

ठेव कामांचा तपशील सादर करावयाचे प्रपत्र

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अधिक्षक अभियंता
सा.बां.मंडळ



GOVERNMENT OF MAHARASHTRA

THE MAHARASHTRA TREASURY RULES 1968

VOLUME I

REPRINT

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1982

[Price—Rs. 11.50]

PART III—RECEIPT OF GOVERNMENT MONEYS AND PAYMENT OF SUCH MONEYS INTO THE GOVERNMENT ACCOUNT

Section I—General Rules

GENERAL INSTRUCTIONS FOR HANDLING CASH

97. "A person may tender moneys in payment of dues to Government either (a) to the concerned departmental officer by cheque, bank draft, postal order, or money order, or in cash upto an amount not exceeding Rs. 300 in each case or such higher amounts as they may be authorised to receive, or (b) at the Treasury or the Bank."

98. (1) Save as otherwise expressly provided in these rules the instructions laid down in the Account Code, Volume II, with regard to the maintenance of Day Books and verification of balances should be observed by all Treasury Officers.

(2) The following rules shall be observed by all departmental officers who are required to receive and handle cash :—

(i) Every Officer receiving money on behalf of the Government should maintain a cash book in Form M.T.R. 4.

(ii) All monetary transactions should be entered in the cash book as soon as they occur and attested by the head of the office in token of check.

(iii) The cash book should be closed regularly and completely checked. The head of the office should verify the totalling of the cash book or have this done by some responsible subordinate other than the writer of the cash book, and initial it as correct.

(iv) At the end of each month, the head of the office should verify the cash balance in the cash book and record a signed and dated certificate to that effect mentioning therein the balance both in words and figures. The certificate should also be recorded on the monthly cash account, primary abstract or account current, where such account, abstract or account current is required to be submitted to the Accountant-General. Such certificates must be signed by the head of the office who should invariably date the signature.

(v) When Government moneys in the custody of a Government Officer are paid into the treasury or the Bank, the head of the office, making such payments should compare the Treasury Officer's or the Bank's receipt on the chalan or his pass-book with the entry in the cash book before attesting it and satisfy himself that the amounts have been actually credited into the treasury or the Bank. When the number of payments made in a month is more than ten and the total amount involved therein exceeds Rs. 1,000

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मादाम कामा मार्ग, हुतात्मा राजगुरु चौक,
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दिनांक - ०९ जानेवारी, २०१९

- वाचा :-** १. शासन निर्णय, सा.बां.विभाग क्र. संकीर्ण २०१८/प्र.क्र.४९/शिकाना/नियोजन-१अ
दि.०२.०८.२०१८
२. शासन पत्र, सा.बां.विभाग क्र. संकीर्ण २०१८/प्र.क्र.४९/शिकाना/नियोजन-१अ,
दि.१०.०८.२०१८
३. शासन पत्र क्र. संकीर्ण २०१८/प्र.क्र.४१३/रस्ते-५, दि. २१.१२.२०१८

प्रस्तावना -

राज्याच्या रस्त्याच्या सर्वांगीण विकासासाठी राबविण्यात येणाऱ्या हायब्रीड ॲन्युईटी प्रकल्पांतर्गत ज्या उद्योजकांची स्वतःची आर्थिक क्षमता आहे. त्यांना ४० टक्के Equity टप्प्याटप्प्याने Escrow Account मध्ये जमा करण्याबाबत परवानगी देण्यात आली आहे. तदनुषंगाने उपरोक्त शा.नि. क्र.३ अन्वये परवानगी देण्यात आली असून, या संदर्भात उद्योजकांच्या प्राप्त झालेल्या सूचना आणि मुख्य अभियंता यांनी शासनासमोर मांडलेल्या अडचणी विचारात घेवून दि. ०१ नोव्हेंबर, २०१८ रोजी निर्गमित करण्यात आलेल्या शासन निर्णयात हायब्रीड ॲन्युईटी योजनेमधील अडचणी सोडविण्यासाठी मा. मंत्री मंडळाच्या उपसमितीने दि. ०८ जानेवारी, २०१९ रोजी दिलेल्या मान्यतेनुसार खालील अंशतः बदल करण्यात येत आहेत :-

- १) उपरोक्त शासन निर्णयात तक्ता क्र. १ मध्ये उद्योजकाने जमा करावयाची Equity ८ टक्के इतकी दर्शविण्यात आली आहे. यामध्ये मुख्य अभियंता यांनी केलेल्या शिफारशीनुसार ज्या उद्योजकांनी कामाच्या जागेवर प्रत्यक्ष काम सुरु केले आहे व त्यात स्वतःची रक्कम खर्च केली आहे, अशा कामांच्या बाबतीत उद्योजकाने केलेल्या कामाची किंमत ही कार्यकारी अभियंता यांनी मोजमापे प्रमाणित करून प्रचलित दरसूचीवर आधारीत निश्चित करण्यात यावी. या किंमतीला उद्योजकांची Equity म्हणून गृहीत धरण्यात यावे. अशा ठिकाणी उद्योजकाने Performance Bank Guarantee ५ टक्के, आणि Mobilization Advance ची Bank Guarantee १ टक्का इतकी जमा केल्यानंतर Escrow Account मध्ये उद्योजकाने ८ टक्के Equity जमा करण्याची अट शिथील करण्यात येत आहे. उद्योजकाने प्रत्यक्ष साईटवर काम सुरु केले असल्यास, त्यास Mobilization Advance चा प्रथम हप्ता (५ टक्के) Escrow Account मध्ये जमा करण्यास या शासन निर्णयाद्वारे परवानगी देण्यात येत आहे.
- २) Equity ची रक्कम Escrow Account मध्ये जमा केलेली असल्यास उद्योजकाने सुरु केलेल्या कामाची किंमत १० टक्के (बीड प्रोजेक्ट कॉस्टच्या १० टक्के) इतके काम झाल्यानंतर त्यास Mobilization Advance चा द्वितीय हप्ता देण्यात यावा. तसेच Equity ची रक्कम Escrow Account मध्ये जमा करण्यास उद्योजकास सुट दिल्यानंतर उद्योजकाने सुरु केलेल्या कामाची

किंमत १० टक्के व ८ टक्के (Equity) असे एकूण किमान १८ टक्के इतके काम झाल्याशिवाय १st mile stone installment चे पेमेंट अदा करण्यात येवू नये. असे एकूण १८% काम पूर्ण झाल्यानंतरच त्यास Mobilization Advance चा द्वितीय हप्ता (५%) देण्यात यावा. उद्योजकाने ५ % Mobilization Advance घेतल्यानंतर Escrow Account मध्ये पुढील कामाचा खर्च Equity म्हणून जमा करणेस व Escrow Account मधूनच खर्च करणेस त्यास आदेशित करण्यात यावे.

सदर शासन निर्णय महाराष्ट्र शासनाच्या www.maharashtra.gov.in या संकेत स्थळावर उपलब्ध करण्यात आला असून, त्याचा संकेतांक २०१९०१०९१५२८४७४३१८ असा आहे. हा आदेश डिजीटल स्वाक्षरीने साक्षांकित करून काढण्यात येत आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने,

Prashant

Vinayakrao Patil

(प्रशांत पाटील)

अवर सचिव, महाराष्ट्र शासन

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७. मा.राज्यमंत्री (सा.बां.) यांचे खाजगी सचिव, मंत्रालय, मुंबई
८. मुख्य सचिव यांचे सह सचिव, मंत्रालय, मुंबई
९. अ.मु.स. (नियोजन) यांचे स्वीय सहायक, नियोजन विभाग, मंत्रालय, मुंबई
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१२. सचिव (रस्ते), सार्वजनिक बांधकाम विभाग यांचे स्वीय सहायक, मंत्रालय, मुंबई
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