રાજકોટ મહાનગરપાલિકા

ટેન્ડર નં.રામન/ડ્રેનેજ(સે.ઝો.)/૨૩-૨૪/૧૮

એ - ટેકનીકલ બીડ

કામનું નામ

વોર્ડ નં.૩ માં લક્ષ્મણ વાટિકા શેરી નં.૧ તથા ૨માં ડ્રેનેજ લાઈન નાખવાનું તથા હાઉસ કનેકશન ચેમ્બર્સ બનાવવાનું કામ

અંદાજીત રકમ: રૂ.૩,૪૯,૦૦૦/-	**અર્નેસ્ટ મની ડીપોઝીટ: રૂ.૩,૪૯૦/-**
ટેન્ડર ફી : રૂ.૭૫૦/-	

મુખ્ય તારીખો	
૧. ટેન્ડર મેળવવાની તારીખ	૧૪/૦૯/૨૦૨૩ થી ૨૭/૦૯/૨૦૨૩ સુધી બપોરે ૧૩:૦૦ કલાક સુધી
૨. ટેન્ડર ભરી પરત કરવાની છેલ્લી તારીખ	૩૦/૦૯/૨૦૨૩ સાંજે ૧૮:૦૦ સુધી (ફક્ત સ્પીડ પોસ્ટ / રજી. પોસ્ટ મારફતે સ્વીકારવામાં આવશે)
૩. ટેકનીકલ બીડ ખોલવાની તારીખ	૦૩/૧૦/૨૦૨૩ સવારે ૧૧:૦૦ પછી
૪.ટેન્ડરમાં સબમિટ કરવામાં આવેલ તમામ ડોકયુમેન્ટના ઓરીજીનલ રૂબરૂમાં બતાવવાની તારીખ	૦૪/૧૦/૨૦૨૩ સાંજે ૧૬:૦૦ થી ૧૮:૦૦ દરમ્યાન
૫. પ્રાઇસ બીડ ખોલવાની તારિખ (જો શકય હશે તો)	૦૫/૧૦/૨૦૨૩ સવારે ૧૧:૦૦ પછી
૬. બીડ વેલીડીટી	૧૮૦ દિવસ
૭. કામની સમયમર્યાદા	૪૫ દિવસ

સીટી એન્જીનીયર (સ્પે.)
રાજકોટ મહાનગરપાલિકા (પશ્ચિમ ઝોન)
શ્રી હરિસિંહજી ગોહિલ ભવન, રૂમ નં.૯,
૧૫૦ ફૂટ રીંગ રોડ, રાજકોટ - ૩૬૦૦૦૫

રાજકોટ મહાનગરપાલિકા

ટેન્ડર નોટીસ

બાંધકામ શાખા – પશ્ચિમ ઝોન

રાજકોટ મહાનગરપાલિકા દ્વારા નીચે જણાવેલ કામે સરકારશ્રીના નિયમ મુજબ રજીસ્ટર્ડ થયેલ કક્ષા પ્રમાણેના અને નિયત સોલવન્સી સર્ટીફીકેટ તથા આ પ્રકારના કામનો અનુભવ ધરાવનાર કોન્ટ્રાકટરશ્રીઓના પર્સન્ટેઈજ રેઈટ ટેન્ડર સીટી એન્જીનીયર (સ્પે.), રાજકોટ મહાનગરપાલિકા, પશ્ચિમ ઝોન, શ્રી હરિસિંહજી ગોહિલ ભવન, ૧૫૦ ફૂટ રીંગ રોડ, રાજકોટ-૩૬૦૦૦૫ ના સરનામે નીચે દર્શાવેલ મુદતમાં મળી જાય તે રીતે મોકલી આપવાના રહેશે.

ક્રમ	કામનું નામ	૧. અંદાજીત રકમ ૨. ટેન્ડર ફી ૩. ઈ.એમ.ડી. ૪. કામની સમય મર્યાદા
૧	વોર્ડ નં.૩ માં લક્ષ્મણ વાટિકા શેરી નં.૧ તથા ૨માં ડ્રેનેજ લાઈન નાખવાનું તથા હાઉસ કનેકશન ચેમ્બર્સ બનાવવાનું કામ	૧. ૩,૪૯,૦૦૦/- ૨. ૭૫૦/- ૩. ૩,૪૯૦/- ૪. ૪૫ દિવસ

<u>ટેન્ડર માટેની અગત્યની તારીખો</u>

૧.	ટેન્ડર મેળવવાની તારીખ	૧૪/૦૯/૨૦૨૩ થી ૨૭/૦૯/૨૦૨૩ સુધી બપોરે ૧૩:૦૦ કલાક સુધી
૨.	ટેન્ડર ભરી પરત કરવાની છેલ્લી તારીખ	૩૦/૦૯/૨૦૨૩ સાંજે ૧૮:૦૦ સુધી (ફક્ત સ્પીડ પોસ્ટ / રજી. પોસ્ટ મારફતે સ્વીકારવામાં આવશે)
૩.	ટેકનીકલ બીડ ખોલવાની તારીખ	૦૩/૧૦/૨૦૨૩ સવારે ૧૧:૦૦ પછી
૪.	ટેન્ડરમાં સબમિટ કરવામાં આવેલ તમામ ડોકયુમેન્ટના ઓરીજીનલ રૂબરૂમાં બતાવવાની તારીખ	૦૪/૧૦/૨૦૨૩ સાંજે ૧૬:૦૦ થી ૧૮:૦૦ દરમ્યાન
૫.	પ્રાઇસ બીડ ખોલવાની તારિખ (જો શકય હશે તો)	૦૫/૧૦/૨૦૨૩ સવારે ૧૧:૦૦ પછી
૬.	બીડ વેલીડીટી	૧૮૦ દિવસ
૭.	કામની સમયમર્યાદા	૪૫ દિવસ

<u>ટેન્ડર કામ કરવા માટે જરૂરી લાયકાત:</u>

૧. નાણાંકીય માપદંડ:

- ✓ છેલ્લાં સાત વર્ષના વાર્ષિક ટર્નઓવરની સરેરાશ ટેન્ડરની રકમના ૫૦% કરતાં વધુ હોવી જોઇશે.
- ✓ વર્કિંગ કેપીટલ ટેન્ડરની રકમના ઓછામાં ઓછી ૨૫% હોવી જોઈએ તથા તે અંગેનું ચાર્ટર્ડ એકાઉન્ટન્ટશ્રીનું પ્રમાણપત્ર રજૂ કરવું ફરજીયાત છે.
- ✓ બીડર પાસે ઓછામાં ઓછુ "ઈ-૨" શ્રેણીનું રજીસ્ટ્રેશન હોવું જોઇશે.
- ✓ બીડરે રૂ! ૧.૦૦ લાખની સોલ્વન્સી રજુ કરવી જોઇશે.

૨. અનુભવનો માપદંડ:

- ✓ એજન્સીએ છેલ્લાં સાત વર્ષમાં આ પ્રકારનું ઓછામાં ઓછું એક કામ સરકારી, અર્ધ-સરકારી અંતર્ગત મુખ્ય એજન્સી તરીકે કરેલું હોવું જોઈશે
- ✓ એજન્સી પાસે કામ કરવા માટે પુરતા પ્રમાણમાં સાધનસામગ્રી તથા જરૂરી અનુભવી સ્ટાફ હોવો જોઈશે.

<u>ખાસ નોંધ</u>:

એજન્સીએ ટેન્ડર ફી નો ડીમાન્ડ ડ્રાફ્ટ, ઈ.એમ.ડી. નો ડીમાન્ડ ડ્રાફ્ટ તેમજ અન્ય રજુ કરવાના થતા જરૂરી ડોકયુમેન્ટસ સાથે ઈ.એસ.આઈ.સી. **(Employees State Insurance Corporation)** રજીસ્ટ્રેશનની નકલ તેમજ ઈ.પી.એફ. **(Employees' Provident Fund)** રજીસ્ટ્રેશનની નકલ અત્રેની કચેરીને રજુ કરવાના રહેશે અન્યથા એજન્સીને નોનરીસ્પોન્સીવ ગણી; તેવી એજન્સીના ભાવ ખોલવામાં આવશે નહી.

<u>સામાન્ય શરતો</u>:

1. અર્નેસ્ટ મની ડીપોઝીટ (ઈ.એમ.ડી.) એસ્ટીમેટની રકમના એક ટકા મુજબ ભરવાની રહેશે. ઈ.એમ.ડી. રાજકોટ મહાનગરપાલિકાની તરફેણમાં કોઈ પણ શેડ્યુલ બેંક (કો-ઓપરેટીવ બેંક સિવાય) ના રાજકોટ પેયેબલ ડીમાન્ડ ડ્રાફ્ટ દ્વારા જ ભરી શકાશે.
2. સિક્યોરીટી ડીપોઝીટની રકમ કામના ૫% લેખે કરારનામું કરતી વખતે જમા કરવાની રહેશે.
3. જરૂરી લેબર લાયસન્સ / ઈ,પી.એફ. નંબર લેવાની જવાબદારી જે તે કોન્ટ્રાક્ટરની રહેશે.
4. કોન્ટ્રક્ટરશ્રીઓએ ટેન્ડરના બંધ કવર ઉપર આ કામનું નામ સ્પષ્ટ અક્ષરે લખવાનું રહેશે.
5. આ કામના ટેન્ડર ડોકયુમેન્ટ ટેકનીકલ બીડ અને પ્રાઈસ બીડ) રાજકોટ મહાનગરપાલિકાની વેબ સાઈટ www.rmc.gov.in પરથી પણ ડાઉનલોડ કરી શકાશે અને ટેન્ડરમાં જણાવ્યા

મુજબની તારીખ સુધીમા ટેન્ડર સાથે જરૂરી દસ્તાવેજો ટેન્ડર કી, ઈ એમ.ડી., આઈડેનટીટી પ્રૂફ, એડ્રેસ પ્રૂફ, પાન કાર્ડની પ્રમાણિત નકલ, વ્યવસાય વેરો ભર્યાની નકલ, સંપર્ક ફોન નંબર / મોબાઈલ નંબર વિગેરે એજન્સીએ રજુ કરી દેવાના રહેશે.
રાજકોટ મહાનગરપાલિકાની વેબ સાઈટ www.mc.gov.in પરથી ટેન્ડર ડાઉનલોડ કરી રજૂ કરનાર એજન્સી પ્રિ-કવોલીફાય નહીં થાય તો તેવી એજન્સીના ભાવ ખોલવામાં આવશે નહીં. તેમજ તેઓએ ટેન્ડર સાથે ભરેલ ટેન્ડર ફી પરત કરવામાં આવશે નહિ. એનેક્ષર-૧માં દર્શાવેલ ફોર્મેટમાં વિગતો રજૂ કરવી ફરજીયાત છે.

6. ટેન્ડર કામની સમજુતી તથા અન્ય વિગતો ઓફીસ સમય દરમ્યાન બાંધકામ શાખા, પશ્ચિમ ઝોન) માંથી જાણવા મળી શકશે.

7. કોન્ટ્રાકટરશ્રીઓએ ટેન્ડરના બંધ કવર ઉપર કામનું નામ તથા વોર્ડ નંબર સ્પષ્ટ અક્ષરે લખવાનું રહેશે.

8. એજન્સીએ છેલ્લા સાત વર્ષના સમયગાળામાં સરકારી, અર્ધસરકારીમાં આ જ પ્રકારનું કોઇ પણ રકમનુ ઓછામાં ઓછું એક સરખા પ્રકારનું કામ મુખ્ય કોન્ટ્રાકટર તરીકે પૂર્ણ કરેલુ હોવુ જોઇએ તથા એજન્સી પાસે કામ કરવા માટે પુરતા પ્રમાણમા સાધન સામગ્રી તથા જરૂરી અનુભવી સ્ટાફ હોવો જોઇએ

   આ કામ બેરોજગાર ડિપ્લોમા / ડીગ્રી હોલ્ડરને કોઈ પણ ટર્નઓવર, અનુભવ કે સોલ્વન્સી વગર આપવામાં આવી શકાશે. પરંતુ તેઓ કોઈ પણ જગ્યાએ નોકરી કે ધંધો નથી કરતા તે અંગેનો રૂ! ૩૦૦/- ના સ્ટેમ્પ પેપર ઉપર "સોગંદનામું" રજુ કરવાનું રહેશે. ઉપરાંત નીચે જણાવ્યા મુજબના જરૂરી દસ્તાવેજોની "ખરી નકલ" ટેન્ડર સાથે રજુ કરવાના રહેશે.

   - ✓ રાજ્ય સરકાર / કેન્દ્ર સરકાર /જી.ડબલ્યુ.એસ.એસ.બી.માં રજીસ્ટ્રેશન કરાવ્યાની નકલ
   - ✓ ડિપ્લોમા / ડીગ્રી સર્ટીફીકેટની નકલ

   ઉપરોક્ત તમામ દસ્તાવેજો અસલ વેરીફીકેશન સમયે રજુ કરવાના રહેશે અન્યથા નોન-રેસ્પોન્સીવ ગણવામાં આવશે.

9. ટેન્ડર ખરીદવાની માગણી સાથે એજન્સીએ જરૂરી તમામ દસ્તાવેજોની નકલો રજૂ કરવાની રહેશે જેને આધારે પ્રી-કવોલીફાય થનાર એજન્સીને જ ટેન્ડર કોપી ઇસ્યુ કરવામાં આવશે.

10. એજન્સીએ ટેન્ડર સાથે પોતાના બીઝનેશ એડ્રેસ પ્રૂફ તથા પોતાનો આઇ.ડી ચૂક રજુ કરવાનુ રહેશે.
11. આ કામે પેનલ્ટી કોંટ્રાકટ વેલ્યુના ૦.૧૦ % મુજબ પ્રતિ દિન રહેશે જે વધુમાં વધુ અંદાજીત કિંમતના ૧૦% સુધી કાપવામાં આવશે.

12. એજન્સીએ જી.એસ.ટી.(GST) તથા અન્ય ટેકસ સહિત પોતાના ભાવ ભરવાના રહેશે, કોન્સ્ટ્રકટર દ્વારા તે મુજબ જી.એસ.ટી. બ્રેક-અપ સાથેનુ ઈન્વોઈસ રજુ કરવામાં નહીં આવે તો સદરહુ ટેકસ કોન્ટ્રાકટરના બીલમાંથી કપાત કરી જમા કરવામાં આવશે.

13. આ ટેન્ડર કામે ખરીદવાનું થતુ મટીરીયલ એજન્સીએ જી.એસ.ટી. (GST) નંબર ધરાવતા હોય તેવા રજીસ્ટર્ડ સપ્લાયર પાસેથી જ મટીરીયલ ખરીદ કરવાનું રહેશે, જી.એસ.ટી. (GST) નંબર ન ધરાવતા હોય તેવા અનરજીસ્ટર્ડ સપ્લાયર પાસેથી મટીરીયલ ખરીદ કરવામાં આવશે તો તેવા મટીરીયલ માટેનું જી.એસ.ટી. (GST) અંગે કોઈ પણ પ્રકારનું પેમેન્ટ / રકમ ચુકવવા રાજકોટ મહાનગરપાલિકા જવાબદાર રહેશે નહીં.

14. એજન્સીએ ટેન્ડર ફી નો ડીમાન્ડ ડ્રાફ્ટ, ઈ.એમ.ડી. નો ડીમાન્ડ ડ્રાફ્ટ તેમજ અન્ય રજુ કરવાના થતા જરૂરી ડોકયુમેન્ટસ સાથે ઈ.એસ.આઈ.સી. રજીસ્ટ્રેશનની નકલ તેમજ ઈ.પી.એફ. રજીસ્ટ્રેશનની નકલ અત્રેની કચેરીને રજુ કરવાના રહેશે અન્યથા એજન્સીને નોન-રિસ્પોન્સિવ ગણી એવી એજન્સીના ભાવ ખોલવામાં આવશે નહીં.

15. એજન્સી કોઈ પણ જગ્યાએ બ્લેક લીસ્ટ થયેલ નથી તથા કોઈ પોલિસ ફરિયાદ થયેલ નથી તે અંગેનું રૂ! ૩૦૦/- નું નોટરાઈઝ્ડ સોગંધનામું રજુ કરવાનું રહેશે.

16. ટેન્ડર ડોક્યુમેન્ટમાં દર્શાવેલ તમામ શરતો ધ્યાને લઇ ઓફર આપવાની રહેશે.

17. આ કામે આવેલ કોઈપણ ટેન્ડર કે બધા ટેન્ડરનો સ્વીકાર / અસ્વીકાર કરવાનો હક રાજકોટ મહાનગરપાલિકા અબાધિત રાખે છે.

18. ઉપરોક્ત કામના કોઈ પણ અથવા બધા ટેન્ડરો કોઈ પણ કારણ દર્શાવ્યા સિવાય મંજુર અથવા ના-મંજુર કરવાનો અધિકાર નીચે સહી કરનાર દ્વારા અબાધિત રાખવામાં આવે છે.

સીટી એન્જીનીયર (સ્પે.)
રાજકોટ મહાનગરપાલિકા

-:: ટેન્ડર રજુ કરવા બાબતની સમજુતી ::-

૧. ટેકનીકલ બીડ તથા પ્રાઇસ બીડ અલગ-અલગ કવરમાં બંધ કરવાના રહેશે અને કવર ઉપર કામનું નામ તથા "ટેકનીકલ બીડ" / "પ્રાઇસ બીડ" મોટા અક્ષરે આ ટેન્ડર સાથે છેલ્લા પાના પર લખાયેલ સ્ટીકર ચોટાડવાનું રહેશે.

૨. ઉપરોક્ત બન્ને કવર - એક મોટા કવરમાં બંધ કરી; ઉપર કામનું નામ તથા સંપૂર્ણ વિગતો દર્શાવી રજુ કરવાનું રહેશે.

૩. નિયત સમયે "ટેકનીકલ બીડ" ખોલવામાં આવશે અને "ટેકનીકલ બીડ" માં રજુ થયેલ યોગ્ય શ્રેણીના રજીસ્ટ્રેશન, અનુભવની વિગત, અર્નેસ્ટ મની ડીપોઝીટ, સોલવન્સી વિગેરેની ચકાસણી કરવામાં આવશે. જે અન્વયે યોગ્યતા ધરાવનાર એજન્સીની જ "પ્રાઇસ બીડ" ખોલવામાં આવશે. અન્ય એજન્સીઓની "પ્રાઇસ બીડ" ખોલવામાં આવશે નહી, જે તમામ એજન્સીઓને બંધનકર્તા રહેશે.

કોન્ટ્રાક્ટરની સહી તથા સિક્કો

-:: ચેક લીસ્ટ ::-

૧. સરકારી, અર્ધ-સરકારી વિભાગમાં રજીસ્ટ્રેશન કરાવ્યાની નકલ.

૨. છેલ્લા સાત નાણાંકીય વર્ષ દરમ્યાન સમાન પ્રકારના કરેલ કામના અનુભવના દાખલાની નકલ. બેરોજગાર ઈજનેર માટે અનુભવ જરૂરી નથી પરંતુ રૂ!૩૦૦/- નું નોટરાઈઝડ સોગંધનામું કે તેનો બેરોજગાર છે અને ક્યાય પણ નોકરી કે કોઈ ધંધો કરતાં નથી.

૩. કામની રકમના ૨૫% મુજબ વર્કિંગ કેપિટલ હોવા અંગેનો આધાર

૪. રૂ! ૧.૦૦ લાખની રકમ સોલવન્સી સર્ટીફીકેટ.

૫. રૂ! ૩૦૦/- ના સ્ટેમ્પ પેપર ઉપર બ્લેક લીસ્ટ થયેલ નથી તથા ડોક્યુમેન્ટની ખરી તેમજ કોઈ પોલિસ ફરિયાદ થયેલ નથી તે અંગેનું સોગંધનામું રજુ કરવાનું રહેશે.

૬. અર્નેસ્ટ મની ડીપોઝીટ (સહકારી બેંક સિવાય): રૂ! ૩,૪૯૦/-

બેંકનું નામ તથા વિગત

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કોન્ટ્રાક્ટરનું નામ : .....

સરનામું : .....

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ઉપરોક્ત વિગતે જરૂરી તમામ ડોક્યુમેન્ટ રજુ કરેલ છે.

કોન્ટ્રાક્ટરની સહી તથા સિક્કો

-:: <u>શરતો અને બોલીઓ</u> ::-

૧. ટેન્ડર ભરતી વખતે નીચેની વિગતો ધ્યાનમાં રાખવી:

અ. ટકા(%) કે રકમ આકડા તેમજ શબ્દોમાં સ્પષ્ટ લખવી.

બ. પેઢી કે ભાગીદાર વતી સહી કરનારે તે જ પ્રમાણે સહી કરવી.

ક. નિયત થયેલ જગ્યાએ નિયત થયેલ વિગતો જ લખવી.

ડ. છેકછાકવાળું ટેન્ડર રદ કરવામાં આવશે.

ઈ. શરતો, એબ્સ્ટ્રેકટ તથા સમજુતીમાં દરેક પાને સહી કરવી.

એફ. અર્નેસ્ટ મની ભર્યાનો દાખલો ટેન્ડરના કવર ઉપર પહોચ નંબરથી લખવો. અસલ પહોચ ટેન્ડર સાથે રાખવી.

૨. કામ પુરા ખંતથી કરવું જોઈશે અને કરેલું સઘળું કામ કારીગરની રીતે કરેલું હોવું જોઈએ. ટેન્ડર રજુ કરનાર કામમાં જે માલ સામાન વાપરે તે ઉત્તમ પ્રકારનો હોવો જોઈએ અને સીટી એન્જીનીયર (સ્પે.)શ્રી એ પસંદ કરેલો હોવો જોઈએ. કામ કેટલી ત્વરાથી ચલાવવું તે બાબત તથા કામ અથવા તેમાં વપરાતો માલ સમાન કેવા પ્રકારનો છે તે બાબત સીટી એન્જીનીયર (સ્પે.)શ્રી જે નિર્ણય કરે તે આખરનો સમજવો જોઈશે. કામની ઝડપ અને તેની ગતી વધારવા સીટી એન્જીનીયર (સ્પે.)શ્રી નો નિર્ણય આખરી સમજવાનો રહેશે તથા લેખિત તેમજ મૌખિક સુચના તેમજ નોટીસ આપવા છતાં પણ કામની ગતી કે ઝડપ વધારવામાં નહી આવે તો માન. કમિશ્નર સાહેબને કોન્ટ્રાક્ટ રદ કરવાનો અધિકાર રહેશે.

૩. સઘળી ખાણોની ફી, રોયલ્ટી, સિક્યોરીટી ડીપોઝીટ અને સમાન ભરી રાખવા માટે કોઈ જમીનનું ભાડું આપવાનું હોય તો તે કોન્ટ્રાક્ટરે આપવાનું રહેશે.

૪. કોન્ટ્રાક્ટર પોતાના કામદારોને થયેલ ઈજા માટે તથા તેને કોઈ બદલો આપવો પડે તો તે માટે તમામ રીતે જવાબદાર કોન્ટ્રાક્ટર રહેશે. કામદારોને થયેલ ઈજા માટે યોગ્ય બદલો આપવામાં જો કોન્ટ્રાક્ટર નિષ્ફળ નીવડે અને કામ કરતા કામદારોને તેનો બદલો રાજકોટ મહાનગરપાલિકા તરફથી આપવામાં આવે તો તેવી આપેલી રકમ ટેન્ડર ભરનાર આપવા જોગ થયેલ રકમમાંથી અથવા આપવાના થાય તે રકમમાંથી કાપી લેવા રાજકોટ મહાનગરપાલિકા મુખત્યાર છે.

૫. આમાં કબુલ કરેલી તેવી કામની જુદી-જુદી બાબતો માટેનો દરજ્જો તે બાબતો મંજુર કરેલી સમજુતી અનુસાર પૂરી કરવામાં આવી છે એમ સ્વીકારવામાં આવે તો જ કાયદેસર ગણાશે. જે તે પ્રસંગે કામની સદરહુ બાબતો એવી રીતે પૂરી કરી છે એમ સ્વીકારવામાં નહી આવે તે પ્રસંગે સીટી એન્જીનીયર (સ્પે.)શ્રી છેવટના બીલો તૈયાર કરતી વખતે વ્યાજબી લાગે તેવા ઘટાડાના દરથી બીલો કરવા મુખત્યાર છે.

૬. કોન્ટ્રાક્ટરે નીચે જણાવ્યા મુજબના કોઈને કામે રાખવા નહી:
અ. ૧૮ વર્ષથી ઓછી ઉમર હોય, કે
બ. કામ ઉપર જેને સીટી એન્જીનીયર (સ્પે.)શ્રી એ મનાઈ કરેલ હોય

૭. વર્ક ઓર્ડર મળ્યે તુર્ત જ કામ ચાલુ કરવાનું છે. ઓર્ડરમાં જણાવેલ ૪૫ દિવસની મુદત દરમ્યાન કામગીરી કરવાની છે. જો મુદત દરમ્યાન સુચના પ્રમાણે કામ કરવામાં નહી આવે તો માન. કમિશ્નર સાહેબને યોગ્ય લાગશે તો કોન્ટ્રાક્ટરના ખર્ચે અને જોખમે અન્ય કોન્ટ્રાક્ટર પાસે અગર તો ખાતા મારફત કામ પુરુ કરાવશે અને આમ બાકી રહેતું કામ પુરુ કરવામાં રાજકોટ મહાનગરપાલિકાને કોન્ટ્રાક્ટ એગ્રીમેન્ટ કરતા જો વધુ ખર્ચ થશે તો તે કોન્ટ્રાક્ટર પાસેથી કાયદેસર રીતે આ વધારાનો ખર્ચ વસુલ કરી શકશે. માન.કમિશ્નર સાહેબને જો યોગ્ય લાગશે તો મુદત દરમ્યાન કામ પુરુ નહી થયું હોય છતાં પણ કોન્ટ્રાક્ટર પાસે કામ ચાલુ રખાવી શકાશે અને તેની મુદત સંજોગોને લક્ષમાં રાખીને વધારી આપશે. આ કામ નિયત સમય મર્યાદામાં પૂર્ણ ન થયેથી વધારાના દરેક દિવસની પેનલ્ટી ફી ટેન્ડરની રકમના ૦.૧૦% મુજબની રહેશે.

૮. ટેન્ડરની વેલીડીટી ૧૮૦ દિવસની રહેશે.

૯. કામ કરતા માલ સમાન નડતરરૂપ ન થાય તે રીતે કરવાનું છે.

૧૦. એજન્સી દ્વારા રજુ કરવામાં આવેલ ભાવ અત્રેથી સ્વીકાર્યા બાદ સદરહુ કામે કરાર કરવા જણાવવામાં આવ્યેથી દિન-૮ માં સિક્યુરિટી ડિપોઝિટ જમા કરાવી સ્ટેમ્પ ડ્યુટી એક્ટ,૧૯૫૮ અને તેના વખતો-વખતના સુધારા મુજબ જરૂરી સ્ટેમ્પ ડ્યુટી ભરી કરારનામું કરવાનું રહેશે. જેમાં નિષ્ફળ ગયેથી ભરવામાં આવેલ અર્નેસ્ટ મની ડિપોઝિટ જપ્ત કરવામાં આવશે અને એજન્સીને રાજકોટ મહાનગરપાલિકાના કામો માટે ત્રણ વર્ષ માટે બ્લેકલિસ્ટ અથવા ડીબાર કરવામાં આવશે.

૧૧. સિક્યોરીટી ડીપોઝીટ તરીકે ભરેલ રકમ કામ પૂરું થઈ ગયા બાદ ૧૨ (બાર) માસ પછી કે કોન્ટ્રાક્ટરને ફાઈનલ બિલ મળ્યા બાદ એ બે માંથી જે મોડું હશે તે પછી આપવામાં આવશે. પરંતુ તે સમય દરમ્યાન કોઈ કામ ખરાબ થયેલ અથવા નુકશાન પામેલ માલુમ પડશે તો તે કામ કોન્ટ્રાક્ટરે દુરસ્ત કરી આપવાનું રહેશે અને જો તેમ કરવામાં નાકામિયાબ નીવડશે તો દુરસ્તી તેને ખર્ચે અને જોખમે રાજકોટ મહાનગરપાલિકા તરફથી કરાવી લેવામાં આવશે અને તે પૈકીનો થયેલ ખર્ચ સિક્યોરીટી ડીપોઝીટની રકમમાંથી કાપી લેવામાં આવશે.

૧૨. કામ ઉપર કોન્ટ્રાક્ટરે પોતે અથવા તેના વતી કોઈ જવાબદાર માણસને હાજર રાખવાનો રહેશે.

૧૩. કામ પૂરું થઇ ગયા બાદ સાઈટ બરાબર સાફ કરી આપવાની રહેશે અને જો તેમ કરવામાં કોન્ટ્રાક્ટર નાકામિયાબ નીવડશે તો તેને ખર્ચે અને જોખમે રાજકોટ મહાનગરપાલિકા તરફથી સાઈટ સાફ કરાવી લેવામાં આવશે.

૧૪. રસ્તો બંધ કરવા માટે દિવસના ભાગમાં સુચનાના બોર્ડ તથા રાત્રે યોગ્ય બત્તીની વ્યવસ્થા કોન્ટ્રાક્ટરે કરવાની રહેશે. તેના અભાવે થતી નુકશાનીની તમામ જવાબદારી કોન્ટ્રાક્ટરની રહેશે.

૧૫. વર્ક ઓર્ડર આપ્યા બાદ ચાલુ કામે અન્ય આસામીઓની મિલકતને અગર જાનમાલને કોઇપણ નુકશાન થશે તો તેની તમામ જવાબદારી કોન્ટ્રાક્ટરની રહેશે અને તે માટે કોઇપણ વળતરની રકમ ચુકવવાની થાય તો તે કોન્ટ્રાક્ટરે ભરી આપવાની રહેશે. જો કોન્ટ્રાક્ટર અમલ ન કરે તો તેવા વળતર વિગેરેની રકમ તેના બીલોમાંથી કપાત કરવામાં આવશે.

૧૬. કોઇ પણ કારણોસર કોન્ટ્રાક્ટર ટેન્ડરમાં દર્શાવેલ કામ કરવા અશક્તિમાન થશે તો રાજકોટ મહાનગરપાલિકા તેના ખર્ચે અને જોખમે આ કામ પૂરું કરાવશે અને આમ કરતા ટેન્ડરમાં જણાવેલ ભાવ કરતા વધારે ખર્ચ થશે તો રાજકોટ મહાનગરપાલિકા કોન્ટ્રાક્ટરની સિક્યોરીટી ડીપોઝીટમાંથી કે સાઈટ ઉપર પડેલા માલ સામાનની હરરાજી કરી કે બિલમાંથી વસુલ કરી શકશે અને તેમ કરતા કોન્ટ્રાક્ટરનો કોઈપણ વાંધો કે હક્ક રહેશે નહી.

૧૭. આ કામનો કોઈ પણ ભાગ સંતોષકારક રીતે કોન્ટ્રાક્ટર નહી કરે તો રાજકોટ મહાનગરપાલિકા ના ઈજનેર તેઓને ૧૦ દિવસની નોટીસ કામ સુધારવા આપશે. મુદત વિત્યા બાદ રાજકોટ મહાનગરપાલિકાના ઈજનેર કોન્ટ્રાક્ટરના ખર્ચે અને જોખમે માણસો રાખી તેમજ માલ સમાન ખરીદી કામ કરવાની કાર્યવાહી કરશે અને કોન્ટ્રાક્ટર પાસેથી ખર્ચ વસુલી શકશે. આ કામ સીટી એન્જીનીયર (સ્પે.)શ્રી બીજા કોન્ટ્રાક્ટર પાસે પણ કરાવી શકશે.

૧૮. વર્ક ઓર્ડરમાં જણાવ્યાની તારીખે કામ પૂરું કરવામાં કોન્ટ્રાક્ટર નિષ્ફળ જશે તો અગાઉ કલમ-૭ માં જણાવ્યા પ્રમાણે પેનલ્ટી વસુલ લેવામાં આવશે. જો રાજકોટ મહાનગરપાલિકા ને કારણે સંજોગો અનુસાર કામ બંધ રહે તો જેટલા દિવસ કામ બંધ રહે તેટલા દિવસની મુદત આપવામાં આવશે અથવા તો કોઈ સબળ કારણસર કામ બંધ રહે તેની જાણ કોન્ટ્રાક્ટરે રાજકોટ મહાનગરપાલિકા ઈજનેરને જ કરવાની રહે છે અને જો કારણ વ્યાજબી લાગશે તો વધારાની મુદત માટે માન. કમિશ્નર સાહેબ વિચારશે અને તેનો નિર્ણય આખરી ગણાશે.

૧૯. આ કામ ચાલુ થયે વચ્ચેના ગાળાની સંતોષકારક પ્રગતી હશે તો જરૂર જણાયે ઓછામાં ઓછા એક માસ પછી કોન્ટ્રાક્ટરને થયેલ કામનું રનીંગ બિલ આપવામાં આવશે. આ રનીંગ બિલ થયેલ કામ પ્રમાણે અને ફાઈનલ બીલના "ઉપાડ" એડવાન્સ તરીકે આપવામાં આવશે. રનીંગ બીલમાં લીધેલ કામનો જથ્થો કે કામની વિગતનું આખરી સ્વરૂપ બિલ વખતે નક્કી થાય તે રીતે રહેશે. રનીંગ બિલ આકરવામાં; આવેલ બીલની વિગત બધી જ ફાઈનલ બીલમાં હોવી જરૂરી નથી.

૨૦. કોન્ટ્રાક્ટરે આ કામમાં કોઈ પણ આઇટમ સંતોષકારક રીતે સ્પેસીફીકેશન મુજબ નહી કરી હોય તો રાજકોટ મહાનગરપાલિકા ને લાગે તે "ભાવ ઘટાડો" (રીડ્યુઝ રેઈટ) કરી શકશે અને તે કોન્ટ્રાક્ટરે માન્ય રાખવાનો રહેશે.

૨૧. આ કામમાં રાજકોટ મહાનગરપાલિકા ના ઈજનેર ટેન્ડરમાં જણાવ્યા મુજબના સ્પેસીફીકેશન કે ડ્રોઇંગ કે ડીઝાઈનમાં ફેરફાર કરી શકશે એટલે કે મૂળ સ્પેસીફીકેશનમાં જણાવ્યા મુજબના કામમાં ઘટાડો કરવો કે વધારો કે તદન નવું કામ કરાવી શકશે અને કોન્ટ્રાક્ટરે ટેન્ડરની મૂળ શરતોને કાયમ રાખી તે મુજબ કામ કરી આપવાનું છે. આ ફેરફારને કારણે રાજકોટ મહાનગરપાલિકા સાથે થયેલ કરાર રદ થઇ શકશે નહી.

(અ) આ વધારાના ઉપર મુજબના કામમાં જો એક્સ્ટ્રા આઇટમ થઇ અને આઇટમ ટેન્ડરમાં જણાવેલ હશે તો તે મુજબ ભાવ આપવામાં આવશે.

(બ) જો એક્સ્ટ્રા આઇટમ ટેન્ડરમાં નહી હોય પરંતુ રાજકોટ મહાનગરપાલિકા નો જે તે વખતનાં શેડ્યુલ ઓફ રેઈટ (SOR) હશે તો તે મુજબ ભાવ આપવામાં આવશે. આ વખતે જો ટેન્ડર ઉચા ભાવનું હશે તો વધારાના ટકા આપવામાં આવશે નહી પરંતુ જો ટેન્ડર નીચા ભાવનું હશે તો આવી આઇટમોમાંથી કોન્ટ્રાક્ટરે ભરેલ નીચા ટકા બાદ કરવામાં આવશે.

(ક) એક્સ્ટ્રા આઇટમ ટેન્ડરમાં કે રાજકોટ મહાનગરપાલિકા ના જે તે વખતમાં શેડ્યુલ ઓફ રેઈટસ (SOR) માં નહી હોય તેવી આઇટમનો વ્યાજબી ભાવ સમજુતીથી નક્કી કરશે અને જે ભાવ માન. કમિશ્નર સાહેબ ની મંજુરી આપ્યે આપી શકાશે. આવી આઇટમોના ભાવ ઉપર કોન્ટ્રાક્ટરે ટેન્ડરમાં જણાવેલ વધારે કે ઓછા ટકાની અસર થશે નહી.

(ડ) આ મૂળ જથ્થામાં કે ડ્રોઈંગ સ્પેસીફીકેશનમાં કરવો પડતો ફેરફાર કોન્ટ્રાક્ટરે કબુલ રાખવાનો રહેશે અને આમ કરવાને કારણે મજુરી કે માલ સામાનનો ભાવ વધારો થશે તો રાજકોટ મહાનગરપાલિકા ઉપર કોન્ટ્રાક્ટર નો દાવો રહેશે નહી.

૨૨. આ કામ કોન્ટ્રાક્ટરે માલ મજુરી સાથે કરવાનો છે. એટલે કે કામમાં જોઈતા મટીરીયલ્સ (હથીયાર, સાધનો, સીડી કે ત્રાપા વગેરે) નો સમાવેશ થાય છે. આ કામ માટે તેને જોઈતા મજદુરો (કારીગરો, સુપરવાઈઝર વિગેરે) નો સમાવેશ થાય છે. કોન્ટ્રાક્ટરે તે કામ કરનારાઓ માટે પીવાના પાણીની વ્યવસ્થા કરવાની છે. જે કોઈ આઇટમમાં સ્પેસીફીકેશન ન હોય ત્યાં પણ રાજકોટ મહાનગરપાલિકા ના સ્પેસીફીકેશન મુજબ કામ કરવાનું રહેશે. જો રાજકોટ મહાનગરપાલિકા માં પણ સ્પેસીફીકેશન ન હોય તો ગુજરાત વોટર સપ્લાય એન્ડ સુવરેજ બોર્ડ (GWSSB) ના સ્પેસીફીકેસ્ન મુજબ કામ કરવાનું છે. કોઈ કામનું સ્પેસીફીકેશન ઉપરોક્ત જણાવેલ ખાતામાં ન હોય તો એવા કામનું સ્પેસીફીકેશન કોન્ટ્રાક્ટરે રાજકોટ મહાનગરપાલિકા ઈજનેર પાસેથી લેખિતમાં મેળવવાનું રહેશે. કામ બાબત કોઈ પણ જાતનો વાંધો કે વાંધાઓ પડે તો તેનો આખરી નિર્ણય માન. કમિશ્નર સાહેબનો રહેશે અને તે કોન્ટ્રાક્ટરને બંધનકર્તા રહેશે.

૨૩. કોન્ટ્રાક્ટર તરફથી કામ થઈ ગયા બાદ ૨૪ કલાકમાં સાઈટ સાફ કરી આપવાની રહે છે. તે સમય દરમ્યાન સાઈટ સાફ કરવામાં આવશે નહી તો જગ્યા રોકાણ અંગેનું;

કામ પૂરું થયાની તારીખથી ધોરણસર ભાડું ચડત થશે અને તે કોન્ટ્રાક્ટર પાસેથી વસુલ કરવામાં આવશે આથવાતો તેઓને ખર્ચે અને જોખમે સાઈટ ઉપર પડેલ માલ રાજકોટ મહાનગરપાલિકા ના ઈજનેર દુર કરાવશે અને તેની રકમ કોન્ટ્રાક્ટર પાસેથી વસુલ લેવામાં આવશે.

૨૪. જે કામ અથવા માલ નાપાસ કરવામાં આવે તે સાઈટ ઉપરથી ૨૪ કલાકમાં ખસેડવાનો રહેશે અને તેમ કરવામાં કસુર થશે તો કોન્ટ્રાક્ટરના ખર્ચે અને જોખમે તે કામ અથવા માલ ખસેડવામાં આવશે.

૨૫. ટેન્ડરમાં જણાવેલ કોઈ પણ આઇટમ ખાતા મારફત કરવાની જરૂર જણાશે તો તે કામ ખાતા મારફત કરવામાં આવશે. જેના માટે કોન્ટ્રાક્ટર વાંધો ઉઠાવી શકશે નહી.

૨૬. દરેક કામમાં વપરાતો માલ-સમાન સીટી એન્જીનીયર (સ્પે.)શ્રી / સક્ષમ અધિકારીશ્રી પાસે પાસ કરવી ત્યાર બાદ જ વાપરવાનો રહેશે.

૨૭. જો કોન્ટ્રાક્ટર ચાલુ કામ છોડી જતા રહેશે અગર કામ બંધ કરી દેશે તો રાજકોટ મહાનગરપાલિકા તેમને ખર્ચે અને જોખમે કામ ચાલુ કરી શકશે અગર તો બીજા કોન્ટ્રાક્ટર પાસે કામ શરુ કરાવી શકશે. આમ કરવામાં રાજકોટ મહાનગરપાલિકા ને કોન્ટ્રાક્ટર સાથેના એગ્રીમેન્ટ કરતા વધુ ખર્ચ થશે તો કોન્ટ્રાક્ટર પાસેથી કાયદેસર રીતે વસુલ કરી શકશે અને આ ઉપરાત તેમની સિક્યોરીટી ડીપોઝીટ જપ્ત કરી શકશે.

૨૮. કોન્ટ્રાક્ટરના દરેક પ્રોગ્રેસીવ બિલમાંથી ૧૦% રકમ રાજકોટ મહાનગરપાલિકામાં જમા રહેશે તેનો ફાઈનલ બીલમાં સમાવેશ કરવામાં આવશે.

૨૯. આ સાથેના પ્રાઈસ બીડના પરિશિષ્ટમાં સમાવિષ્ટ આઇટમ માં દર્શાવેલ ભાવ (દર) બાબતે ભવિષ્યમાં ગેરસમજ ઉપસ્થિત થાય તો તે અંગે સીટી એન્જીનીયર (સ્પે.)શ્રી નો નિર્ણય આખરી ગણાશે.

૩૦. સીટી એન્જીનીયર (સ્પે.)શ્રી મારફત ટેન્ડરો ખોલવામાં આવશે ત્યારથી ૧૮૦ દિવસમાં ટેન્ડર સ્વીકારવામાં આવેલ છે કે નહી તેનો નિર્ણય માન. કમિશ્નર સાહેબ મારફત કરવામાં આવશે. આ મુદતમાં જો કોઈ પણ પ્રકારના નિર્ણયની જાણ

કોન્ટ્રાક્ટરને કરવામાં નહી આવે તો ટેન્ડરના ભાવો કોન્ટ્રાક્ટર કે રાજકોટ મહાનગરપાલિકાના સક્ષમ અધિકારીશ્રી બંનેની સહમતીથી આવેલ ભાવોનું ટેન્ડર મંજુર કરવા માટે માન. કમિશ્નર સાહેબ આખરી નિર્ણય કરી શકશે.

૩૧. જે કોન્ટ્રાકટરના ભાવ મંજુર થશે અને ભાવ મંજુર થવાના ખબર મળ્યેથી થયેલ ભાવથી થતી કિંમતના ૫ ટકાની રકમ સીકયોરીટી ડીપોઝીટ તરીકે મહાનગરપાલિકાની ટ્રેઝરીમાં દિવસ-૮ માં ભરી સ્ટેમ્પ ડ્યૂટિ એક્ટ મુજબની રકમના નોન-જ્યુડિશિયલ સ્ટેમ્પ પેપર ઉપર મહાનગરપાલિકા દ્વારા માન્ય કરેલ ફોર્મમાં કરારનામુ કરી આપવાનું રહેશે. આ માટે સ્ટેમ્પ પેપર તેમજ એડહેસિવ સ્ટેમ્પનો ખર્ચ કોન્ટ્રાકટરે ભોગવવાનો રહેશે.

૩૨. વર્કમેન કોમ્પેન્સેશન એકટ હેઠળ ઈન્સ્યુરન્સની ડબલ્યુ.સી.ની પોલીસી લેવાની રહેશે.

૩૩. સાઈટ ઉપર કામ કરતાં કામદારોની સંખ્યા અન્વયે સરકારશ્રીના લેબર એક્ટ મુજબ લેબર લાયસન્સ લેવાનું રહેશે અને તેના પ્રવર્તમાન કાયદાઓનું પલક કરવાનું રહેશે તેમજ આ કાયદામાં સરકારશ્રી તરફથી વખતો વખત જે કોઈ ફેરફાર થાય તેનો અમલ કરવાનો રહેશે.

૩૪. સરકારશ્રીના પ્રવર્તમાન નિયમો અનુસાર ઈ.પી.એફ.નંબર લેવાનો રહેશે તથા આ કાયદામાં વખતો વખત જે કાંઈ ફેરફાર થાય તેનો અમલ કરવાનો રહેશે.

૩૫. સર્વિસ ટેકસ / જી.એસ.ટી. ના કાયદા અનુસાર ટેકસ ભરવાની જવાબદારી જે તે કોન્ટ્રાકટરશ્રીની રહેશે.

૩૬. કચેરી તરફથી સુચવવામાં આવતા આ કામને લગતા જરૂરી ટેસ્ટ રીપોર્ટ કોન્ટ્રાકટરે પોતાના ખર્ચે કરાવી આપવાના રહેશે.

૩૭. ગુજરાત સરકારશ્રીના શ્રમ અને રોજગાર વિભાગના જી.આર. નં.સી.ડબલ્યુ.એ/૨૦૦૪/૮૪૧/એમ-૩ તા.૩૦.૦૧.૦૬ ના ઠરાવ મુજબ શ્રમીકોના કલ્યાણ માટે બીલની કુલ રકમના ૧% (એક ટકા) લેખે સેસ રકમ રાજકોટ મહાનગરપાલિકા રનીંગ બીલમાંથી કપાત કરશે, તેમજ તેના માટે જરૂરી રજીસ્ટ્રેરશન એજન્સીએ સ્વ.ખર્ચે કરવાનું રહેશે.

૩૮. કામ રાખનાર કોન્ટ્રાકટરશ્રીએ ૧૦ કે તેથી વધુ કામદારો કામે રાખેલ હશે તો કોન્ટ્રાકટરશ્રીએ ઈ.એસ.આઈ. (એમ્પ્લોઈઝ સ્ટેટ ઈન્સ્યોરન્સ) એકટ હેઠળ રજીસ્ટ્રેશન કરાવી જરૂરી રજીસ્ટ્રેશન નંબર મેળવવાનો રહેશે. કોન્ટ્રાકટરશ્રીએ તેમના હસ્તકના કામદારોને ઈ.એસ.આઈ.એકટ હેઠળ મળવાપાત્ર તમામ લાભો આપવાના રહેશે. કોન્ટ્રાકટરશ્રીએ ઈ.એસ.આઈ.એકટના જે તે સમયે પ્રવર્તમાન તમામ ધારા-ધોરણોનું પાલન કરવાનું રહેશે.

૩૯. આ સાથે સામેલ રાખેલ આ કચેરી હુકમ નં.રામનપા/સી/૧૩૨ તા.૧૦.૦૬.૨૦૧૩ તથા પરિપત્ર નં.રામનપા/સી/૩૨૯ તા.૨૨.૧૨.૨૦૧૨ તેમજ અન્ય સામેલ પરંપત્રો વાંચીને તેમાં સહી સીકકા કરી ટેન્ડર સાથે રજુ કરવાના રહેશે.

૪૦. ટેન્ડરની તમામ શરતો અને બોલીઓ વાંચીને કોન્ટ્રાક્ટરે દરેક પાના પર ટુંકી સહીઓ કરી આપવાની છે. અધુરી વિગત કે ચેકચાક વાળું ટેન્ડર રદ કરવાપાત્ર બનશે.

૪૧. વર્કમેન કોમ્પેન્સેશન એક્ટ હેઠળ ઇન્સ્યુરન્સની, ડબલ્યુ.સી. ની પોલીસી લેવાની રહેશે.

૪૨. સરકારશ્રીના પ્રવર્તમાન નિયમો અનુસાર ઈ.પી.એફ. નંબર લેવાનો રહેશે તથા આ કાયદામાં વખતો વખત જે કંઈ ફેરફાર થાય તેનો અમલ કરવાનો રહેશે.

૪૩. કચેરી તરફથી સૂચવવામાં આવતા કામે લગતા જરૂરી ટેસ્ટ રીપોર્ટ કોન્ટ્રાક્ટરે પોતાના ખર્ચે કરાવી આપવાના રહેશે.

૪૪. ભારત / ગુજરાત સરકારશ્રી ના વખતો-વખત ના કાયદાઓ-નિયમોમાં થતા ફેરફાર કોન્ટ્રાક્ટરને બંધનકરતા રહેશે.

૪૫. પોલીસ કમિશ્નરશ્રી, રાજકોટ દ્વારા વખતો-વખત બહાર પાડવામાં આવતાં જાહેરનામાનો કોન્ટ્રાક્ટરે ચુસ્તપણે અમલ કરવાનો રહેશે.

અધિક મદદનીશ ઈજનેર	**નાયબ કાર્યપાલક ઈજનેર**	**સીટી એન્જીનીયર (સ્પે.)**
બાંધકામ શાખા	**બાંધકામ શાખા**	**બાંધકામ શાખા**

કોન્ટ્રાક્ટરની સહી તથા સિક્કો:

-:: કામના તાંત્રિક સ્પેશીફીકેશન ::-

-:: ટેન્ડરના જુદા-જુદા કવર માટેના સ્ટીકર ::-

મુખ્ય કવર પર ચોંટાડવું

બીડ સબમીશન

ટેન્ડર નં. રામન/ડ્રેનેજ(સે.ઝો.)/૨૩-૨૪/૧૮

કામનું નામ: વોર્ડ નં.૩ માં લક્ષ્મણ વાટિકા શેરી નં.૧ તથા ૨માં ડ્રેનજ લાઈન નાખવાનું તથા હાઉસ કનેકશન ચેમ્બર્સ બનાવવાનું કામ

ટેકનીકલ બીડના કવર માટે

એ - ટેકનીકલ બીડ

ટેન્ડર નં. રામન/ડ્રેનેજ(સે.ઝો.)/૨૩-૨૪/૧૮

કામનું નામ: વોર્ડ નં.૩ માં લક્ષ્મણ વાટિકા શેરી નં.૧ તથા ૨માં ડ્રેનેજ લાઈન નાખવાનું તથા હાઉસ કનેકશન ચેમ્બર્સ બનાવવાનું કામ

પ્રાઈસ બીડના કવર માટે

બી - પ્રાઈસ બીડ

ટેન્ડર નં. રામન/ડ્રેનેજ(સે.ઝો.)/૨૩-૨૪/૧૮

કામનું નામ: વોર્ડ નં.૩ માં લક્ષ્મણ વાટિકા શેરી નં.૧ તથા ૨માં ડ્રેનેજ લાઈન નાખવાનું તથા હાઉસ કનેકશન ચેમ્બર્સ બનાવવાનું કામ

રાજકોટ મહાનગરપાલિકા

ટેન્ડર નં.રામન/ડ્રેનેજ(સે.ઝો.)/૨૩-૨૪/૧૮

બી - પ્રાઈસ બીડ

રૂ..... પહોચ નં..... તારીખ.....

છૂટક કામ (સેંકડે ટકાવારી દર)

હું / અમો આ ટેન્ડરમાં લખેલું કામ અંદાજ પત્રકના રૂ. ૩,૪૯,૦૦૦/- કરતાં .....% (શબ્દોમાં .....ટકા) ઓછા / વધુ ભાવે કરવા સહમત છું / છીએ.

કામનું નામ: **વોર્ડ નં.૩ માં લક્ષ્મણ વાટિકા શેરી નં.૧ તથા ૨માં ડ્રેનેજ લાઈન નાખવાનું તથા હાઉસ કનેકશન ચેમ્બર્સ બનાવવાનું કામ**

મંજુર થયેલ અંદાજ : રૂ.૩,૪૯,૦૦૦/- અર્નેસ્ટ મની : રૂ.૩,૪૯૦/-

ટેન્ડર ફી: રૂ.૭૫૦/-

કોન્ટ્રાક્ટરનું નામ: .....

સરનામું: : .....

.....

તારીખ :..... સાક્ષી :.....

સરનામું :.....

.....

ધંધો :.....

ભાવ ભરનારની સહી

સદરહુ ભાવ પત્ર રાજકોટ મહાનગરપાલિકા વતી મંજુર કરવામાં આવે છે.

તારીખ: ..... મંજુર કરનાર અધિકારીની સહી

રાજકોટ મહાનગરપાલિકા

-:: પરિશિષ્ટ – "બ" ::-

(કામની કઈ કઈ બાબત કરવાની છે તે બતાવવાની યાદી)

કામનું નામ: વોર્ડ નં.૩ માં લક્ષ્મણ વાટિકા શેરી નં.૧ તથા ૨માં ડ્રેનેજ લાઈન નાખવાનું તથા હાઉસ કનેકશન ચેમ્બર્સ બનાવવાનું કામ

SD	HyYM	IJUT	EFJ	NZ	ZSD
1	16.00	0FDZGL ; 5F8L TM0JFG SFDPs5JZf	69.00	RMPDLP	1,104.00
2	244.36	BMNF6 SFD ; MPDMPqCFPDMP G VJP Z . 8YL ! P5_ DLP ; WLGL p0F . G	100.05	3PDLP	24,448.21
4	182.00	!__ VD VD 0FIF :8MGJZ 5F . 5 G , . U SFD ; % , FI OL1FLU ; FY	216.00	ZPDLP	39,312.00
5	120.00	! 5_ VD VD 0FIF :8MGJZ 5F . 5 G , . U SFD ; % , FI OL1FLU ; FY	332.00	ZPDLP	39,840.00
6	13.28	0GH 5F . 5 , F . GG ; LP ; LP A0LU SFD s8F . 5 ; L f	3558.00	3PDLP	47,250.24
7	21.00	હા ક ચેમ્બર ૦.૪૫ થી વધુ અને ૦.૬૦ મી સુધી	2182.00	GU	45,822.00
8	6.00	હા ક ચેમ્બર ૦.૬૦ થી વધુ અને ૦.૭૫ મી સુધી	2692.00	GU	16,152.00
	2.00	0GH DF8 V v ! 8F . 5 GF DGCM , AGFJJFG SFD	5167.00	GU	10,334.00
9	4.00	0GH DF8 V 8F . 5 GF DGCM , AGFJJFG SFD	6368.00	GU	25,472.00
10	0.96	v ; NZ DGCM , GL JWFZFGL p0F . ; NZ v	6052.00	ZPDLP	5,809.92
11	27.00	I5 SF:8 0D SJZGL HM0L 5 8G UM / ; % , FI OL1FLU	1300.00	HM0L	35,100.00
12	6.00	I5 SF:8 0D SJZGL HM0L ! _ 8G UM / ; % , FI OL1FLU	1541.00	HM0L	9,246.00
13	4.00	NLJF , DF CM , 5F0L ZL5ZLU ; FY Sd5 , L8P	75.00	GU	300.00
14	80.64	DF8L p5F0JFG SFD 5YZF6 ; FYP	122.00	3PDLP	9,837.93
				S ,	310,028.30

SD	HyYW	IJUT	EFJ	NZ	ZSD
			૧૨.૫ % સુપરવીઝન ચાર્જ		38,753.53
				S,	348,781.83
			SAY		349,000.00

સઘળું કામ ફરમાવવામાં આવે તે પ્રમાણે શરતો અને સમજુતી મુજબ કરવાનું છે. ઉપરોક્ત પરિશિષ્ટમાં નિર્દેશ કરેલ આઈટમોનું કામ ભાગ-એ ટેકનીકલ બીડ માં સામેલ કરેલ સંબંધિત આઈટમોની શરતો અને સમજુતી પ્રમાણે કરવાનું છે.

મદદનીશ એન્જી.	નાયબ કાર્યપાલક ઈજનેર	સીટી એન્જીનીયર (સ્પે.)
રાજકોટ મહાનગરપાલિકા	રાજકોટ મહાનગરપાલિકા	રાજકોટ મહાનગરપાલિકા

કોન્ટ્રાક્ટરની સહી તથા સિક્કો

PROVIDING AND TESTING OF SWG AND RCC NP3 PIPE :

Inspection and testing of pipes at works shall be carried out as per IS: 3597:1998 or its latest amendment for RCC NP3 pipe and IS: 651:2007or its latest amendment for SWG pipes. No extra payment for testing of pipes at works shall be made. Contractor shall issue inspection call well in advance (min.7 days) to carry out testing of pipes. After successful testing of pipes, RMC or its representative shall give clearance for dispatch of pipes. Random Physical inspection of pipes at site will be carried out after delivery of pipes and if found any damage during transportation or due to any reason, pipes shall be rejected and same will not be used by contractor.

1. PROVIDING AND TESTING OF SWG PIPES AS PER THE TENDER SPECIFICATIONS.

1.1 TECHNICAL SPECIFICATION FOR S & S STONEWARE GLAZED PIPE.

All the specifications mentioned in the I.S Code 651-1992 & its latest revised addition shall be strictly followed.

1.1.1 In the revision of the above said code, grading based on Hydraulic test has been deleted and the standard monogram has also been modified and it appears as ISI symbol with IS:651.

1.1.2 Tests for Acid & Alkali resistance for pipes and fittings which were earlier optional have now been made mandatory.

1.1.3 GLAZED STONEWARE PIPES AND FITTINGS:

1.1.3.1 This standard covers dimensions and performance requirements for the following glazed stoneware pipes and fittings:

a) Straight pipes and taper pipes
b) Bends
c) Taper bend
d) junctions
e) half section channels, straight and taper
f) channel junctions
g) channel bends
h) channel interceptors
i) gully traps, and
j) inspection pipes

1.1.3.1.1 The pipes as covered in this standard are not meant for potable water applications.

1.1.4 Dimensions of glazed stoneware pipes and fittings are grouped into two sections, A&B. Section-A covers dimensions of straight pipes and all such fittings which normally form part of pipeline and which are subject to same conditions, specifications and tests as straight pipes. Section-B includes dimensions of fittings which are commonly used but do not form a part of the normal pipeline. The fittings in section-B being hand-moulded articles, their conformity to dimensional specifications is not required to be so zccurate as for those in Section-A.

1.1.5 REFERENCES:

1.1.5.1 The following Indian Standards are the necessary adunct to this standard.

IS No	Title
808 : 1989	Dimensions for hot rolled steel beam, column, channel and angle section (third revision)
2730 : 1977	Magnesium sulphate (Epsom salt) (first revision)
2781 : 19/5	Glossary of terms relating to ceramic ware (first
4905 : 1968	Method for random sampling

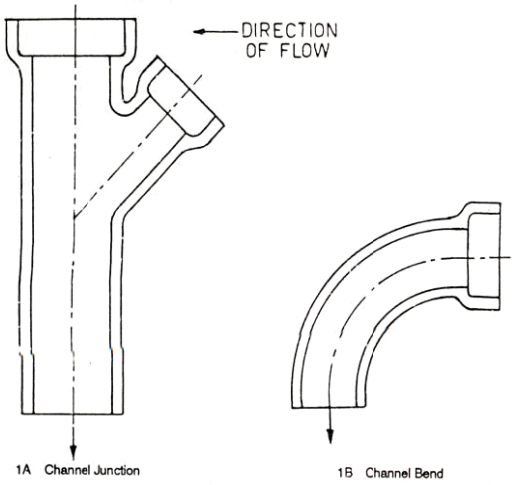
1.1.6. TERMINOLOGY:

1.1.6. For the purpose of this standard, the definitions of terms given in IS 2781 : 1975 shall apply.

1.1.7. RIGHT-HAND AND LEFT-HAND FITTINGS:

1.1.7.1. A right-hand fitting is such that when viewed from the spigot towards the socket, the arm of a junction or the socket of a bend projects to the right (See Fig. 1A and 1B). a left-hand fitting is such that when viewed as above, the arm of socket projects to the left.

RIGHT-HAND FITTINGS



1.1.8 GENERAL QUALITY:

1.1.8.1 All pipes and fittings shall be sound and free from visible defects which impair the strength, durability and serviceability. The glazed of pipes and fittings shall give a sharp clear note when struck with a light hammer

1.1.8.2. For pipes and fittings, a maximum of 10 percent shall be acceptable with any one of the following blemishes which do not impair the strength, durability and serviceability provided these pipes and fittings satisfactorily pass the hydraulic test specified in 4.1.10.2.

a) A thin chipping not exceeding one quarter of the thickness of the body and not exceeding 10 cm^2 on the outside of spigot or on either side of the socket.

b) One blister, unbroken, not more than 3 mm high not more than 40 mm in largest dimension inside or outside of the pipe; and

c) Hairline surface cracks.

1.1.8.3. Colour of pipes / fittings may vary from yellow to dark brown / black.

1.1.9. GLAZING:

1.1.9.1. The interior and exterior surfaces of the pipes and fittings which remain exposed after jointing shall be glazed. The portion which remains covered after jointing may or may not be glazed. The glaze shall be obtained by the action of fumes of volatized common salt on the material of the pipes and fittings during the process of burning or glazed shall be ceramic glaze consisting of glazing material applied prior to fixing.

1.1.10. TESTS:

1.1.10.1. Testing Facilities:

The manufacturer shall at his premises and at his own cost, provide the necessary gauges, supply and prepare all test pieces and supply all labour and apparatus for testing which may be necessary for carrying out the tests as required by this standard.

1.1.10.2. Hydraulic Test:

When subjected to the hydraulic test straight pipes shall withstand the internal hydraulic test pressure of 0.15 MPa (1 MPa = 10.2 kg/cm^2) on the barrels and fittings covered in Section-A and 0.075 MPa for fittings covered in Section-B without showing signs of injury or leakage. The pressure shall be applied on pipes and fittings at a rate not exceeding 0.075 MPa in 5 seconds, and full pressure shall be maintained for at least 5 seconds. Care shall be taken to ensure that all air is expelled before the test is commenced.

1.1.10.3. Absorption Test:

The test pieces for testing shall be taken from the body of the pipe or fittings but not from within 150 mm of the end.

Each test pieces shall be of the whole thickness of the wall of the pipe or fittings and shall have two glazed surfaces each having an area of not less than 50 cm^2 and not more than 130 cm^2. The test pieces shall be cleaned by wire brush to dislodge any loose particles which may increase loss of mass during boiling. The test piece shall be dried at a temperature of not less than 150^{o}C until no further loss of mass is noted and cooled in a desiccator to the room temperature and the specimen weighed to an accuracy of 0.1 g. The test piece may be suitable suspended in cold distilled water by means of thread so that the test piece may not strike against each other or the container and incur loss in mass and the water in the container shall then be brought to the boiling point. The water shall be maintained at that temperature for 1 hour and after it has been allowed to cool to room temperature, the test pieces shall be removed carefully wiped with a dry cloth and then the mass determined. The percentage increase in mass of each test piece by absorption of water shall not exceed the following values:

Thickness of pipe or fitting	**Increase in Mass**
Up to and including 20	6
Over 20 and up to 25	7
Over 25 and up to 32	8
Over 32 and up to 38	9
over 38	10

1.1.10.4. Test for Acid Resistance:

Pipes and fittings shall be tested for acid resistance in accordance with the procedure given in Annexure-A. The loss in mass shall not exceed 2.5%.

1.1.10.5. Test for Alkali Resistance:

Pipes and fittings shall be tested to the action of magnesium sulphate in accordance with the procedure given in Annexure-

B. There shall be no evidence of pitting, softening, spalling or cracking in the pipe or fitting after the test.

1.1.10.6. Crushing Strength Test:

When tested along the full length of the pipe barrel from shoulder to spigot in accordance with Annex.C, the pipe tested shall have a minimum crushing strength of 16 k N/m length.

1.1.11 SAMPLING AND CRITERIA FOR CONFORMITY:

1.1.11.1 The scale of sampling and the criteria for conformity of a lot shall be as prescribed in Annexure-D.

1.1.12. MARKING:

1.1.12.1 Every pipe and fitting shall have legibly impressed upon it before firing the following:
a) Name or trade-mark of the manufacturer, and
b) Size (Internal Dia.)

1.1.12.2 Each pipe and fitting may also be marked with the Standard Mark.

SECTION - A PIPES AND FITTINGS FORMING PART OF PIPE LINE

1.13 INTERNAL DIAMETER:

1.13.1 The internal diameter of the barrels of straight pipes, junctions and bends shall be as specified in col 1 of Table-1.

1.13.2 Permissible Tolerances:
The internal diameters specified in 4.1.13.1 shall be within the following tolerances:

Internal diameter of pipes	Permissible Tolerance
100	± 3
150	± 5
200, 230	± 6
250 to 350	± 8
400, 450	± 10
500, 600	± 12

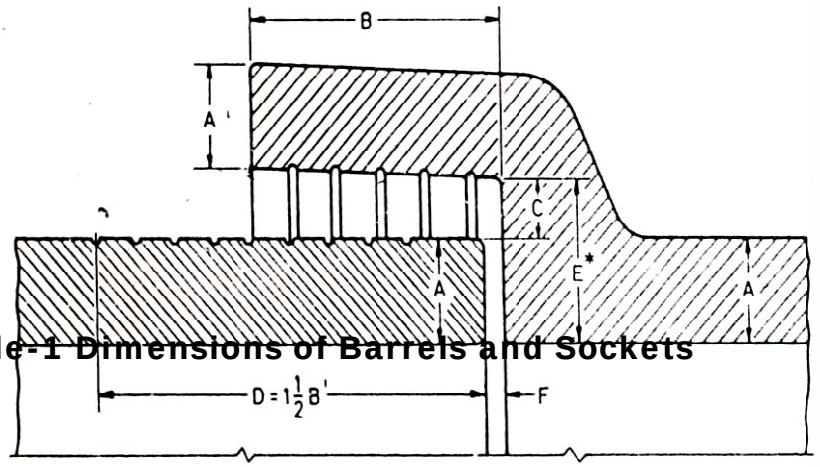


Table-1 Dimensions of Barrels and Sockets

(Clauses 1.1.13.1,1.1.13.2, 1.1.14.1, 1.1.16.1)

(All Dimensions In Millimeters)

Internal Diameter	Mean Thickness of Barrel and Socket, Min A	a) Internal Depth of Socket, Min B	Excess shoulder Measure-ment, Min C	Length of Grooving of Spigot, Min D(1½B)
1	2	3	4	5
100	12	50	10	75
150	15	57	11	85.5
200	16	63	12	94.5
230 +	19	63	12	94.5
250	20	70	16	105
300	25	70	16	105
350	30	75	16	112.5
400	35	75	16	112.5
450	37	76	16	14
500	40	80	19	120
600	43	90	19	135

- E = width of shoulder of socket which shall exceed the mean thickness of the barrel of the pipe (ascertained as directed in 4.1.14.1) by not less than the values for C given in col 4.

+ This is non-preferred size and has been included to facilitate replacements.

1.1.13.3 The pipes shall be inspected by Third Party Inspection Agency, the cost of which is to be borne by contractor. The Third Party Inspection Agency will be from any Government undertaking agency like RITES, EIL, CEIL, MACON, WAPCOS, SGS etc approved by Gujarat Water Supply & Sewerage Board..

1.1.14. THICKNESS OF BARRELS, SOCKETS AND BENDS:

1.1.14.1 The mean thickness of the barrel and the socket of the pipes junctions and bends shall not be less than the means thickness given in col 2 of Table 1. Such mean thickness of the barrels or sockets of any individual pipe junctions and bends shall be ascertained by making several minimum 4 measurements and adding the measured minimum thickness (not in the groove) to the maximum thickness and dividing the sum by two. The mean thickness of the barrel and socket shall be determined separately.

1.1.14.2. Permissible Variation:

The difference between the minimum and maximum measured thicknesses mentioned in 4.1.14.1 shall not exceed the amounts given below:

Internal diameter of pipe (in mm)	**Permissible variation in Thickness of Barrel and Sockets (in mm)**
Not exceeding 450	**2**
500 and 600	**3**

ANNEX-A (Clause-1.1.10.4.)
TEST FOR RESISTANCE TO ACIDS

A-0 PRINCIPLE:

A-0-1 The test specimen is completely immersed in the test solution and the resistance to acid is determined as the percentage of acid soluble matter expressed as sulphate.

A-1 REAGENTS:

A-1.1 Sulphuric Acid - 4.90 percent, specify gravity 1.84.

A-2 PREPARATION OF TEST SPECIMEN:

A-2.1 Test specimen shall be sound with all edges freshly broken, free from cracks or shattered edges, about 5 cm square, not more than
200 g in mass, and shall be thoroughly cleaned with wire brush.

A-3 WEIGHING APPARATUS:

A-3.1 The weighing shall be made on a balance accurate to 0.01 g when loaded with 200 g.

A-4 PROCEDURE:

A-4.1 The specimens to be tested shall be dried to a constant mass (M_1) at a temperature not less than 150°C. The specimens upon reaching constant mass shall be completely immersed in the test solution at the ambient temperature for a period of 48 hours. Then removed from the solution and carefully and thoroughly washed with hot distilled water, allowing the wash to run into the solution in which specimens were immersed. The solution shall be filtered and to the filtrate shall be added 5 ml of concentrated sulphuric acid. The solution shall then be evaporated (avoiding loss by ignition) and heated cautiously to dryness. It shall then be ignited to constant mass (M_2)

A-5 CALCULATION:

A-5.1 The percentage of acid soluble matter, expressed as sulphate shall be calculated as follows:

$$\text{Loss in mass \%} = \frac{\text{Mass of residue } (M_2)}{\text{Mass of dry specimen } (M_1)} \times 100$$

ANNEX-B

(Clause-1.1.10.5.)

TEST FOR ALKALI RESISTANCE

B-0 PRINCIPLE:

B-0.1 The resistance of stoneware pipes or fittings to alkali is determined by reaching it with magnesium sulphate solution.

B-1 PREPARATION OF SAMPLE":

B-1.1 Test samples measuring not less than 75 cm2 and not more than 130 cm2 shall be broken from the pipe or fittings. The samples shall be sound, free from cracks or surface defects.

B-2 REAGENTS:

B-2.1 Saturated Solution of Magnesium Sulphate - Conforming to IS:2730:1977.

B-3 PROCEDURE:

B.3.1. Heat the magnesium sulphate solution (specific gravity 1.295 to 1.308) to the boiling temperature. Place the test sample in a wire basket and submerge it into the boiling solution; continue heating for two hours. then remove the sample and bring it to a constant mass in a drier or oven at a temperature not less than 110oC. Subject to the test sample to at least five cycles using fresh solution for each cycle. After the completion of five cycles remove the sample from the solution, wash it and bring it to constant mass in a drier or oven at a temperature not less than 110oC. Air cool the sample and observe.

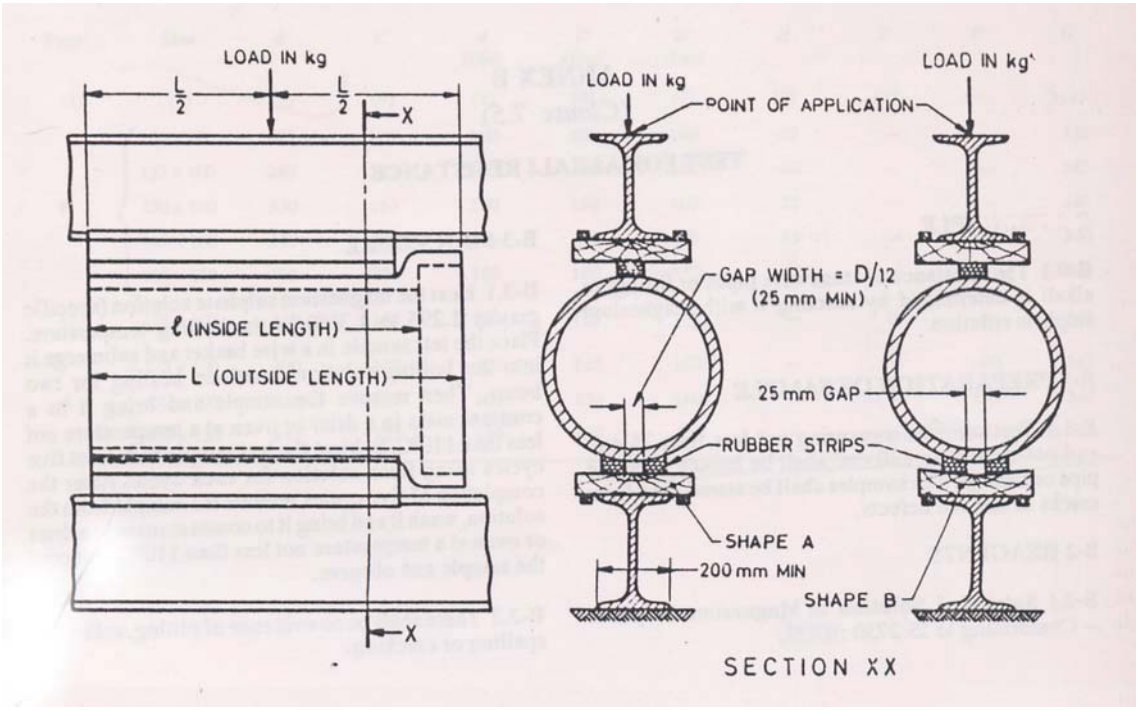
B.3.2. There shall be no evidence of pitting, softening, spalling or cracking.

ANNEX-C (Clause-4.1.10.6.)
CRUSHING STRENGTH TEST

C-1 **CRUSHING STRENGTH TESTING MACHINE:**

C-1.1. While the pipe to be tested is supported in a horizontal position on two bearings parallel to its axis, the load shall be applied to it along the length of the barrel through a third bearing on top of the barrel (see Fig below).

CRUSHING TEST RIG



C-1.2 Any testing machine having a device that will apply the load at a uniform rate of about 30 (kN/m) min. or in increments of not more than 500 N at the same rate, may be used for making the test.

C-1.3 The testing machine shall be substantial and rigid throughout, so that the distribution of the load will not be affected appreciably by the deformation or yielding of any part. The bearings shall be as specified in C-1.4, C-1.5, C-1.6 and C-2.1, and shall be attached to the machine so as to receive and uniformly transmit maximum loads required in the tests without lost motion, vibrations, or sudden shock. The machine and bearings shall be designed to transmit the load in a vertical plane through the longitudinal center lines of the bearings and pipe.

C-1.4 The three bearings shall consist of a lower member, being a rigid

beam on which two bearings strips are symmetrically disposed parallel to a vertical plane passing through the longitudinal axis of the pipe, and an upper member also being a rigid beam, on which one bearing strip is centred and disposed so that it lies in the vertical plane passing through the longitudinal axis of the pipe (See Fig. Crushing Test Rig).

C-1.5 The beam on which the bearing strips are disposed shall be structural steel beams single or of compound sections having moments of inertia about the vertical and horizontal axis of the cross section not less than those of WB 250 (See IS 808 : 1989) and with a width of flange not less than 200 mm.

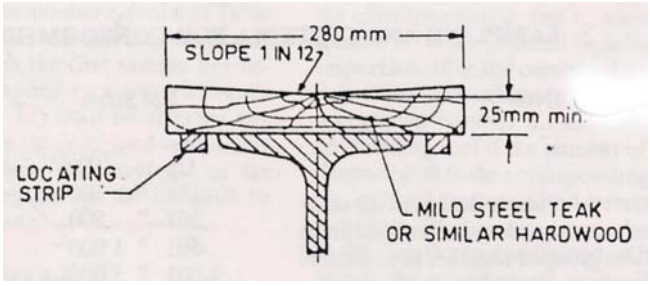
C-1.6 Mild steel, teak or similar hardwood shall be used to face the upper flange of the bottom beam. The facing shall be straight and free of warping or twisting and shall be centrally located on the flange of the beam by means of hardwood strips attached to its lower face and in contact with the edges of the flange. The cross section of the facing may have either of two shapes at the discretion of the pipe manufacturer.

Shape A shall be rectangular 280 x 25 mm minimum, without a joint. Shape B is shown in (Fig. **DETAILS OF ALTERNATIVE FACING**).

A similar facing of shape A may be used to face the lower flange of the upper beam if desired.

DETAILS OF ALTERNATIVE FACING

All dimensions in millimeters



C-2 BEARING STRIPS:

C-2.1 The bearing strips shall consist of rubber cut or formed from material having sufficient hardness. The strips shall be of rectangular cross section having a width of 50 mm and a thickness of not less than 25 mm or more than 40 mm. The two bottom strips shall be of equal thickness.

C-2.2 The single top bearing strip shall be used with the 50 mm dimension in contact with the pipe. It may be positioned on the bearing by the use of wood or metal strips along its outside edges, provided the thickness of the positioning strips does not exceed one-half the thickness of the rubber bearing strip.

C-2.3 The two lower bearing strips shall be laid on the 50 mm dimension and may be positioned on the bearing with wood or metal strips between them and adjacent to their outside edges, provided the thickness of these positioning strips does not exceed one-half the thickness of these rubber bearing strips. The two strips shall be parallel and, when used with a facing of Shape A shall be spaced a distance apart of approximately 1 mm per 12 mm of pipe diameter but in no case has than 25 mm. When used with Shape B they shall be parallel and 25 mm apart for all pipe diameters.

C-2.4 The rubber bearing strips may be attached to the facings, or in the case of the single upper strip, directly to the upper beam, by adhesive if desired, provided, such method of attachment results in the strip remaining firmly fixed in position when carrying the maximum load.

C-3 **APPLICATION OF LOAD:**

C-3.1 The load shall be applied to the top bearing at a point distant from the spigot and of the pipe equal to one-half of the overall length of the pipe including the socket if any. The test load shall be applied to the top bearing in such a way that the bearing is free to rotate in vertical plane through the longitudinal center line, of the top and bottom bearings. In testing a pipe that is not straight it shall be placed between the bearings in the position that appears to give the most favourable bearing conditions for fair test.

C-3.2 The loading of the pipe shall be a continuous operation, and the pipe shall not be allowed to stand under load longer than is required to apply the load and record the observations.

C-4 **EVALUATION OF CRUSHING STRENGTH:**

C-4.1 The ultimate crushing strength in kN per linear metre shall be calculated by dividing the total applied load at fracture by the inside length of the barrel of the sample broken

ANNEX-D (Clause-1.1.11.1)
SAMPLING AND CRITERIA FOR CONFORMITY

D-1 SCALE OF SMAPLING: D.1 Lot:

All the pipes or fittings of the same type, size and manufactured under similar conditions of production, shall be grouped together to constitute a lot.

D.2 The number of pipes or fittings to be selected at random from the lot depends upon the size of the lot and shall be in accordance with col 1 to 4 of Table 2.

D.3 NUMBER OF TESTS:

D.3.1 All the pipes or fittings selected as in D.2 shall be inspected for general quality (See 1.1.8.), dimensions (See Section A or Section B).

D.3.2. The number of pipes or fittings to be tested for hydraulic test (See 1.1.10.2.) shall be 5% of the lot as prescribed in D1. These pipes may be selected at random from those already selected in D.2 and suitable test specimens.

D.3.3 The number of pipes of fittings to be tested for absorption (1.1.10.3.) for resistance to action of acids (1.1.10.4.) and of alkali (See 1.1.10.5) and crushing strength (See 1.1.10.6.) shall be as given below:

Lot	No.of pipes to be tested
Up to	3
151 to 1200	5
1201 to 10,000	8

These pipes may be selected at random from those already selected in D.2 and suitable test specimens shall be selected from them.

D.4 CRITERIA FOR CONFORMITY:

D.4.1 A lot shall be considered as conforming to the requirements of the specifications, if the conditions mentioned in D.4.2 to D.4.6 are all satisfied.

D.4.2. General Quality (See1.1.8.) and Dimensions (See Section A and Section B).

The number of pipes and fittings in the first sample (See Col 2 and 3 of Table-2) shall be first selected and subjected

to inspection for general quality and dimensions. If in the first sample the number of defectives, that is those failing either for general quality or dimensions, is less than or equal to the corresponding acceptance number a_c (col 5 of Table-2), the lot shall be considered as conforming to the requirements of general quality and dimensions. If the number of defectives in the first sample is greater than or equal to the corresponding rejection number r_c (col 6 of Table-2), the lot shall be considered as not conforming. If the number of defectives in the first sample lies between the corresponding a_c and r_c a second sample (see col 2 and 3 of Table-2) shall be selected and subjected to inspection. If in the combined sample, the number of defectives is greater than or equal to the corresponding rejection number r_c the lot shall be considered as not conforming.

Table-2 :Sample Size and Criteria for Conformity (Clause D.2)

Lot size	**Sample**	**Sample Size**	**Cumulative sample size**	**General Quality (See 4.1.8) and dimensions Section a & B)**	
1	**2**	**3**	**4**	**5**	**6**
Upto 150	First Second	20 20	20 40	1 4	4 5
151 to 280	First Second	32 32	32 64	2 6	5 7
281 to 500	First Second	50 50	50 100	3 8	7 9
500 to 1200	First Second	80 80	80 160	5 12	9 13
1201 to 3200	First Second	125 125	125 250	7 18	11 19
3201 to 10,000	First Second	200 200	200 400	11 26	16 27

D.4.3 For the hydraulic test, all the specimens shall satisfy the requirements as specified in 1.1.10.2.

D.4.4 For water absorption test, the mean and range (difference between the highest and the lowest value) of the test results obtained shall be calculated and (mean + 0.6 range) shall be less than or equal to the maximum limit specified in 1.1.10.3.

D.4.5. For resistance to action of acids and of alkali shall satisfy the requirements specified in 1.1.10.4. and 1.1.10.5. respectively.

D.4.6 For crushing strength test all the test specimen shall satisfy the requirement as specified in 1.1.10.6.

2. PROVIDING AND TESTING OF RCC PIPES AS PER THE TENDER SPECIFICATIONS.

2.1 SCOPE

All the specifications mentioned in the I.S Code 458-2003 & its latest revised addition shall be strictly followed.

2.1.1 This standard covers the requirements for reinforced unreinforced precast cement concrete pipes, of both pressure and non – pressure varieties used for water mains, sewers, culverts and irrigation. The requirements for collars are also covered by this standard.

NOTES

1 This standard covers the requirements for pressure and also non–pressure pipes of class NP3 and NP4 manufactured by vibrated casting process.

2 In addition to the requirements specified specifically for the collars, the requirements given in the following clause shall also apply for the collars:

2.5.2,2.5.3,2.5.4,2.5.5.1,2.5.5.3,2.5.5.4,2.5.7,2.5.8,2.7.1,2.7.2,2.7.2.1,2.
7.2.2.,2.7.3,2.7.3.1,2.7.4,2.8.2,2.9.1,2.9.1.1,2.9.1.2,2.9.1.3,2.9.1.4, 2.12.1 and 2.12.1.1.

2.1.2 Pre-stressed concrete pipes and pipes with non-circular section are not covered by this standard

2.2 TERMINOLOGY

2.2 For the purpose of this standard, the following definitions shall apply.

2.2.1 Working Pressure – The maximum sustained internal pressure excluding surge, to which each portion of the pipeline may be subjected when installed.

2.2.2 Site Test Pressure – 1.5 times working pressure pertaining to the section or 1.1 times static pressure. Whichever is more (surge pressure is to be controlled within 25 percent pump head in case of pumping mains).

2.2.3 Hydrostatic Test Pressure – It is the maximum pressure

which the pipe can withstand without pressure which the pipe can withstand without any leakage when tested for hydrostatic pressure in accordance with this standard and IS 3597.

2.2.4 Surge (Water Hammer) Pressure – It is a pressure which is produce by a change of velocity of the moving stream and becomes maximum when there is a sudden stoppage which may be caused by the closing of a valve or by shutting down a pump station. Surge head.

2.3 CLASSIFICATION

2.3.1 For the purpose of this standard, concrete pipes shall be classified as under:

Class Description Conditions Where Normally Used

NP1 Unreinforced concrete non–pressure pipes

NP2 Reinforced concrete, light–duty, non – pressure pipes

NP3 Reinforced and also unreinforced (in case of pipes manufactured by vibrated casting process) concrete, medium–duty, non–pressure pipes.

NP4 Reinforced and also unreinforced (in case of pipes manufactured by vibrated casting process) concrete, heavy – duty, non–pressure pipes

P1 Reinforced concrete pressure pipes tested to a hydrostatic pressure of 0.2 MPa (20m head)

P1 Reinforced concrete pressure pipes tested to a P1 Reinforced concrete pressure pipes tested to a hydrostatic pressure of 0.4 MPa (40m head)

P3 Reinforced concrete pressure pipes tested to a hydrostatic pressure of 0.6 MPa (60m head)

For drainage and Irrigation use, above ground or in shallow trenches

For drainage and irrigation use, for cross drains/culverts carrying light traffic

For drainage and irrigation use, for cross drains/culvert carrying heavy medium traffic

For drainage and irrigation use, for cross drain/culvert carrying heavy traffic

For use on gravity mains, the site test pressure not exceeding two – thirds of the hydrostatic test pressure

For use on pumping mains the site test

For use on pumping mains, the site test pressure not exceeding half of the hydrostatic test pressure

For use on pumping mains, the site test pressure not exceeding half of the hydrostatic test pressure

Note:–The uses are only by way of recommendations as a general guidance and the exact usage shall be decided by the engineer – in – charge.

2.3.2 Unreinforced and reinforced concrete non-pressure pipes shall be capable of withstanding a test pressure of 0.07 MPa (7m head).

2.4 MATERIALS

2.4.1 For precast concrete pipes, materials complying with the requirements given in 2.4.2 to 2.4 .8 shall be used.

2.4.2 Cement

Cement used for the manufacture of unreinforced and reinforced concrete pipes shall conform to IS 269 or IS 455 or IS 1489 (Part 1) (see Note 1) or IS 1489 (Part 2) or IS 8041 or IS 8043 or IS 8112 or IS 12269 or IS:12330.

NOTES

1. Unless otherwise specified by the purchaser, the type of cement to be used is left to the discretion of the manufacturer. Fly ash based cement conforming to IS 1489 (Part 1) with fly ash contents up to 25 percent is permitted for non-pressure pipe only.

2. Sulphate resisting Portland cement (see IS 12330) shall be used, where sulphate is predominant.

3. Site blending with fly ash up to a maximum of 25 percent may be carried out provided its uniform blending with ordinary Portland cement is ensured. Such blended cement shall be used only for non-pressure pipes. The fly ash used for blending shall be either from ESP or processed by established fly ash processing units and shall conform to Grade 1 of IS:3812. Specified requirements of concrete strength, permeability, hydrostatic test and three-edge bearing test shall be met to the satisfaction of customer before it is used for regular production.

2.4.3 Aggregates

Aggregates used for the manufacture of unreinforced and

reinforced concrete pipes shall conform to 3 of IS:383. The maximum size of aggregates should not exceed one third thickness of the pipes or 20 mm, whichever is smaller for pipes above 250 mm internal diameter. But for pipes of internal diameter 80 to 250 mm the maximum size of aggregates should be 10 mm.

NOTE:- It is preferable to have the size and grading of aggregates conforming to IS 383. It is also preferable that materials finer than 75 micron IS Sieve is restricted to 3.0 percent by mass.

2.4.4 Reinforcement

Reinforcement used for the manufacture of the reinforced concrete pipes shall conform to mild steel Grade 1 or medium tensile steel bars conforming to IS 432 (Part 1) or hard-drawn steel wire conforming to IS
432 (Part 2) or structural steel (standard quality) bars conforming to IS:2062.

NOTE :- Wire fabric conforming to IS 1556 or deformed bars and wires conforming to IS 1786 or plan hard -drawn steel wire for pre-stressed concrete to IS 1785 (Part 1) or IS 1785 (Part 2) may also be used. For such reinforcement maximum tensile stress shall be as given in 6.1.

2.4.5 Concrete Mortar

2.4.5.1 The concrete quality (concrete mix, maximum water-cement ratio, minimum cement content, etc) shall be as per IS 456 for at least very server environment exposure condition. Design mix requirements shall be as per IS 456. However, in case of pipes cast by spinning process higher cement contents, more fines and higher water-cement ration may be the need of the process. For non-pressure pipes, if mortar is used, it shall have a minimum cement content of 450 kg/m3 and a compressive strength not less than 35 N/mm2 at 28 days. For pressure pipes if mortar is used, it shall have a minimum cement content of 600 kg/m3 and a compressive strength not less than 35 N/mm2 at 28 days. However, in case of pipes manufactured by vibrated casting process, concrete shall minimum compressive strength as indicated in Tables 4, 5, 7 and 8 for the respective classes of pipes.

Where the process of manufacture is such that the strength of concrete or mortar in the pipe differs from that given by tests on cubes, the two may be related by a suitable conversion factor. If the purchaser requires evidence of this factor, he shall ask for it before placing the order. The conversion factor

for 28 days compressive strength for spun concrete may be taken as 1.25 in the absence of any data.

2.4.5.2 For pressure pipes, splitting tensile strength of concrete cylinders at 28 days, when tested in accordance with IS
5816, shall be not less than 2.25 N/ mm2.

2.4.5.3 Compressive strength tests shall be conducted on 150 mm cubes in accordance with the relevant requirements of IS 456 and IS 516.

2.4.5.4 The manufacture shall give a certificate indicating the quantity of cement in the concrete mix.

2.4.6 Rubber Ring

Rubber ring chords used in pipe joints shall conform to Type 2 of IS 5382.

2.4.7 Water

Water used for mixing of concrete and curing of pipes shall conform to 5.4 of IS 456.

2.4.8 Chemical Admixtures

The admixtures, where used, shall conform to IS 9103.

2.5 DESIGN

2.5.1 General

Reinforced concrete pipes either spun or vibrated cast shall be designee such that the maximum tensile stress in the circumferential steel due to specified hydrostatic test pressure does not exceed the limit of 125
N/mm2 in the case of mild steel rods, 140 N/mm2 in the case of hard- drawn steel wires and high strength deformed steel bars and wires.

2.5.1.1 The barrel thickness shall be such under the specified hydrostatic test pressure, the maximum tensile stress in concrete, when considered as effective to take stress along with the tensile reinforcement, shall not exceed 2 N/mm2 for pressure pipes and 1.5 N/mm2 for non-pressure pipes. But the barrel wall thickness shall be not less than those given in **Table 1** subject to 2.7.2 (iii) for pipes manufactured by spun process. For pipes manufactured by vibrated casting process, the barrel wall thickness shall be as given in Table **2, 3**

2.5.1.2 Pipes of length above 3 mm and up to 4 m may be supplied by agreement between the user and the supplier

and for such pipes, the quantity of reinforcement shall be modified as per 2.5.1.2.1

2.5.1.2.1 Longitudinal reinforcement

Reinforced cement concrete pipes of lengths up to 4 m may be accepted if the longitudinal reinforcement in increased in proportion to the square of length compared with what is used for 3 m length as specified in Tables 1 and 3, except for Table 2

For 'L' (in metre) length of pipe, longitudinal reinforcement shall be $L^2/3^2$ times the longitudinal reinforcement used for 3 m long pipes.

2.5.1.3 Longitudinal reinforcement shall be provided to ensure rigidity and correct location of cages (girds) longitudinally and to limit the effects of transverse cracking. Minimum longitudinal reinforcement shall be as given in Table-1 for pipes manufactured by spinning process. For reinforced pipes manufactured by vibrated casting process, the minimum longitudinal reinforcement shall be as given in Table 3

2.5.2 Reinforcement

The reinforcement in the reinforced concrete pipe shall extend throughout the length of the pipe and shall be so designed that it may be readily placed and maintained to designed shape and in the proper position maintained to designed shape and in the proper position within the pipe mould during the manufacturing process. The circumferential and longitudinal reinforcement shall be adequate to satisfy the requirements specified under 2.5.1.

For non-welded cages spiral reinforcement of the same diameter shall be closely spaced at the end of the pipe for a length of 150 mm to minimize damage during handling. The spacing of such end spirals shall not exceed 50 mm or half the pitch whichever is less. Such spiral reinforcement at ends shall be part of the total spiral reinforcement specified in different tables.

2.5.2.1 The pitch of circumferential reinforcement shall be not more than the following:

a) 200 mm for pipes of nominal internal diameter 80 to 150 mm.
b) 150 mm for pipes of nominal internal diameter 200 to 350 mm, and
c) 100 mm for pipes of nominal internal diameter 400 mm and above.

The pitch shall also be not less than the maximum size of aggregate plus the diameter of the reinforcement bar used.

2.5.2.2 The quantity and disposition of steel in pipes may be decided by mutual agreement between the purchaser and the supplier; however, it shall be proved by calculations and tests that the quantity of the reinforcement conforms to all the requirements specified in the standard. In the absence of calculations and tests, the reinforcement given in Table 1for pipes manufactured by spinning process and in Table 3 for pipes manufactured by vibrated casting process shall be used as minimum reinforcement subject to the requirements of 2.5.2.2.1.

2.5.2.2.1 Tolerances given in IS 432 (part 1), IS 432 (Part 2), and IS 2062 shall be applied to the minimum mass to longitudinal reinforcement specified in different tables. Total mass of longitudinal reinforcement shall be calculated taking into account the clear cover provided at each end of the pipe.

NOTE: For longitudinal reinforcement conforming to IS:432 (Part-2), tolerance on mass shall be calculated from the diameter tolerance.

2.5.2.3 If so required by the purchaser, the manufacturer shall give a certificating the details relating to quality, quantity and dispersion of steel in the pipes as well as the clears cover to the steel provided in the pipes.

2.5.3 Ends of Pipes

Spigot and Socket ended pipes shall be used for water mains, sewer, irrigation and culverts/cross drains. Whereas, flush jointed (NP3 and NP4) and collar jointed (NP2) pipes shall be used for culverts/cross drains only. The ends of concrete pipes used for water mains, sewer and irrigation shall be suitable for socket and spigot, roll on joints or confined gasket joints. Dimensions of spigot and socket for various classes of pipes shall be as given in Table 4,5for pipes manufactured by spinning process. However the dimensions of spigot and socket shall be as given in Tables 6 in case of pipes manufactured by vibrated casting process. Reinforcement in socket of rubber ring jointed pipes shall be as given in Table 7.

However, the ends of concrete pipes used for road culverts/cross drains may be suitable for flush (NP3 and NP4) or collar joints (NP2) (see Fig.1 and 2). For pipes of diameter up to 700 mm, external flush joint and for diameters above 700 mm, internal flush joint is recommended.

NOTES

1. Bends, junctions and specials for concrete pipes covered under this standard shall conform to the requirements of IS 7322.

2. Same typical arrangement of reinforcement in socket are illustrated **in Fig. 3 and Fig.4.**

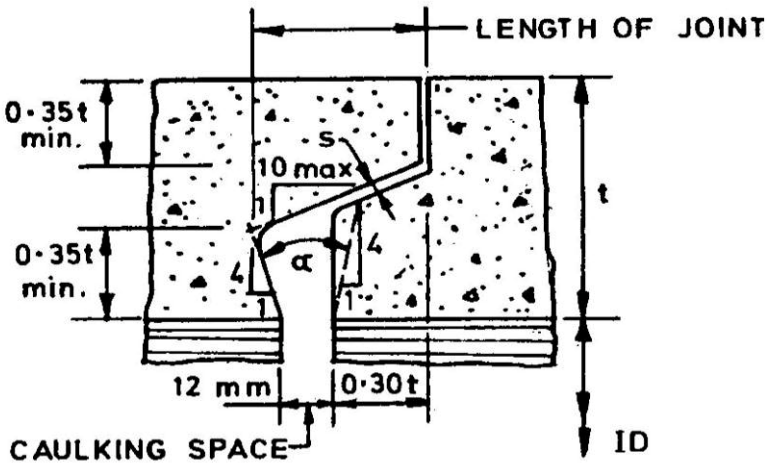
2.5.3.1 Only flexible rubber ring joints shall be used for the joints in (a) all pressure pipes and (b) all non-pressure pipes except when used for road culverts/cross drains. The pipe joints shall be capable of withstanding the same pressure as the pipe.

NOTE : The requirements of 2.5.3.1 does not imply that the collar shall also be tested for the test pressure for pipes specified in 2.3.1, 2.3.2 and 2.9.

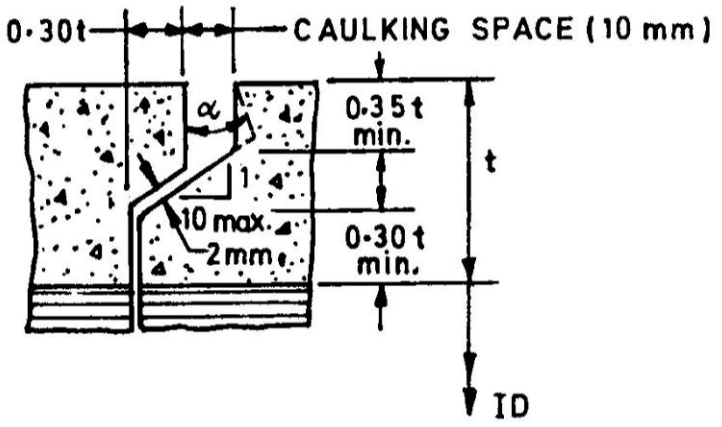
2.5.4 Cover

The minimum clear covers for reinforcement in pipes and collars shall be as given below:

SI NO	***Precast Concrete Pipe/Collar***	***Minimum Clear Cover, mm***
i)	Barrel wall thickness :	
	a) Up to and including 75 mm	8
	b) Over 75 mm	15
ii)	At spigot steps	5
iii)	At end of longitudinal	5



1A Internal Flush Joints



1B External Flush Joints

t – wall thickness.
s – 0.002 of intenal dia or 2 mm, *Min*.
ID – internal diameter.
α – included angle not more than 25° (only for design purp not be measured).

Fig. 1 DETAILS OF FLUSH JOINT

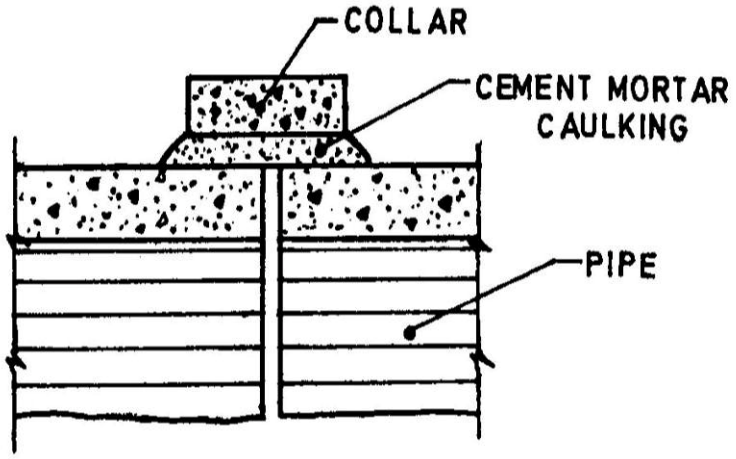
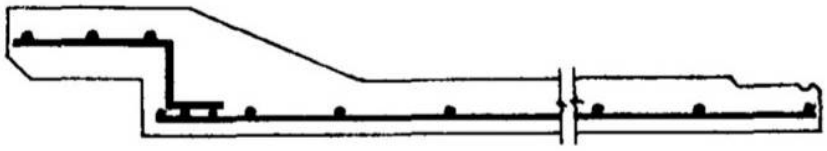


FIG-2 COLLOR JOINT(RIGID)

NOTE : - An effective means shall be provided for maintaining the reinforcement in position and for ensuring correct cover during manufacture of the unit. Spacers for this purposes shall be of rustproof materials or of steel protected against corrosion.

NOTE — No. of Z bars : Minimum half the number of longitudinals.
Maximum equal to number of longitudinals.

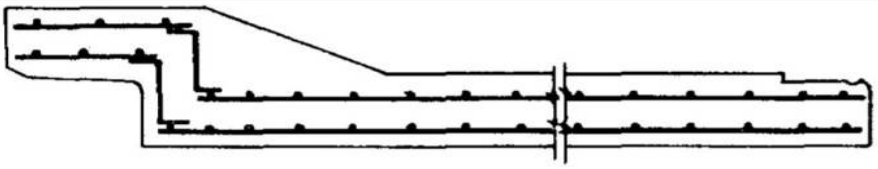
3A Socket Cage Gonnected to Barrel
Cage by Means of Z Bars



3B Socket Cage Longitudinals Suitably Bent
for Connecting to Barrel Cage

3C Cage made of Continuous Longitudinals

FIG. 3 TYPICAL ARRANGEMENTS OF REINFORCEMENT IN SOCKET FOR SINGLE CAGE



NOTE — No. of Z bars : Minimum half the number of longitudinals.
Maximum equal to number of longitudinals.

4A Socket Cage Connected to Barrel
Cage by Means of Z Bars

4B Socket Cage Longitudinal Suitably Bent for Connecting to Barrel Cage

4C Cage made of Continuous Longitudinal

Fig 4. Typical arrangements of reinforcement in socket for double cage (use suitable type of spacers)

2.6 MANUFACTURE

2.6.1 General

The method of manufacture shall be such that the forms and dimensions of the finished pipe are accurate within the limits specified in this standard. The surfaces and the limits specified in this standard. The surfaces and edges of the pipes shall be well defined and true, and their ends shall be square with the longitudinal axis.

2.6.2 Concrete Mixing and Placing

2.6.2.1 Concrete shall be mixed in a mechanical mixer. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency, but in no case shall the mixing be done for less than 2 min.

2.6.2.2 Concrete shall be placed before setting has commenced. It should be ensured that the concrete is not dropped freely so as to cause segregation. The concrete shall be consolidated by spinning, vibrating, spinning combined with vibrations, or other appropriate mechanical means.

2.6.3 Reinforcement Cages

Reinforcement cages for pipes shall extend throughout the pipes barrel. The cages shall consist of spirals or circular rings and straights of hard- drawn steel wire or mild steel rod. Reinforcement cages shall be placed symmetrically with

respect to the thickness of the pipe wall. The spirals shall end in a complete ring at both the ends of a pipe.

2.6.3.1 Pipes having barrel wall thickness 100 mm and above shall have double reinforcement cage and the amount of spirals steel in the outer cage shall be 75 percent of the mass of spiral steel in the inner cage, whilst the total shall conform to the requirements specified in the relevant tables of this standard. The mass of longitudinals in the outer cage and inner cage should be the same, that is equal to half the total mass of longitudinals steel per pipe shall be given in the relevant tables.

NOTES : It is preferable that single reinforcement cage should be located near the inner surface of the pipe with adequate clear cover.

2.6.3.2 Diagonal reinforcement may be provided in pipes, the cages for which are not welded so as to help in binding the cage securely. It shall, however, be ensured that the clear cover for any reinforcement is not below the limits specified in 2.5.4. Diagonal reinforcement is a process requirement and shall not be counted against longitudinal and spiral reinforcement.

2.6.4 Curing

Curing shall be either by steam or by water or by a combination of steam and water, or by use of approved curing compounds. If water curing is used, the pipes shall be cured for a minimum period of 7 days in case of non-pressure pipes and 14 days in case of pressure pipes. In case of pipes where cement with fly ash or slag is used, the minimum period of water curing shall be 14 days, if steam curing is used, after that is shall be water cured for 3 days.

2.7. DIMENSIONS

2.7.1 Pipes

The internal diameter, barrel wall thickness, length, the minimum reinforcement and strength test requirements for different classes of pipes (see 2.2.1), shall be as specified in Table 1 to 3. However, in case of pipes manufactured by vibrated casting process, the internal diameter, wall thickness, the minimum reinforcement (in case of reinforced pipes) and strength test requirements for different classes of pipes shall be as given in Table The manufacturer shall inform the purchaser of the effective length of spigot and socket, and flush jointed pipes that he is able to supply. For collar jointed

pipes, effective length shall be 2 m or 2.5 m up to 250 mm nominal diameter pipes and 2.5 m, 3.0 m or 4.0 m for pipes above 250 mm nominal diameter 900 mm and above, the effective length may also be 1.25 m.

NOTES : Pipes of internal diameter, barrel wall thickness and length of barrel and collar other than those specified in 2.7.1 may be supplied by mutual agreement between the purchaser and the supplier. In such case, the design of pipes submitted to the purchaser shall include all standard details as covered in Tables 1 to 3.

2.7.2 Tolerances

The following tolerances shall be permitted:

Sr No.	***Dimensions***		***Tolerances***
i)	Overall length	:	± 1 percent of standard length
ii)	Internal diameter of pipes	:	
	a) Up to and including 300 mm	:	± 3 mm
	b) Over 300 mm and up to and including 600	:	± 5 mm
	c) Over 600 mm	:	± 10 mm
iii)	Barrel wall thickness	:	
	a) Up to and including 30 mm	:	+ 2 mm - 1 mm
	b) Over 30 mm up to and including 50 mm	:	+ 3 mm - 1.5 mm
	C) Over 50 mm up to and including 65	:	+ 4 mm - 2 mm
	d) Over 65 mm up to and including 80 mm	:	+ 5 mm - 2.5 mm
	e) Over 80 mm up to and including 95 mm	:	+ 6 mm - 3 mm
	f) Over 95 mm	:	+ 7 mm - 3.5 mm

NOTE - In case of pipes with flexible rubber ring joints, the tolerance on thickness near the ends will have to be reduced. Near the rubber ring joints, the tolerance on thickness shall be as given in Tables 4 to 6 in case of pipes manufactured by spinning process and as given in Table 5 in case of pipes manufactured by vibrated casting process.

2.8 WORKMANSHIP AND FINISH

2.8.1 Finish

Pipes shall be straight and free from cracks except that craze

cracks may be permitted. The ends of the pipes shall be square with their longitudinal axis so that when placed in a straight line in the trench, no opening between ends in contact shall exceed 3 mm in pipes up to 600 mm diameter (inclusive), and 6 mm in pipes larger than 600 mm diameter.

2.8.1.1 The outside and inside surfaces of the pipes shall be dense and hard and shall not be coated with cement wash or other preparation unless otherwise agreed to between the purchaser and the manufacturer or the supplier. The inside surface of the pipe shall be smooth. For better bond, inner surface of the collar may be finished rough.

Table 1 Design and Strength Test Requirements of Concrete Pipes of Class NP3 – Reinforced Concrete, Medium Duty, Non – pressure Pipes

(Clauses 2.5.1.1,2.5.1.2.1, 2.5.1.3, 2.5.2.2, 2.5.3.2 and 2.7.1; and Table 7)

Internal Diameter of Pipes	Barrel Wall Thickness	Reinforcements			Strength Test Requirement for Three Edge Bearing Test	
		Longitudinal, Mild Steel or Hard Drawn Steel		Spirals, Hard Drawn Steel	Load to Produce	Ultimate Load
mm	mm	Minimum number	Kg / linear meter	kg / linear meter	0.25 mm Crack kN/linear meter	kN / liner meter
(1)	(2)	(3)	(4)	(5)	(6)	(7)
300	40	8	0.78	1.80	15.50	23.25
350	75	8	0.78	2.95	16.77	25.16
400	75	8	0.78	3.30	19.16	28.74
450	75	8	0.78	3.79	21.56	32.34
500	75	8	0.78	4.82	23.95	35.93
600	85	8 or 6+6	1.18	7.01	28.74	43.11
700	85	8 or 6+6	1.18	10.27	33.53	50.30
800	95	8 or 6+6	2.66	13.04	38.32	57.48
900	100	6+6	2.66	18.30	43.11	64.67
1000	115	6+6	2.66	21.52	47.90	71.85
1100	115	6+6	2.66	27.99	52..69	79.00
1200	120	8+8	3.55	33.57	57.48	86.22
1400	135	8+8	3.55	46.21	67.06	100.60
1600	140	8+8	3.55	65.40	76.64	114.96
1800	150	12+12	9.36	87.10	86.22	129.33

NOTE :

1. If mild steel is used for spiral reinforcement, the weight specified under col 5 shall be increased to 140/125
2. The longitudinal reinforcement given in this table is valid for pipe up to 2.5m effective length for internal diameter of pipe up to 250mm and up to 3m effective length for higher diameter pipes
3. Total mass of longitudinal reinforcement shall be calculated by multiplying the value given in col 4 by the length of the pipe and then deducting for the cover

length provided at the two ends.

4. Concrete for pipes shall have a minimum compressive strength of 35 N/mm^2 at 28 days.

Table 2 Design and Strength Test Requirement of Concrete Pipes of Class NP3 – Un reinforced Concrete, Medium – Duty, Nonpressure Pipes Made by Vibrated Casting Process (Clauses 2.4.5.1, 2.5.1.1, 2.5.3 and 2.7.1 and Table 7)

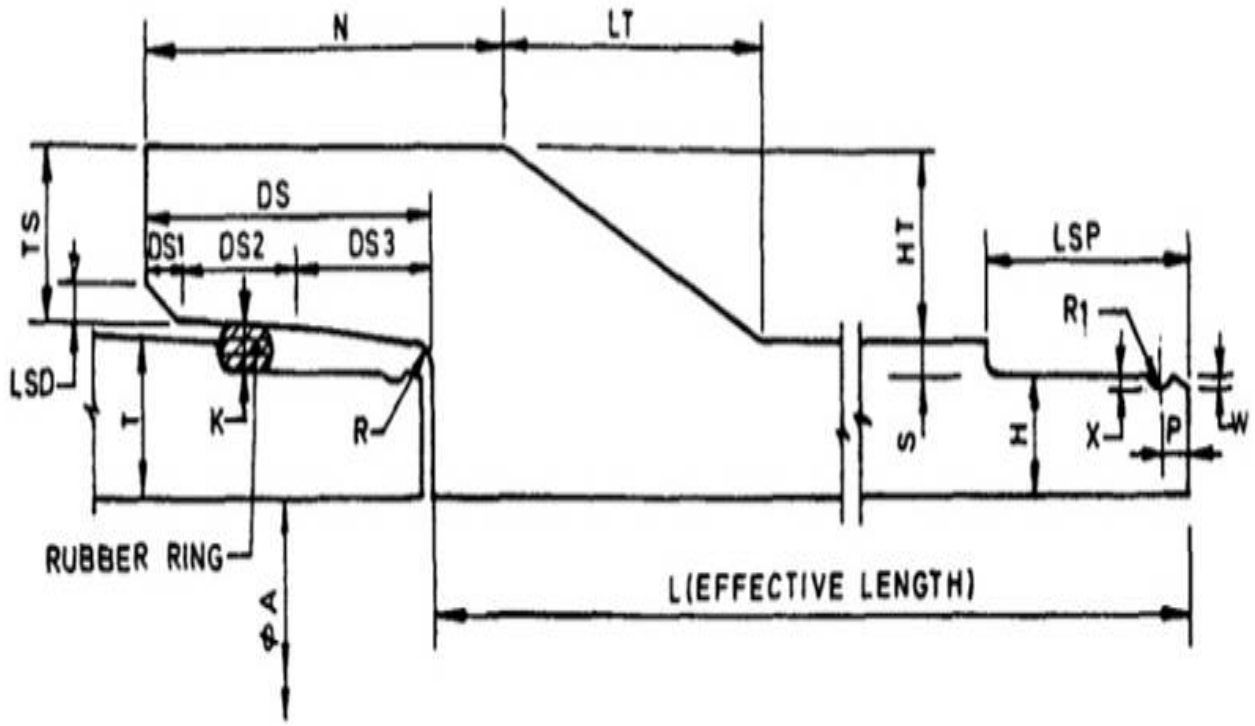
Internal Diameter of Pipes	Minimum Barrel Wall Thickness	Strength Test Requirement for Three Edge Bearing Test,
mm	Mm	kN Bearing Test, Ultimate
(1)	(2)	(3)
300	50	15.50
350	55	16.77
400	60	19.16
450	65	21.56
500	70	23.95
600	75	28.74
700	85	33.53
800	95	38.22
900	100	43.11
1000	115	47.90
1100	120	52.69
1200	125	57.48
1400	140	67.06
1600	165	76.64
1800	180	86.22
NOTE – Concrete for pipes shall have a minimum compressive strength of 45		

Table 3 Design and Strength Test Requirements of Concrete Pipes of Class NP3 – Reinforced Concrete, Medium Duty, Non – pressure Pipes made by vibrated casting process

(Clauses 2.4.5.1., 2.5.1.1, 2.1.2.1, 2.5.1.3, 2.5.2.2, 2.6.3.2 and 2.7.1;
and Table 7)

Internal Diameter of Pipes	Minimum Barrel Wall Thickness	Reinforcements			Strength Test Requirement for Three Edge Bearing Test	
		Longitudinal, Mild Steel or Hard Drawn Steel		Spirals, Hard Drawn Steel	Load to Produce	Ultimate Load
mm	mm	Minimum number	Kg / linear meter	kg / linear meter	0.25mm Crack kN/linear meter	kN / liner meter
(1)	(2)	(3)	(4)	(5)	(6)	(7)
300	50	8	0.78	1.53	15.50	23.25
350	55	8	0.78	1.58	16.77	25.16
400	60	8	0.78	1.60	19.16	28.74
450	65	8	0.78	1.90	21.56	32.34
500	70	8	0.78	2.0	23.95	35.93
600	75	8 or 6+6	1.18	2.20	28.74	43.11
700	85	8 or 6+6	1.18	4.87	33.53	50.30
800	95	8 or 6+6	2.66	6.87	38.32	57.48
900	100	6+6	2.66	11.55	43.11	64.67
1000	115	6+6	2.66	15.70	47.90	71.85
1100	120	6+6	2.66	19.61	52..69	79.00
1200	125	8+8	3.55	21.25	57.48	86.22
1400	140	8+8	3.55	30.00	67.06	100.60
1600	165	8+8	3.55	50.63	76.64	114.96
1800	180	12+12	9.36	64.19	86.22	129.33
2000	190	12+12	9.36	83.12	95.80	143.70
2200	210	12+12	9.36	105.53	105.40	158.07
2400	225	12+12	14.88	133.30	115.00	172.44

NOTE: - Concrete for pipes shall have a minimum compressive strength of 35 N/mm^2 at


N
LT
DS
DS1
DS2
DS3
TS
HT
LSP
R1
LSD
T
K
R
S
H
X
P
W
RUBBER RING
ϕA
L(EFFECTIVE LENGTH)

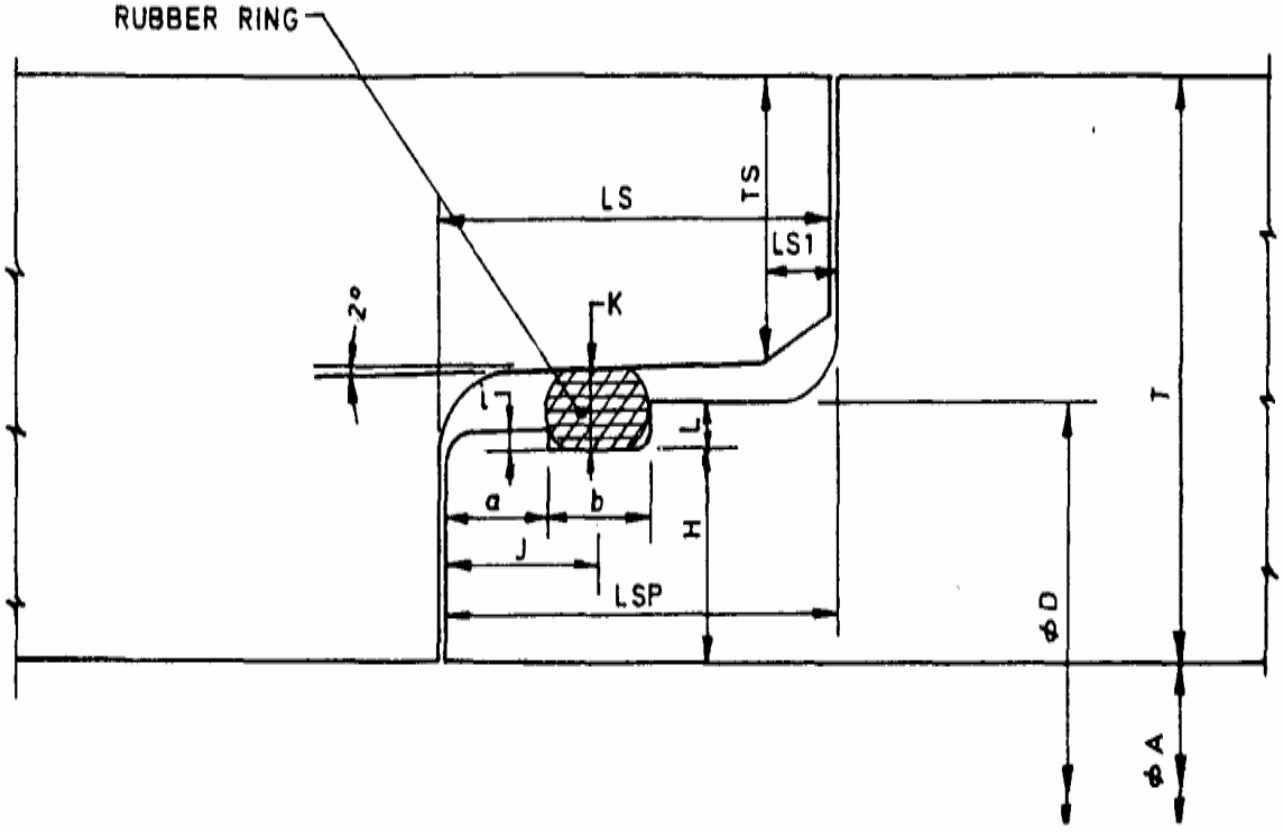

RUBBER RING
LS
TS
LS1
2°
K
L
a
b
J
H
LSP
T
ϕD
ϕA

Table 4 Spigot and Socket Dimensions of NP3 and NP4 Class Pipes (Rubber Ring Roll on Joint) from 80 to 900 mm

Diameter (Clauses 2.5.3 and 2.7.2)

All dimensions in millimeters

Pipe Diameter *ΦA*	Rubber Ring Chord Diameter	Rubber Ring Internal Diameter	T	TS	DS	DS1	DS2	DS3	R	LSD	K	N	LT	HT	LSP	P	S	H	X	W	R1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
80	11	102	25	32.5	70	8	28	34	3	5.5	6.5	95	84	34	50	7	5.5	19.5	1	1	5.5
100	11	120	25	32.5	70	8	28	34	3	5.5	6.5	95	84	34	50	7	5.5	19.5	1	1	5.5
150	11	170	25	32.5	70	8	28	34	3	5.5	6.5	95	84	34	50	7	5.5	19.5	1	1	5.5
200	11	230	30	38	83	11	38	34	5	6.5	6.5	113	97	39.5	50	7	5.5	24.5	1	1	5.5
225	11	255	30	38	83	11	38	34	5	6.5	6.5	113	97	39.5	50	7	5.5	24.5	1	1	5.5
250	11	275	30	38	83	11	38	34	5	6.5	6.5	113	97	39.5	50	7	5.5	24.5	1	1	5.5
300	12	340	40	51	90	12	42	36	6	7	7	130	130	53	55	7.5	6	34	1	1	6
350	16	435	75	75	120	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
400	16	480	75	75	120	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
450	16	525	75	75	120	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
500	16	570	75	75	120	16	56	48	8	10	10	158	135	78	72	10	8	67	2	2	8
600	20	675	85	85	150	20	70	60	10	12	12	193	153	88.5	90	12	10	75	2	2	10
700	20	765	85	85	150	20	70	60	10	12	12	193	153	88.5	90	12	10	75	2	2	10
800	20	875	95	95	150	20	70	60	10	12	12	197	171	98.5	90	12	10	85	2	2	10
900	20	970	100	100	150	20	70	60	10	12	12	200	180	103.5	90	12	10	90	2	2	10

Table 4*(Concluded)*

NOTES

1 Corners to be rounded off

2 The dimensions DS2, DS3, LSP, TS, T.H.S.HT and K shall conform to the values given in this table as there are critical dimensions. Other dimensions are for guidance only. The following tolerance shall apply on the critical dimensions.

Dimensions *Tolerances*

T and *HT* Same as that of barrel wall thickness given in 2.7.2

TS and *H* Half the tolerance on barrel wall thickness given in 2.7.2

DS2, DS3, LSP, K & S The tolerance, in mm, shall be given below :

Chord Diameter	***DS2***	***DS3***	***LSP***	***K***	***S***
11	± 2	± 3	± 4	± 1.25	± 0.75
12	± 2	± 3	± 4	± 1.25	± 0.75
16	±2.5	±3.5	± 5	± 2.00	± 1.25
20	± 3	± 4	±5.5	± 2.25	± 1.50
25	± 4	± 5	±7	± 3.25	± 2

Table 5 Spigot and Socket Dimensions of NP3 and NP4 Class Pipes from 1000 to 2600 mm Diameter (Rubber Ring Confined Joint)

(Clauses 5.3 and 7.2)

All dimension in millimeters.

Pipe Diameter Φ A	*Rubber Ring Chord Diameter*	*Rubber Ring Internal Diameter*	*T*	*TS*	*LS*	*LS1*	*K*	*LSP*	*a*	*b*	*J*	*H*	*I*	*L*	*Ø D*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*
1000	*20*	*920*	*115*	*58.0*	*114*	*20*	*13*	*114*	*25*	*28*	*39*	*42*	*4*	*9*	*1102*
1100	*20*	*1003*	*115*	*58.0*	*114*	*20*	*13*	*114*	*25*	*28*	*39*	*42*	*4*	*9*	*1202*
1200	*20*	*1095*	*120*	*60.5*	*114*	*20*	*13*	*114*	*25*	*28*	*39*	*44.5*	*4*	*9*	*1307*
1400	*25*	*1275*	*135*	*67.5*	*114*	*20*	*16*	*114*	*25*	*35*	*42.5*	*50*	*4*	*10*	*1520*
1600	*25*	*1445*	*140*	*72.5*	*114*	*25*	*16*	*114*	*25*	*35*	*42.5*	*50*	*4*	*10*	*1720*
1800	*25*	*1620*	*150*	*77.5*	*114*	*25*	*16*	*114*	*25*	*35*	*42.5*	*55*	*4*	*10*	*1930*
2000	*25*	*1810*	*170*	*87.5*	*114*	*25*	*16*	*114*	*25*	*35*	*42.5*	*55*	*4*	*10*	*2150*
2200	*25*	*1995*	*185*	*95.0*	*114*	*25*	*16*	*114*	*25*	*35*	*42.5*	*72.5*	*4*	*10*	*2365*
2400	*25*	*2180*	*200*	*102.5*	*114*	*25*	*16*	*114*	*25*	*35*	*42.5*	*80*	*4*	*10*	*2580*
2600	*25*	*2360*	*215*	*110.0*	*114*	*25*	*16*	*114*	*25*	*35*	*42.5*	*87.5*	*4*	*10*	*2795*

Table 5 (Concluded)

NOTES

1 Corners to be rouded off.

2 The dimensions LS, LSP, TS, T, H, L, b and K shall conform to the values given in this table as these are critical dimensions. Other dimensions are for guidance only. The following tolerances shall apply on the critical dimension.

Dimension Tolerances

LS and LSP ±7mm.

T Same as that of barrel wall thickness given in 2.7.2

H and TS Half the tolerance on barrel wall thickness given in 2.7.2

L ±0.5 mm.

b ±1mm. for 20mm. rubber ring chord diameter

K ±2.5mm. for 25mm. rubber ring chord diameter

Table 6

All dimension in millimeters.

di	*G*	*R*	*T*	D_o	L_t	L_b	d_s	D_m	L_m	I_s	*S*
300 ± 4	13	322	50	487 ± 4	112±4	105±2	370.07	386.07	49	50	8.00±1.0
350 ± 5	13	370	55	555 ± 4	112±4	105±2	425.07	441.07	49	50	8.00±1.0
400 ± 5	13	417	60	615 ± 4	112±4	105±2	480.07	496.07	49	50	8.00±1.0
450 ± 5	13	465	65	680 ± 4	112±4	105±2	536.07	552.07	49	50	8.00±1.0
500 ± 5	13	513	70	735 ± 4	112±4	105±2	590.07	606.07	49	50	8.00±1.0
600 ± 5	13	609	75	850 ± 4	112±4	105±2	700.07	716.07	49	50	8.00±1.0
700 ± 7	18	706	85	980 ± 5	141±5	132±3	808.00	830.00	61	65	11.00±1.2
800 ± 7	18	803	95	1100±5	141±5	132±3	924.00	946.00	61	65	11.00±1.2
900 ± 7	18	901	100	1215±5	141±5	132±3	1036.00	1058.00	61	65	11.00±1.2
1000 ± 7	18	998	115	1330±5	141±5	132±3	1148.00	1170.00	61	65	11.00±1.2
1100 ± 7	24	1097	120	1520±6	155±6	145±3	1262.00	1291.30	72	63	14.65±1.5
1200 ± 7	24	1195	125	1640±6	155±6	145±3	1372.48	1401.78	72	63	14.65±1.5
1400±10	24	1383	140	1870±6	155±6	145±3	1590.91	1620.21	72	63	14.65±1.5
1600±10	24	1578	165	2100±6	155±6	145±3	1814.91	1844.21	72	63	14.65±1.5
1800±10	24	1774	180	2340±6	155±6	145±3	2040.00	2069.30	72	63	14.65±1.5
2000±12	28	1850	190	2380±8	173±8	168±4	2126.80	2161.00	75	78	17.10±1.8
2200±12	28	2037	210	2620±8	173±8	168±4	2341.80	2376.00	75	78	17.10±1.8
2400±12	28	2224	225	2850±8	173±8	168±4	2556.80	2591.00	75	78	17.10±1.8

NOTES

1. G is the diameter of the unstretched rubber chord, hardness 40 + 5 IRHD, stretching 15 percent.
2. R is the inner diameter of the unstretched rubber ring.
3. T is the minimum barrel wall thickness.
4. d_x D_m L_m and L_s are nominal diameter

Table 7 Weight of Spirals (Hard Drawn Steel) in Socket of R/R Joint RCC Pipes of Different Classes (kg/Number) (Clause 2.5.3)

Internal Diameter of Pipes	NP2 Class	NP3 Class	NP4 Class	P1 Class	P2 Class	P3 Class
(1)	(2)	(3)	(4)	(5)	(6)	(7)
80	0.08	0.08	0.08	0.08	0.08	0.08
100	0.09	0.09	0.09	0.09	0.09	0.09
150	0.12	0.12	0.12	0.12	0.12	0.15
200	0.14	0.14	0.21	0.14	0.21	0.35
225	0.15	0.15	0.26	0.15	0.26	0.43
250	0.16	0.16	0.31	0.16	0.31	0.51
300	0.45	0.45	0.53	0.45	0.53	0.84
350	0.51	0.64	0.64	0.51	0.74	1.24
400	0.56	0.71	0.71	0.56	0.99	1.66
450	0.63	0.76	0.76	0.63	1.23	2.26
500	0.68	0.87	1.08	0.68	1.57	2.85
600	0.81	1.00	2.12	1.52	2.88	4.74
700	0.92	2.16	3.02	1.79	3.96	6.79
800	1.14	2.87	4.67	2.04	6.28	9.99
900	1.50	4.06	6.03	2.63	8.29	-
1000	1.91	-	-	3.33	11.29	-
1100	2.34	-	-	4.08	-	-
1200	2.80	-	-	4.90	-	-
1400	3.82	-	-	-	-	-
1600	5.64	-	-	-	-	-
1800	7.25	-	-	-	-	-
2000	11.68	-	-	-	-	-
2200	12.88	-	-	-	-	-

NOTES

1. Longitudinal reinforcement shall be proportional to the length of socket cage as given in Table 1 & 2.

2. If mild steel is used for spiral reinforcement, the weight specified above shall be increased to 140/125.

Table 8 Design Requirements of Reinforced Concrete

Collars for Pipes of Class NP3 and

NP4 (*Clauses* 2.5.3 *and* 2.7.1)

Nominal Internal Diameter of Pipe	Collar Dimensions			Reinforcements		
	Minimum Caulking Space	Minimum Thickness	Minimum Length	Longitudinal, Mild Steel or Hard Drawn Steel		Spiral Hard-Drawn Steel
mm (1)	mm (2)	mm (3)	mm (4)	No. (5)	kg/collar (6)	kg/collar (7)
90	13	25	150	6	0.08	0.07
100	13	25	150	6	0.08	0.08
150	13	25	150	6	0.08	0.10
200	13	25	150	6	0.08	0.12
225	13	25	150	6	0.08	0.14
250	13	25	150	6	0.08	0.16
300	16	30	150	8	0.11	0.22
350	19	35	200	8	0.15	0.40
400	19	35	200	8	0.15	0.50
450	19	35	200	8	0.15	0.60
500	19	40	200	8	0.15	0.70
600	19	40	200	8	0.23	1.05
700	19	45	200	8	0.23	1.85
800	19	50	200	8	0.23	2.05
900	19	55	200	8	0.33	2.25
1000	19	60	200	8	0.33	3.09
1100	19	65	200	8	0.33	4.11
1200	19	75	200	12	0.50	5.08
1400	19	80	200	12 or 8+8	0.67	6.55
1600	19	90	200	12 or 8+8	0.67	9.00
1800	19	100	200	12+12	1.00	12.15
2000	19	110	200	12+12	1.00	13.30

2.9 TESTING OF RCC NP3 PIPE

All the specifications mentioned in the I.S Code 3597-1998 & its latest revised addition shall be strictly followed.

SCOPE

2.9 This Standard covers methods for carrying out the following tests on concrete pipes, both reinforced concrete and prestressed concrete and of pressure and non pressure types to evaluate the properties stipulated in the relevant Indian Standards:

a) Three-edge bearing test,
b) Absorption test,
c) Hydrostatic test,
d) Permeability test, and
e) Straightness test.

2.10 INSPECTION

2.10.1 The quality of all materials, process of manufacture and the finished pipes shall be subject to inspection and approval by the purchaser. If the pipe is tested for three-edge bearing or absorption ,inspection of the reinforcement shall be made on the pipe sections used for those tests

2.10.2 The pipes & shall be inspected by Third Party Inspection Agency, the cost of which is to be borne by contractor. The Third Party Inspection Agency will be from any Government undertaking agency like RITES, EIL, CEIL, MACON, WAPCOS, SGS etc approved by Gujarat Water Supply & Sewerage Board**.**

2.11 GENERAL PRECAUTION

2.11.1 The test specimens shall not have been exposed to a temperature below 4^{o} C for 24 hours immediately preceding the test and shall be free from all visible moisture. The specimens shall be inspected and any specimen with visible flaws shall be discarded

2.11.2 If any test specimen fails because of mechanical reasons, such as failure of testing equipment or improper specimen preparation, it shall be discarded and another specimen taken.

2.12 SELECTION OF TEST SPECIMENS

In addition to the requirements specified in this standard, the number of test specimens and the method of their selection shall be in accordance with the specification for type of pipe being tested.

2.13 THREE-EDGE BEARING TEST

2.13.1 GENERAL

Three-edge bearing test shall be performed by the method given in 2.13.2. The pipe shall be surface dry when tested. The test specimen shall be tested in a machine so designed that a crushing force may be exerted in a true vertical plane through one diameter and extending the full length of the pipe but excluding the sockets, if any.

2.13.2. Three-Edge Bearing Method

2.13.2.1 Apparatus

2.13.2.2 Testing machine

Any mechanical or hand-powered device may be used in which the head that applies the load moves at such a speed as to increase the load at a uniform rate of approximately 20 percent of the expected crushing load per linear meter per minute. The loading device shall be calibrated within an accuracy of ±2 percent. The testing machine used for the load tests should produce a uniform deflection throughout, that the distribution of the test load along the length of the barrel of the pipe will not be appreciably affected by the deformation or yielding of any part of the machine during the application of the load.

2.13.2.3 Lower bearing block

The lower bearing block (see Fig 1) shall consist of two hardwood or hard rubber strips fastened to a wooden or steel beam or direct to a concrete base, which shall provide sufficient rigidity to permit application of maximum load without appreciable deflection. Wooden or rubber strips shall be straight, have a cross-section of not less than 50mm in width and not less than 25mm nor more than 40mm in height and shall have the top inside corners rounded to a radius of approximately 15mm.The interior vertical sides of the strips shall be parallel and spaced apart a distance of not more than $1/12^{th}$ of the specimen diameter but in no case less than 25mm.The bearing faces of the bottom strips shall not vary from a straight line vertically or horizontally by more than 1mm in 375 mm of the length under load.

About 6 mm thick hard rubber or felt should be placed/fixed at the lower face of the upper wooden block which shall come in contact with the surface of the pipe.

2.13.2.4 Upper bearing block

The upper bearing shall be a rigid hardwood block or a block with hard rubber facing at least 150 mm x 150 mm in cross-section. The wood block shall be free of knots and shall be straight and true from end to end. It shall be fastened to a steel or wood faced steel beam of such dimensions that deflection under maximum load will not be appreciable. The bearing face of the upper bearing block shall not deviate from a straight line by more than 1 mm in 375 mm of length under load.

2.13.2.5 The equipment shall be so designated that the load will be distributed about the center of the overall length of the pipe(see Fig. 1).The load may be applied either at a single point or at multiple points dependent on the length of the

pipe being tested and the rigidity of the test frame.

NOTE- Multiple points of load applicable to the top bearing will permit use of lighter beams without appreciable deflection.

2.13.2.6 Crack measuring gauge

The crack measuring gauge shall be made from 0.25 mm thick strip and shall be of a shape as shown in fig 2.

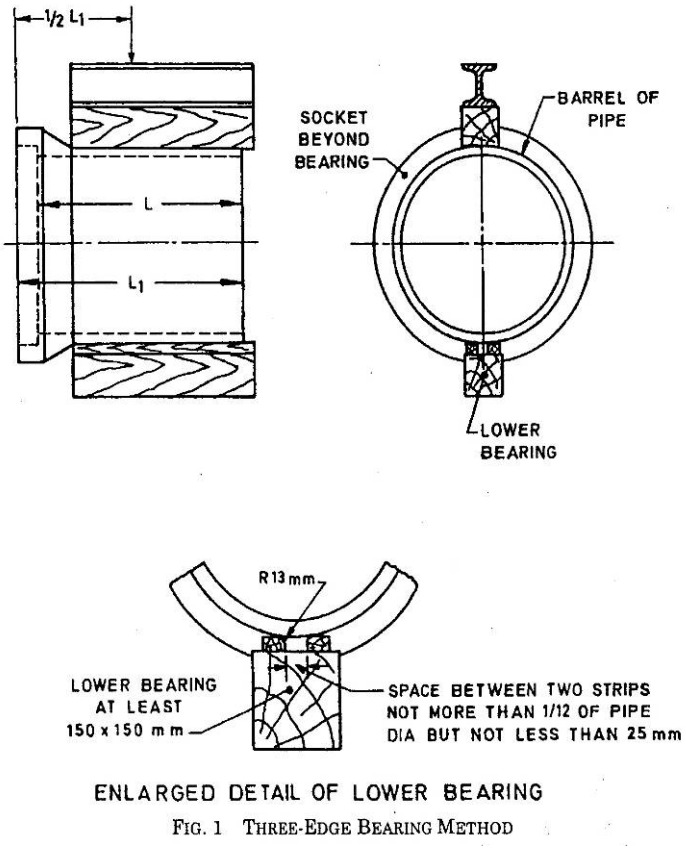


FIG. 1 THREE-EDGE BEARING METHOD

2.13.3 Procedure

2.13.3.1 The specimen shall be placed on the two bottom bearing strips in such a manner that the pipe tests firmly and with the most uniform possible bearing on each strip for the full length of the pipes less the socket portion ,if any.

If mutually agreed upon by the manufacturer and the purchaser prior to the test , a fillet of plaster of Paris not exceeding 25 mm in thickness may be cast on the surface of the upper and lower bearing before the pipe is placed. The width of the fillet cap, top or bottom, shall be not more than 25mm per 300mm diameter, but in no case less than 25 mm.

2.13.3.2 Each end of the pipe at a point mid-way between the lower bearing strips shall be marked and then diametrically

opposite points thereof shall be established. The top bearing block shall be so placed that it contacts the two ends of the pipe at this marks. After placing the specimen in the machine on the bottom strips, the top bearing shall be symmetrically aligned in the testing machine. Load shall be applied at the rate indicated in 2.13.2.2. Until either the formation of 0.25 mm wide crack or ultimate strength load, as may be specified, has been reached.

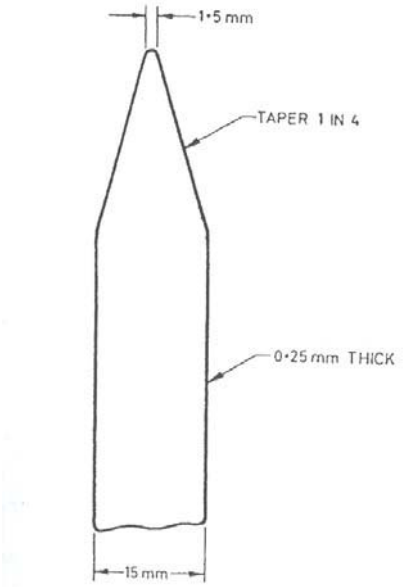


FIG. 2 GAUGE LEAF FOR MEASURING CRACKS

If both the 0.25 mm crack and ultimate load are required, the specified rate of loading need not be maintained after the load at 0.25 mm crack has been determined.

2.13.3.3 The 0.25 mm crack load is the maximum load applied to the pipe before a crack having a width of 0.25 mm measured at close intervals, occurs throughout a length of 300 mm or more. The crack shall be considered 0.25mm in width when the point of the measuring gauge described in 2.13.2.6 penetrates 1.5 mm at close intervals throughout the specified distance of 300 mm. The ultimate load will be reached when the pipe will sustain no greater load.

2.13.4 Calculation

The crushing strength in Newton per linear meter of pipe shall be calculated by dividing the total load on the specimen by the nominal laying length. Effective length of the pipe shall be taken

as the nominal laying length of the specimen. In case of spigot and socket ended pipes, the effective length shall be equal to the overall length minus the depth of socket(see Fig 3) and in case of collar and flush jointed pipes, the effective length shall be equal to the overall length.

NOTE - In most machines the total load will include the dead weight of the top bearing plus the load applied by the loading apparatus.

2.14 ABSORPTION TEST

2.14.1 TEST SPECIMEN

Each specimen selected at random shall have a square area of 100 cm2±10 percent of the length of the pipe as measured on surface of the pipe, and a thickness equal to the full depth of the pipe thickness and shall be free from visible cracks.

2.14.2 Procedure

2.14.2.1 Drying Specimens

Specimens shall be dried in a mechanical convection oven at a temperature of 1050C to 1150C until two successive weighings at intervals of not less than 8 h show an increment of loss not greater than 0.1 percent of the mass of the specimen. The drying time shall be not less than 36 h. the dry mass of the specimen shall be the mass after the final drying determined at ambient temperature.

2.14.2.2 After drying and weighing as specified in 2.14.2.1,the specimens shall be immersed in clean water at room temperature for the specified period. The specimens shall then be removed from the water and allowed to drain for not more than one minute. The superficial water shall then be removed by absorbent cloth or paper and the specimens weighted immediately.

2.14.2.3 The least count/accuracy of the weighing balance shall be 0.1 g which the test specimen shall be weighed.

2.14.2.4 Calculation and report

The increase in mass of the specimen over its dry mass shall be taken as the absorption of the specimen and shall be expressed as a percentage of the dry mass. The results shall be reported separately for each specimen.

2.15 HYDROSTATIC TEST

2.15.1 Test Specimen

The specimens for determination of leakage under interval hydrostatic pressure shall be sound and full size pipe. If the pipes are tested after storing in adverse weather condition presoaking shall be submerged in water or sprayed with water for a period not less than 6 hours prior to testing and excess water removed.

2.15.2 Procedure

2.15.2.1 The pipe shall be supported in such a way so that the longitudinal axis is approximately horizontal and the exterior surface excepting the supports can be examined readily.

2.15.2.2 The equipment for making the test shall be such that the specimen under test can be filled with water to the exclusion of air and subjected to the required hydrostatic pressure. Apply hydrostatic pressure to the whole pipe including the portion of socket and rebated joints, that is, subjected to pressure in 'as laid' condition.

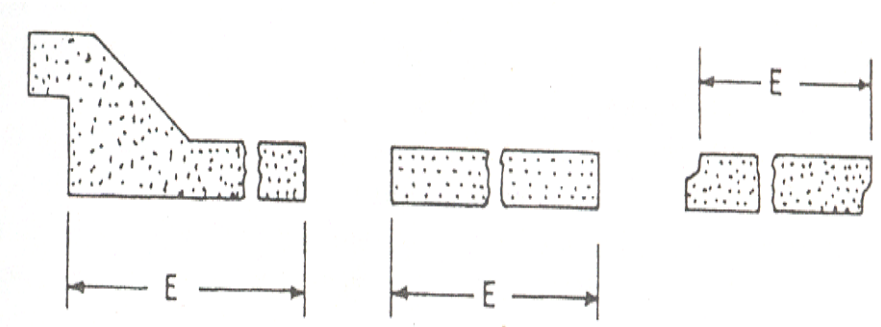


FIG. 3 ILLUSTRATING EFFECTIVE LENGTH 'E' OF PIPES

2.15.2.3 The specimen shall be filled with water and the air expelled. Pressure shall be applied at a gradual rate until the specified test pressure is reached ,or beads of water on the pipe surface is seen , whichever occurs first.

2.15.2.4 Pressure shall be maintained for 1 min + 30 s for each 10mm of wall thickness (for precast concrete pipes wall thickness shall be full barrel wall thickness, whereas it shall be core thickness, in case of prestressed concrete pipe) or for twice that entire period if the application of pressure resulted in

the formation of beads of water on the pipe surface.

2.15.2.5 At the end of the holding period, the pressure shall be released immediately if the test pressure has been maintained. If the beads of the water have not grown or run the pressure shall be increased slowly until the test pressure is reached or the beads of water grow or run (whichever occurs first).

2.15.2.6 If the test pressure has been reached without the beads of water growing or running , the test pressure shall be maintained constant for 1 min + 30 s for each 10 mm of wall thickness (for precast concrete pipes wall thickness shall be full barrel wall thickness ,whereas it shall be core thickness , in case of prestressed concrete pipe).At the end of the holding period the pressure shall be released immediately.

After releasing the pressure, the test pipe shall be drained completely.

2.16 PERMEABILITY TEST

2.16.1 Prestressed Concrete pipes and Precast Concrete Pipes

This test shall be done on outside surface of the pipe. No additional treatment of any type shall be done on the pipe before permeability test is carried out. For Prestressed Concrete Pipe, the test shall be conducted at 3 places on coating and for Precast Concrete pipe at 2 places simultaneously, immediately after curing is completed (see Fig 4). In case this is done later, the pipe shall be kept wet for 48 hours prior to test. For plain/flush ended precast pipes, it shall be carried out about 300mm away from both ends.

2.16.1.1 Procedure

The dry surface of the pipe shall be scrapped by wire brush and loose particles, if any, removed. Sealant shall then be applied to the lower portion of the cup and cup shall be pressed on the pipe. After hardening of sealant, water shall be filled in cup with wash bottle. The glass tube with rubber cork shall then be fixed in the cup as shown in fig. Water in the tube shall then be filled using wash bottle and air shall be allowed to escape during filling. Precaution shall be taken , so that water does not leak either from cup ends or from the rubber stopper.

2.16.1.2 Initial Absorption

Water shall be filled up to zero mark and reading shall be taken at every half hour interval up to two hours. The drop in

water level in the stand pipe at the end of two hours in the initial absorption.

2.16.1.3 Final Permeability

Fill the water in the stand pipe again up to zero mark and take the reading at one hour interval up to 4 h.The absorption in the fourth hour, that is , difference between fourth and third hour reading is the final permeability. The average of tests conducted at three places for prestressed Concrete pipe and two places for precast concrete pipe shall be expressed in cm^3 as final permeability.

Criteria for acceptance is the final permeability.

2.16 STRAIGHTNESS TEST

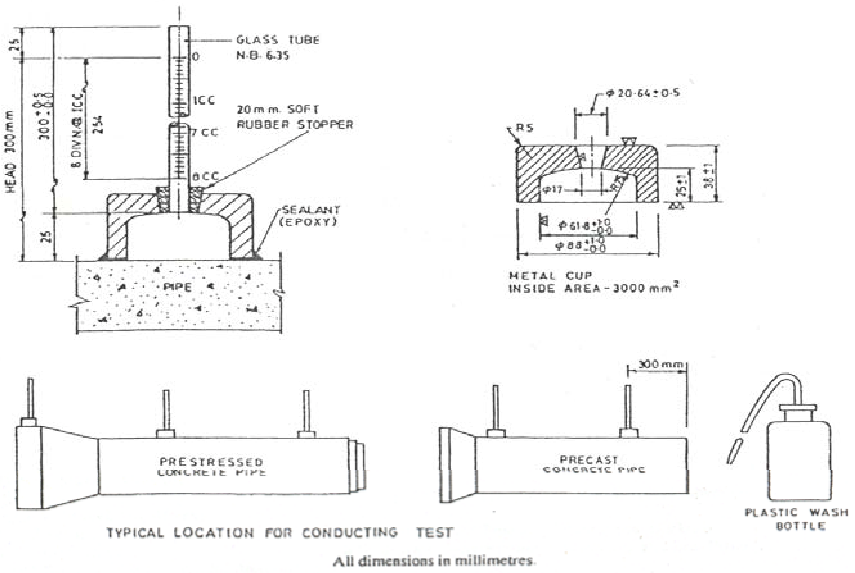
2.16.1 Procedure

2.16.1.1 A rigid straight edge, made into a gauge of the form and dimension shown in (fig 5) shall be placed in the bore of the pipe with edge x in contact with the pipe internal surface and/or the line parallel to the pipe axis. Hold the plane of the gauge in a radial plane.

2.16.2. If both ends of the gauge , when so placed are in contact with the internal surface of the pipe ,the deviation from straightness is excessive. If this condition occurs at any one of four different position of the gauge, approximately equally spaced around the pipe circumference the pipe does not comply with the particular requirement.

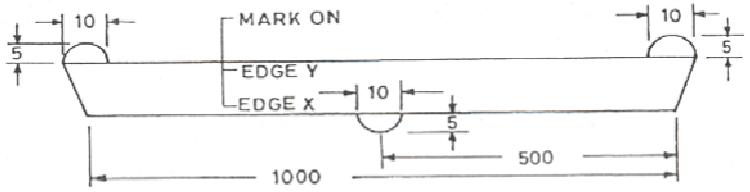
2.16.3 If both ends of the gauge , when used as described in 2.16.1.1 are not in contact with the internal surface of the pipe at both ends, the gauge shall be reversed so that edge y, placed as in 2.16.1.1 is adjusted to the internal surface of the pipe. If the two studs in edge y cannot be made to touch the surface of the pipe simultaneously, The deviation from the straightness is excessive.

If this condition occurs at any four position of the gauge the pipe does not conform with this particular requirement.



All dimensions in millimetres.

FIG. 4 METHOD FOR PERMEABILITY TESTING OF CONCRETE PIPES



All dimensions in millimetres.

FIG. 5 STRAIGHTNESS TEST

3 PROVIDING & SUPPLYING RCC PRE-CAST M.H. FRAME & COVER & HOUSE CONNECTION CHAMBER FRAME AND COVER.

i) GENERAL :-

The R.C.C. pre-cast manhole cover shall confirm to IS:12592 / 2002 or its latest version and as per detailed Drawing attached herewith.

ii) SHAPES & DIMENSIONS :-

Shapes :- The shapes of pre-cast M.H. covers shall be circular only and 10 and 20 MT capacity for MHS and 5MT for HC chambers.

ii.a) DIMENSION & TOLERANCES: - length, breadth & diameter of pre-cast concrete manhole covers shall be such that the maximum clearance at top between the frame & the cover shall be 5mm. The minimum thickness of HD, MD & LD Covers shall be 90, 70 & 60 mm respectively.

ii.a.i) **GRADES AND TYPES:**

Manhole covers and frames shall be of the following four grades and types:

Grade	Grade Designation	Type / Shape of Cover
Light Duty	LD-5	Rectangular, Square, Circular
Medium Duty	MD-10	Rectangular, Circular
Heavy Duty	HD-20	Rectangular (Scrapper Manhole), Square, Circular
Extra Heavy Duty	EHD-35	Rectangular (Scrapper Manhole), Square and Circular

ii.a.ii) Recommended locations for placement of different grades and types/ shapes of manhole covers and frames are as given in ii.a.ii.a to ii.a.ii.c.

ii.a.ii.a) ***LD-5 Rectangular, Square or Circular Types***

Suitable for use within residential and institutional complexes / areas with pedestrian but occasional light motor vehicle traffic. These are also used for 'Inspection chambers'.

ii.a.ii.b) ***MD 10 Circular or Rectangular Types***

Suitable for use in service lanes / roads, on pavements for use under medium duty vehicular traffic including for car parking areas.

ii.a.ii.c) ***HD-20 Circular, Lamphole, Square or Rectangular (Scrapper Manhole) Types.***

Suitable for use in institutional / commercial areas / carriageways / city trunk roads/ bus terminals with heavy duty vehicular traffic of wheel load between 50 to 100 kN, like buses, trucks and parking areas and where the manhole chambers are located in between the pavement and the middle of the road.

iii) SAMPLE:- The contractor shall get approved sample of R.C.C. pre-cast M.H. Cover & frame & house connection chamber frame and covers and shall supply materials as per approved samples from approved factory.

iv) TESTS: - The contractor / manufacturer at his own cost shall give all the required tests of RCC manhole cover and frame and all the testing facilities shall be kept open for the officers of RMC / Engineer-In-Charge at his factory.

v) RESPONSIBILITY: - The contractor shall be responsible for the materials for a period of defect liability period. After payment of

final bill of the work and during this period he will be responsible for defects in the materials & for road accidents due to defective M.H. / H.C.C. Frame & covers. He shall have to replace defective materials during this period at his cost.

vi) LETTER OF COMMITMENT:- Contractor shall have to provide the letter of commitment in favour of Rajkot Municipal Corporation from the standard manufacturer of RCC Pre-cast M.H. / H.C.C. frame and covers to supply the desired quantity given in the e-Tender document in time (i.e. well in advance not to remain any manhole or chamber open at site of work after construction) with all quality control. Manufacturer shall have a long experience for preparing the RCC Pre-cast M.H. / H.C.C. frame and covers of all types i.e. HD, MD and LD as per the relevant I.S. Code of practice. A supply Schedule shall be submitted immediately on receipt of Work Order.

vii) R.C.C. MANHOLE COVERS AND FRAMES, FOLLOWING POINTS SHOULD BE CONSIDERED

Sr.	Particulars	Heavy duty manhole covers and frames	Medium duty manhole covers and frames	Light duty manhole covers and frames
1	Clear opening of the manhole	500 mm dia.	500 mm dia.	500 mm dia.
2	Type of the covers & frames	Circular	Circular	Circular

The Rate shall be paid per Number basis / pair basis.

MATERIAL:

3.1. Cement

Cement used for the manufacture of precast concrete manhole covers shall conform to IS:269 or IS:455 or IS:1489 (Part-1) or IS:1489 (Part-2) or IS:6909 or IS:8041 or IS:8043 or IS:8112 or IS:12330 or IS:12269.

3.2. Aggregates

The aggregates used shall be well graded. The nominal maximum size of coarse aggregate shall not exceed 20 mm. The aggregates shall be clean and free from deleterious matter and shall conform to the requirements of IS:383.

3.3 Concrete

The mix proportions of concrete shall be determined by the manufacturer and shall be such as will produce a dense concrete without voids, honey combs, etc (See IS:456). The minimum cement content in the concrete shall be 360 kg/m^3, with a maximum water cement ratio of 0.45. Concrete weaker than grade M30 shall not be used. Compaction of concrete shall be done by machine vibration.

3.4. Reinforcement

The reinforcement steel shall conform to Grade A of IS 2062 or IS:432 (Part-1) or IS 432 (Part-2) or IS 1786.

3.4.1 Reinforcement shall be clean and free from loose mill scale, loose rust, mud, oil, grease or any other coating which may reduce or destroy the bond between concrete and steel. A slight film of rust may not be regarded as harmful but steel shall not be visibly pitted by rust.

3.5 Steel Fibers

The diameter / equivalent diameter of steel fibres where used, shall not be greater than 0.75 mm. The aspect ratio of the fibers (ratio of the length of the fibre to its diameter / equivalent diameter) shall be in the range of 50 to 80. The minimum volume of fibres shall be 0.5 percent of the volume of concrete.

In case of propriety fibres, manufacturer's recommendations shall be taken into account.

3.6. Admixtures

Where admixtures are used, they shall conform to IS 9103.

3.7. Water

The water used shall be free from matter harmful to concrete or reinforcement or matter likely to cause efflorescence in the units and shall conform to the requirements of IS 456.

3.8 SHAPES AND DIMENSIONS

3.8.1 Shapes

The pre-cast concrete manhole covers and frames shall be of any shape given in (ii.a.i)

3.8.2 Dimensions And Tolerances

The dimensions and tolerances on dimensions of frames shall be as shown in Table-1 but outside dimensions of cover at top shall match with the corresponding frame so that the maximum clearance at bottom between the frame and the cover all round the periphery is not more than 5 mm and the top surface of the frame and cover is in level within a tolerance of ±5 mm. For facility of removing the cover from the frame, suitable taper matching with taper given for the frame shall be provided to the periphery of the cover (See Fig.1)

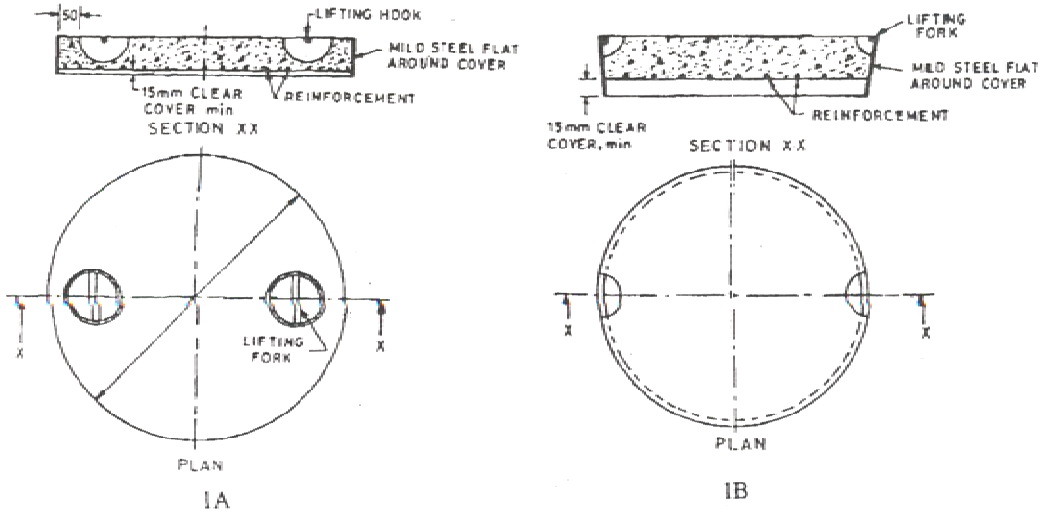


Fig.1 - Typical Illustration of Circular Precast Concrete Manhole Cover
All dimensions in millimeters

3.9 DESIGN:

The reinforced concrete manhole cover and frame shall be designed in accordance with the provisions of IS:456. If required by the purchaser, the manufacturer shall furnish the specification and drawings principle given in IS:456

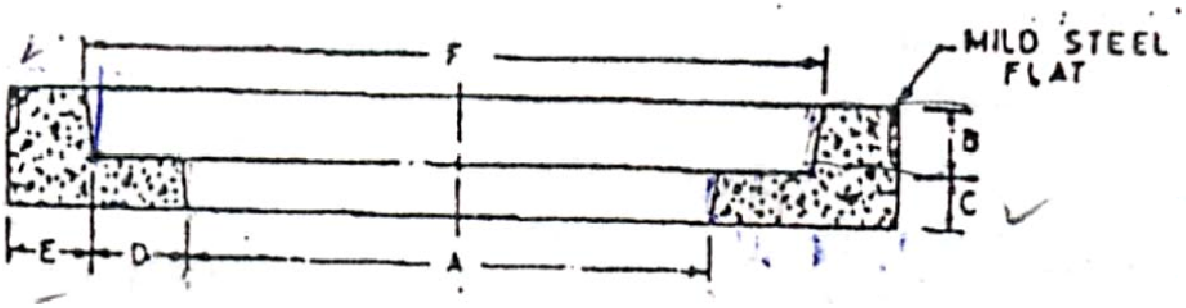
3.10 MANUFACTURER

3.10.1 Concrete SHALL BE MIXED IN A MECHANICAL Mixer. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour nad consistency. If steel fibres are used in addition to reinforcement, it shall be conformed to requirements given in 3.5.

3.10.2 Placing and Compaction

The reinforcement shall be placed in proper position in an appropriate mould coated with a thin layer of mould oil in case of frames and within the protective sheet (See 3.12.1) in case of covers. Concrete shall be filled to slightly overfill and compacted by vibration and struck off level with a trowel.

Table-1 - Dimensions of Frame
(Clause 3.8.2)
All dimensions in millimeters



Grade Designation	Description	Clear Opening in Frame	B	C	D	E	F
1	2	3	4	5	6	7	8
LD-5	Light Duty Rectangular	450 x 450	60	50	50	50	566
LD-5	Light Duty Square	450 x450 400 x400	50 50	50 50	50 50	50 50	566 x 566 516 x 516
LD-5	Light Duty Circular	370 560 500 450	50 50 50 50	50 50 50 50	50 50 50 50	50 50 50 50	486 676 616 566
MD-10	Medium Duty Rectangular	450 x 600	70	50	50	50	570 x 720
MD-10	Medium Duty Circular	450 500 560 600	70 70 70 70	50 50 50 50	50 50 50 50	50 50 50 50	570 620 680 720
HD-20	Heavy Duty Rectangular (Scrapper)	900 x 450	100	75	75	75	1080x 630
HD-20	Heavy Duty Square	560 x 560	100	75	75	75	740 x 740
HD-20	Heavy Duty Circular	450 500 560 600	90 90 90 90	75 75 75 75	75 75 75 75	75 75 75 75	630 680 740 780
HD-20	Heavy Duty Lamphole	350	100	75	75	75	530

Grade Designation	Description	Clear Opening in Frame	B	C	D	E	F
EHD-35	Extra Heavy Duty Rectangular	900 x 560	100	75	75	75	1078x 738
EHD-35	Extra Heavy Duty Square	560 x 560	100	75	75	75	738 x 738
EHD-35	Extra Heavy Duty Circular	450 500 560 600	100 100 100 100	75 75 75 75	75 75 75 75	75 75 75 75	628 678 738 778

NOTES:

1. Tolerance on C shall be ± 5 mm, tolerance on A, B, D and E shall be +5mm 0 mm

2. For facility of removing the manhole cover suitable upward taper not more than 5^0 may be provided to the inner periphery of the frame.

3. If required for the removal of the moulds suitable taper not more than 5^0 can be given at the lower inner periphery of the frame (See figure).

3.10.2.1 Use of needle vibrators for compacting the wet concrete mix containing fibres is not recommended since the holes left by the vibrator in the wet mix may not close after its removal owing to the interlocking of the fibres with the mix. Compaction by means of shutter or form or table vibrators is recommended. In case of extra heavy duty and heavy duty cover and frame, compaction by means of pressure-cum-vibration technique may also be employed so as to achieve dense and strong concrete.

3.10.2.2 Clear cover to reinforcement shall be not less than 15 mm.

3.10.2.3 After demoulding, cover and frame shall be protected until they are sufficiently hardened to permit handling without damage.

3.11 Curing

3.11.1.1 The hardened concrete manhole cover and frame shall be placed in a curing water tank. The period of curing shall be as given in IS:456.

3.11.1.2 Steam curing of manhole cover and frames may be adopted instead of method specified in 3.11.1.1 followed by normal curing for 7 days provided the requirements of pressure or non-pressure steam curing are fulfilled and the

manhole cover and frames meet the requirements specified in this standard.

3.12 Edge Protection and Finishing

3.12.1 Cover

To prevent any possible damage from corrosion of reinforcing steel, the underside of the covers shall be treated with anticorrosive paint. The top surface of the covers shall be given a chequered finish.

In order to protect the edges of the covers from possible damage at the time of lifting and handling, it is necessary that the manhole covers shall be cast with a protective mild steel sheet of minimum 2 mm thickness around the periphery of the covers. Exposed surface of mild steel sheet shall be given suitable treatment with anti- corrosive paint or coating.

3.12.2 Suitable arrangement may be made for fixing the manhole cover and frame in position on the manholes by mutual agreement between the manufacturer and the purchaser.

3.12.3 The manufacture of manhole cover and frame shall be such as to ensure the compatibility of their seatings. For classes HD 20 and HD
35, these seatings shall be manufactured in such a way as to ensure stability and quietness in use. This may be achieved by grinding the contact surface, if needed.

3.13 LIFTING HOOKS:

The minimum diameter of mild steel rod used as lifting device shall be 12 mm for light and medium duty covers and 16 mm for heavy and extra heavy duty covers. The lifting device shall be protected from corrosion by hot dip galvanizing or any other suitable means approved by the purchaser or shall be made of naturally corrosion resistant metal rods.
The lifting arrangement shall be as agreed between the manufacturer and the purchaser. Typical arrangements of lifting devices are shown in Fig.1A and 1B.

3.14 PHYSICAL REQUIREMENTS:

3.14.1 General

All the covers and frames shall be sound and free from cracks and other defects which interferes with the proper placing of the unit or impair the strength or performance of the units. Minor chippings resulting from the customary method of handling and transportation shall not be deemed ground for rejection

3.14.2 Dimensions

The dimensions of the cover and frame shall be as specified in 3.8; the overall dimensions of the units shall be measured in accordance with Annexure-B.

3.14.3 Load Test

The breaking load of individual units when tested in accordance with the method described in Annex-C shall be not less than the values specified in Table-2. Also, the permanent set shall not exceed the requirement given in Annexure-C.

Table-2 - Test Load and Diameter of Block
(Clause 3.14.3, 4.18.3 and C.1.1)

Grade of Cover	Type	Load kN	Diameter of Block mm
1	2	3	4
LD-5	Rectangular, Square or	50	300
MD-10	Rectangular, or Circular	100	300
HD-20	Rectangular, Square or	200	300
EHD-35	Rectangular, Square or	350	300

3.15 TESTS

Tests shall be conducted on samples of covers and frames selected according to the sampling procedure given in 3.16, to ensure conformity with the physical requirements laid down in 3.14.

3.16 SAMPLING AND INSPECTION

3.16.1 Scale of Sampling

3.16.1.1 Lot

In any consignment, 500 precast concrete manhole covers and frames or a part thereof the same dimensions and belonging to the same batch of manufacture, shall be grouped together to constitute a lot.

3.16.1.2 For ascertaining the conformity of the materials in

the lot to the requirements of this specification, samples shall be tested from each lot separately.

3.16.1.3 The number of covers and frames to be selected from the lot shall depend on the size of the lot and shall be according to Table-3

Table 3 - Scale of Sampling and Permissible Number of Defectives
(Clause 3.16.1.3, 4.17.2. and 4.18.2)

No.of covers or frames in the lot.	Dimensional Requirements		Number of samples for load test on cover only
	Sample size	Acceptance Number	
1	2	3	4
Upto 100	10	1	2
101 to 200	15	1	3
201 to 300	20	2	4
301 to 500	30	3	5

Note: If the number of covers in the lot is 20 or less, the number of samples for load test shall be decided by mutual agreement between the purchaser and the manufacturer.

3.16.1.4 The R.C.C. precast manhole frames & covers shall be inspected by Third Party Inspection Agency, the cost of which is to be borne by contractor. The Third Party Inspection Agency will be from any Government undertaking agency like RITES, EIL, CEIL, MACON, WAPCOS, SGS etc approved by Gujarat Water Supply & Sewerage Board.

3.16.2 Sampling Covers and Frames in Motion

Whenever practicable, samples of covers and frames shall be taken when the units are being moved as in the case of loading, unloading, etc. The batch from where the samples are to be drawn shall be divided into a number of convenient portions such that when one sample is drawn from each of these portions, the minimum number of units specified under 3.16.1.3, is provided.

3.16.3 Sampling Covers and Frames from a Stack

The number of covers and frames required for the test shall be taken at random from across the top of the stacks, the sides accessible and from the interior of the stacks by opening trenches from the top.

3.17 Number of Tests

3.17.1 All the covers and frames selected according to 3.16.1.3, shall be checked for dimensions (See 3.14.2) and inspected

for visual defects (See 3.14.1).

3.17.2 The number of covers to be subjected to load test shall be according to col 4 of Table-3.

3.18 CRITERIA FOR CONFORMITY

3.18.1 The lot shall be considered as conforming to the requirements of the specification conditions mentioned in 4.18.2 and 4.18.3 are satisfied.

3.18.2 The number of covers and frames with dimensions outside the tolerance limit and / or with visual defects among those inspected shall be less than or equal to the corresponding acceptance number given in col 3 of Table-3.

3.18.3 For load test no value shall be less than the load specified in Table-2.

3.19 MANUFACTURER'S CERTIFICATE

The manufacturer shall satisfy himself that the manhole cover and frame conform to the requirements of this specification, and if requested, shall supply a certificate to this effect to the purchaser or his representative.

3.20 MARKING

3.20.1 Following information shall be clearly and permanently marked on top of each manhole cover and frame.

a) Identification of the source of manufacturer

b) Grade designation denoted by LD 2.5/ MD 10 / HD 20/ EHD 35 or 5T / 10T / 20T / 35T.

c) Any identification mark as required by the purchaser.

ANNEX-B (Clause 3.14.2)
MEASUREMENT OF DIMENSIONS

B-1 PROCEDURE:

B-1.1 Individually measurements of the dimensions of each unit shall be made with a steel scale graduated in 1 mm divisions and shall be read to the nearest division of scale and the average recorded.

B-1.2 Length and diameter shall be measured on the longitudinal center line of each face, with of square or rectangular manhole covers across the top and bottom bearing at mid length and thickness on both faces at mid length.

B-2 REPORT

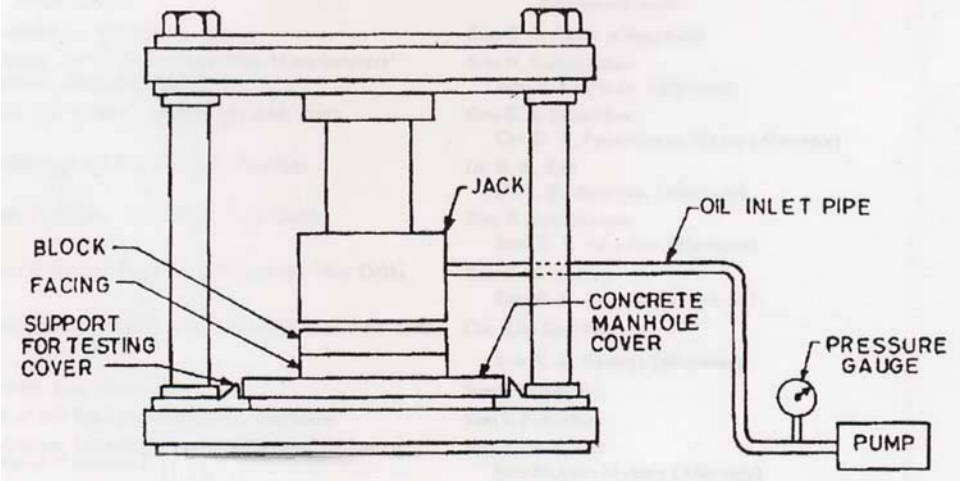
The report shall show the average length, width or diameter and thickness of each specimen.

ANNEX-C (Clause 3.14.3)
METHOD FOR LOAD TEST

C-1 PROCEDURE:

C-1.1 A suitable testing arrangement is shown in Fig.2. The cover shall be supported in a frame which may be standard frame or a specially made testing appliance simulating normal conditions of use. The specified load as given in Table-2 shall be applied without shock through the medium of a bearing block faced with hard rubber or other resilient material. The bearing block shall be of the size specified in Table-2 and shall bear centrally on the cover. The block shall be sufficiently rigid to ensure that the load on the cover is uniformly distributed over the full area of the block.

Fig.2 Arrangement For Load Test of Manhole Cover



C-1.2 All covers shall be submitted to the following tests:

a) Measurement of the permanent set of the cover after the application of 2/3 of the test load.

b) Application of test load

C-1.2.1 *Measurement of permanent Set of the Cover After the Application of 2/3 of the Test load.*

Before the load is applied take an initial reading at the geometric center of the cover.

The load shall be applied at the rate of approximately 0.6 ± 0.4 N/mm/s up to 2/3 of the test load. The load on the test specimen is then released. This procedure shall be carried out five times. Then take reading at the geometric center.

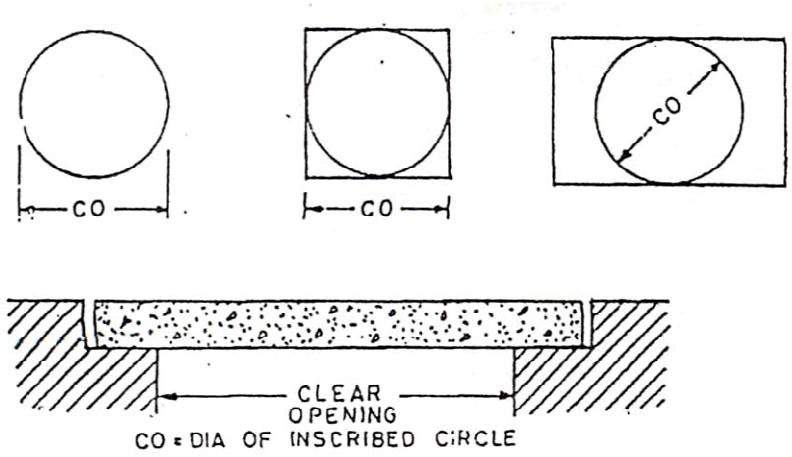
The permanent set shall then be determined on the difference of the

measured readings before the first and the firth loading. The permanent set shall not exceed 1/100 times the diameter of the largest circle that can be inscribed in the clear area of the frame as shown in Fig.3

C-1.2.2 *Application of the Test Load.*

Immediately after the test according to C-1.2.1, the test load shall be applied at the same rate given in C-1.2.1., the test load shall be applied until it is achieved. The test load to be maintained for 30 ± 2 s. Cover shall not show cracks in the course of the test.

Fig.3 Illustration of Largest Inscribed Circle in Clear Area



4 Providing supplying & fixing M.S. Frame and RCC Precleeper Beam & Sleeper Covers for Scrapper Manhole as per given type design and specifications:-

M.S. Frame and RCC Precast Beam & Covers for Scrapper Manhole shall be manufactured as per given type design shown in drawing No.16. The RCC Pre- cast Beam & Covers shall be casted in M-25 on vibrating platform.

The size of M.S. Frame and RCC Precast Sleeper Beam & Sleeper Covers shall be kept as under :-

1) M.S. Frame:- 1440 x 1120 mm (inside) by using 110 x 110 x 8 mm standard M.S. angle with braces for beam support and necessary hold fast with lead primer paint.
2) RCC Precast Sleeper Beam:- 1400 x 100 x 100 mm.
3) RCC Precast Sleeper Cover:- 1100 x 350 x 100 mm with 15x15x3 mm size M.S. angle at outer top periphery.

For each Scrapper Manhole one set comprises of (a) M.S. frame-1 no. (b) RCC Precast Sleeper Beam-1 no. & (c) Sleeper Cover-4 nos, shall be provided with supply and fixing.

The rate of Providing, Supplying & Fixing of M.S. Frame and RCC Precast Sleeper Beam & Sleeper Covers for Scrapper Manhole shall be paid per set.

B2 LABOUR SPECIFICATION

Excavation for sewer line trenches, manholes ind. All safety provisions using site rails etc, including refilling the trenches & stacking the excavated stuff including disposal of Excavated stuff within RMC Area Limit in all sorts of soil and soft murrum, hard murrum, boulders, and macadam road and soft rock and hard rock Average Rated Rate including removing surplus earth

(i) Up to 1.50 mt depth
(ii) 1.50mt to 3.00 mt depth
(iii) 3.00 mt to 4.50 depth

1. EXCAVATION AND REFILLING:

Excavation for sewer line trenches, manholes and house connection chambers etc. with shoring strutting bailing our water form trencher wherever necessary including excavation in khal kuvas or soak pits encountered in the work and making the good after the work and all safety measures and provisions such as site rails fencing lighting watching and stacking excavated stuff up to a lead of cleaning the site etc, as stipulated in the e-Tender specifications complete for lifts and soil strata as specified below :-

(i) In all sorts of soil & soft murrum including macadam road, khal kuvas and soak pits.
(ii) In hard murrum boulders.
(iii) In soft rock, masonry structures like in C.M., L.M. or lime concrete.
(iv) In hard rock, in C.C. 1:2:4 or R.C.C. with controlled blasting and or chiseling

1.1. EXCAVATION FOR TRENCHES (MANHOLES, VENT-SHAFT, HOUSE CONNECTIONS CHAMBERS AND CONNECTING SEWERS) IN ALL SORTS OF SOIL AND SOFT MURRUM INCLUDING MACADAM ROAD (WBM), KHAL KUVAS AND SOAK PITS INCLUDING DEWATERING.

1.1.1. The item shall include dry or wet excavation and removal of excavated material and its stacking and disposal in a manner hereinafter specified. The water met with if any, shall be bailed or pumped out by the contractor as necessary.

1.1.2. The contractor shall provide all materials and perform all labour necessary for the excavation and completion of the work in accordance with the drawings and specifications and the intent thereof.

1.1.3. The Contractor shall provide necessary protection to labour materials, equipment etc. to ensure safety against risk and accident. The B.I.S. standard in this regard shall be followed (IS 3764 – 1966)

1.1.4. The Contractor shall be liable to pay compensation for injury to life, and damage to property, if any, caused due to any operation connected with this item.

1.1.5. The Contractor shall hand over the site of work in neat and tidy condition after completion of work and shall remove all rubbish arising out of construction work.

1.1.6. The contractor shall carry out the work of trial hole of the sizes and depths and at places as directed by the Engineer-in-charge to accurately locate and determine the portions of services like water mains and drains, electric cables, telephone cables .etc, and shall fill them back as required and as ordered. The work shall be paid as per the item of excavation.

1.1.7 Widths of excavation for different diameter of pipes

The width of trenches for different diameters of pipes are to be given I.D. of pipe + 0.90m and it shall be paid as per actual excavation done but limited to ID of pipe +0.90m in case of more width done by the contractor. Contractor shall have to keep in mind that the working space at the bottom for easy laying and jointing of pipes. In case of safety in excavation, in soil more than 3.0 m depth, an excavation chart shown as DRN/PHASE-II PART-II/DRG No. 12 in the e-Tender document shall be used but it shall be measured and paid as per the maximum limits of width of excavation shown in drawing.

1.1.8. Depth of Excavation of Trenches:

The depths of excavation for the trenches shall be calculated from the surface to the bottom of the foundation, No payment shall be made for any excavation, beyond the width and depth, as specified above.

1.1.9. A Grip to be cut for pipe collar :

Where a collar is be provided or where socket of the pipe comes a grip shall be cut in the bottom of the trench or bedding as necessary below the bed of the pipes so that the pipe may have a fair bearing on its shaft and not rest upon its collars. Such grip shall be maintained clear until the joint has been passed by the Engineer – in - charge

1.1.10 Trenches in Rocky Ground:

The trenches in stony or rock ground shall be excavated all along to the full depth such that the bottom of the excavation shall not be higher at any point than the bottom of the concrete bedding layer below the sewer pipe.

1.1.11 Measurement of length of Excavation:

The length of excavation for trenches shall be measured in the horizontal plane between manholes.
The excavation shall be taken up at such places and in such lengths as shall be approved by the Engineer-in-charge. The excavation shall proceed in such portions at one time as the Engineer-in-charge may direct. No permanent works shall be started unless the Engineer-in- charge approves the excavations. The length of trench excavated ahead of the laying and the length of trench which may remain open at any time shall at all times be subject to the approval of the Engineer-in- charge. It shall be at no time, longer than can properly be protected from caving. In case of tapering in excavation, average width in measurement shall be taken in to account.

The materials from the excavation shall be deposited on either side of the trench leaving a clear berm on each side at least 40cm wide or at such further distances from the edges of the trench, as may be necessary. To prevent the weight of materials from causing the side of the trench to slip or fall, or at such distance and in such a manner as to avoid covering fire-hydrants, sluice valves, gas siphons, manhole covers and the like and so as to avoid abutting any wall or structure or causing inconvenience to the public or other persons, or otherwise as the Engineer-in-charge may direct.

In case, where the Engineer-in-charge decides that the width of the road or lane, where he work of excavations to be carried out is so narrow as to warrant stacking of excavated materials away from the site of the work the contractor shall have to remove the same if so directed within the lead of 250M. The excavated stuff shall be brought back for refilling the trenches when required. The surplus material shall be removed as directed. No claims for stacking the excavated stuff away from the site of work or bringing it back for refilling trenches shall be entertained.

1.1.12. Bottom of Trenches and foundation to be saturated with water

The bottom of all trenches and the foundations of all structure

shall be saturated with water and well rammed wherever the Engineer may consider it necessary to do so.

1.1.13. Excess Excavation due to nature of sub-soil for additional foundation

If in any place, the Engineer-in-charge considers on account of the nature of sub soil additional foundations of concrete, rubble or other wise necessary or if at any place, for any purpose whatsoever he required the excavation to be carried out deeper than shown on the plans or described in the specifications, the same shall be carried out as may be ordered by the Engineer-in-charge and such additional works shall be measured and paid for to the contractors according to the rates. Excavation and necessary dewatering and shoring strutting for chambers, Main holes, Vent shafts etc, is also included in this item and no extra shall be paid for excavation for chambers manholes, Vent shafts etc.

1.1.14. Unauthorized excess excavation:

Where excavations are made in excess of the width and depth indicated on the drawings, either by error or by accident the hollows so formed shall be filled in with lime concrete or rubble masonry or otherwise as directed by the Engineer-in-charge to his full satisfaction at the expense of the contractor.

1.1.15. Fencing / Lighting and Watching:

The contractor shall make all proper provisions for protecting the work by fences and by watching and lighting at night, or otherwise as may be directed by the Engineer-in-charge. The posts of the fencing shall be of timber or of other approved material securely fixed in the ground not more that 3M apart. The timber posts shall not be less than 75mm in dia, and shall not be less than 1.2 M above the surface of the ground.

There shall be two rails one near the top of the posts and the other about 150mm above the ground and shall be 50 mm to 70mm dia and sufficiently long to run from post to post to which they shall be securely fixed as per direction of the Engineer-in-charge. The method of projecting rails beyond the posts and typing them together where they meet will not be allowed on any account al along the edges of the excavated trenches a bank of earth about 1.20m high shall be formed where required by the Engineer-in-charge for additional protection Adequate number of red lights wherever required shall be provided at night. Also a watchman shall be engaged to see that the lights are properly maintained during night.

In the event of contractor not fully complying with the provisions of this clause, the Engineer may with or without

notice to the contractor put up a fence, improve the lighting and adopt such other measures as he may deem necessary for the safety and all costs of such works including penalty as may be decided by the Engineer-in-charge shall be paid by the contractor the contractor shall also provide and display special Boards painted with fluorescent paints indicating the progress of the work along a particular road.

1.1.16 Maintenance of Water Pipes, Gas Pipes, Telephone lines, Electric lines and Drains Khalkuvas, Sewers during Excavation:

The contractor shall at the rates entered in the bill of quantities and rates, carry out all excavation as the Engineer-in-charge may require in order to locate the positions of water pipes, Gas Pipes, Telephone lines, Electric lines, drains, khalkuvas, sewers, or any other structures in connection with them and shall properly maintain and protect these services by means of shoring strutting planking over padding or otherwise as the Engineer-in-charge may direct during works resulting from the same shall be made good and effectively remedied by the contractor at his cost if the contractor fails to comply with the requirements, the Engineer-in- charge will got it repaired from any other agency at the expense of the contractor. If however, the Engineer-in-charge considers it impracticable for the contractor to maintain any such water pipes, drains, Khalkuvas, sewers or other works and that exigencies of the work necessitate the breaking down removal, or diversion of any such water pipes, drains, khalkuvas, sewers, or other work, them he may direct the contractor to break down or remove any of the above mentioned services and ask the contractor to provide such chutes pumps or other equipment of raising and temporary passage of the water or sewerage. The cost of pumping out or otherwise removing any water or sewerage which may escape from any such broken water pipes, drains, khalkuvas, sewers shall be borne by the contractor.

1.1.17. Shoring:

1.1.17.1 Wherever shoring is found necessary by the Engineer-in-charge the contractor shall provide the same in the best possible manner with the materials as required and as directed by the Engineer-in-charge to his complete satisfaction. The contractor shall employ such kind or kinds of shoring as the Engineer may consider the exigencies of the work to require and it is to be distinctly understood that the word 'shoring' is to comprise all classes of such work and all appliances and appurtenances, including polling

Corporations, sheet piling and runners (whether the joints be butt., groove and tongue, feather edge and grove, birds mouth and double splay, rebate or otherwise), together with walkways, strut, props point blank shores, raking shores, blocks, wedges, Iron dogs, bolts, screws, nails and everything that may be required for due execution of the work.

1.1.17.2 Contractors responsibility for secure shoring and / or all damages:

The contractor shall be responsible for providing secured shoring and for taking every other precaution which may be necessary or proper for protecting any building or any other structure from getting damaged by the excavation of any trench or otherwise by the execution of the works in the vicinity of such building of structure.

If the Engineer-in-charge shall require the adoption of any special or extra measures, or precautions, the contractor shall forthwith adopt and supply the same. However, this revision shall not in nay degree relieve the contractor from his responsibility or from liability under the conditions of the contract in respect of any claim made against the Corporation for loss or damage which might be caused to any such building or structures by the execution of any works or otherwise.

After the work is completed near building, the contractor shall remove the shoring safety without slipping of soil of trenches if any and make good any cutting out or other damage that might have been done.

1.1.17.3 Liability of Timbering:

No work approved by the Engineer-in-charge or his representative about timbering shall absolve the contractor from his responsibility and he will be responsible for making good damage caused as about result of the failure of timbering to give proper support to the sides of the excavation.
The timbering to the sides of excavation for structures shall be carried out in such a way that there is no obstruction caused to the fixing of form work for the walls. The supporting struts and walling shall be removed by the contractor in stage to facilitate progress of concreting pipe laying etc.

If the Engineer-in-charge finds that the standard of

timbering is not according to requirements or that the sides of the excavations have not been secured in a manner to render such excavations safe for working may be one hour after notifying the contractor of his representative in writing about this shall employ his own men to mend the timbering and the cost of such workmen and materials employed including penalty shall be paid by the contractor.

1.1.17.4 Removing shoring:

No part of the shoring shall nay time be removed by the contractor without obtaining permission of the Engineer-in-charge While out shoring planks, the hollows if any, formed shall simultaneously be filled in with soft earth well rammed with rammers after watering.

1.1.17.5 Shoring left in Trenches:

The Engineer-in-charge may order in writing portions of shoring to be left in the trenches at such places where it is found absolutely necessary to do so, so at to avoid any damage to buildings, cables, water mains, sewers, etc. in close proximity of the excavation.
The contractor shall not claim, anything, whatsoever for the shoring which might have been left in the trenches.

1.1.17.6 Steel trench sheeting:

Where the subsoil conditions meet with are of a soft and unstable in trench excavation the normal methods of timbering will not prove sufficient to avoid subsidence of the adjoining road surface and other services. In such circumstances, the contractor will be required to use steel trench sheeting or sheet steel pining adequately supported by timber struts, welling etc. without any extra cost. The contractor shall supply, and subsequently remove trench sheeting or piling where no longer required.

1.1.18. Constructing Temporary bunds & sumps:

For the purpose of keeping the excavations dry the work shall, if necessary he divided into sections or separate portions, to be determined by the Engineer-in-charge and temporary bunds shall be put up by the Contractor. Sump shall be excavated by the Contractor at such distances apart and of such depths, as the Engineer-in-charge may direct to allow the pumps to work. When and as the work progresses, other sumps shall be excavated by the Contractor from time

to time. The sumps not in use shall be filled in by the Contractor to the satisfaction of the Engineer-in-charge. The contractor shall not claim anything extra for temporary bunds and sumps or their removal and refilling, nor shall such work be taken into measurements in any way.

1.1.19. Rate for Excavation:

The rates for excavation shall be included and cover without extra charge all the stipulations continued in every portion of these specifications, with regard to setting out, provision for the passage or traffic and for access to premises, arrangements for the continuance of drainage, khalkuvas or such points water supply or lighting (If interrupted by the works) arrangements, for the efficient protection of the life and property, fencing, lighting, watching, shaping the trenches, maintenance of water pipes, gas pipes, telephone lines, electric lines drains, khalkuvas and other work met with in or about the excavation driving them dismantling them, rebuilding them as necessary, subsequent re-excavation, on account of rain, holiday or special occasion, filling necessary dewatering etc. complete.

1.1.20 The excavation shall be carried out in the strata met with as specified in the proper manner and with lifts mentioned therein.

1.2. EXCAVATION FOR TRENCHES, MANHOLES, VENT SHAFTS, HOUSE CONNECTIONS CHAMBERS AND CONNECTING SEWERS IN HARD MURRUM, BOULDERS INCLUDING DEWATERING.

1.2.1 All the items of excavation for trenches and manholes vent shaft, house connections, chambers and connecting sewers as described under 1.1 above shall also apply here.

1.2.2 This shall included all kinds of disintegrated rock or shale or indurate clay tending to the formation of conglomerate interspersed with boulders up to having at least dimension of 300mm in any direction which do not need blasting and could be removed by a pick and bar and shovel with some difficulty.

1.3 EXCAVATION FOR TRENCHES MANHOLES, VENT SHAFTS, HOUSE CONNECTIONS CHAMBERS AND CONNECTING SEWERS, IN LARGE BOULDERS AND SOFT ROCK WITHOUT BLASTING INCLUDING DEWATERING.

1.3.1 All the items of excavation for trenches and foundation as described under 1.1 above shall also apply here.

1.3.2 Excavation shall be in soft rock as lime stone, sand stone, laterite hard conglomerate or other soft of disintegrated rock, which may be quarried on spilt with crow bars, boulders which do not require blasting having diameter in any direction not more than 300mm and any rock which in dry state may be hard, requiring blasting but which when wet becomes soft and manageable by means other than blasting and excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor.

1.4 EXCAVATION FOR TRENCHES, MANHOLES, VENT SHAFTS, HOUSE CONNECTIONS CHAMBERS AND CONNECTING SEWERS, IN HARD ROCK INCLUDING DEWATERING AND CONTROLLED BLASTING IF REQUIRED AND OF CHIESELING.

1.4.1 All the items of excavation for trenches and foundations under 1.1 above as applicable shall also apply here.

1.4.2 Excavation shall be in any rock or boulders having diameter in any one direction of more than 300mm for which the use of mechanical plant or controlled blasting is required. The classifications of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor.

1.4.3 Controlled blasting shall be carried out only with the written permission of the Engineer-in-charge All statutory laws, regulations rules etc. Pertaining to the acquisition, transport, obtaining permission of respective departments, handling and use of explosives shall be strictly followed,

1.4.4 when controlled blasting is permitted by the Engineer-in-charge in writing the same shall be carried out by any method of blasting consistent with the safety and job requirements.

1.4.5 The magazine for the storage of explosives shall be built to the design and specifications of the explosive department concerned and located at the approved site. No unauthorized person shall be admitted into the Magazine which when not in use shall be kept securely locked. No matches or inflammable material shall be allowed in the magazine. The Magazine shall have an effective lighting conductor, the following shall be in the lobby of magazine.

(a) A copy of relevant rules regarding safe storage both in English and Gujarati
(b) A statement of update stock in the magazine.
(c) A Certificate showing the last date of testing of the lighting conductor.
(d) A notice that smoking is strictly prohibited.

1.4.6 In addition to these, the contractor shall also observe the following instructions and any further additional instructions may be given by the Engineer-in-charge & shall be responsible for damage to property and any accident which may occur to workman or the public on account of any operations connected with the storage, handling and use of explosives and blasting.

1.4.7 All the materials, tool and requirement used for blasting operations shall be of approved type and approved by the Engineer-in-charge. The fuse to be used in wet locations shall be sufficiently water resistant as to be unaffected when immersed in water for 30 minutes. The rate of burning of the fuse shall be uniform and known to determine its length.

1.4.8 The blasting operation shall remain in charge of competent, experienced supervisory staff and workmen who are thoroughly acquainted with the details of handing explosives and blasting operations.

1.4.9 The blasting shall be carried out during the time fixed and approved by the Engineer-in-charge. The hour of blasting shall be made known to the people in the vicinity.

1.4.10 Red danger signals shall be displayed in all directions during the blasting operation. People except those who actually light the fire shall be prohibited from entering the area.
The flags shall be planted at safe distance from the blasting area in all directions and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing, a warning whistle being sounded for the purpose.

1.4.11 The charge holes shall be drilled in suitable places to depths approved by the Engineer-in-charge blasting should be as light as possible consistent with required breakage of materials.

1.4.12 When blasting is done with powder, the fuse cut to the required length shall be inserted into the hole and the

powder dropped in. The powder shall be gently tamped with copper rod with rounded ends. The Explosive Powder shall then be covered with tamping materials which shall be tamped light but firmly.

1.4.13 As the blasting will be only controlled one with light charges, dynamite etc. shall not be used.

1.4.14 At a time not more than the number of charges approved by the Engineer-in-charge will be prepared and fired. The charges shall be fired after observing the instructions given above and the explosions counted. The man in charge shall satisfy himself that all the charges have been exploded before allowing the workmen to go back to work site.

1.4.15 In case of misfire the following procedure shall be observed.

(a) Sufficient time shall be allowed to account for the delayed blast. The man in charge shall inspect all the charges and determine the missed charges.

(b) In the case of blasting powder missed charge, it shall be completely flooded with water. A new hole shall be drilled about 45 cm. from the old hole and fired. This should be repeated till the old charge is blasted.

1.4.16 The main in charge shall at once report to the contractor's office and the Engineer-in-charge of all cases of misfire the cause of the same and the steps taken in connection there with.

1.4.17 A careful and day to day account of the explosives shall be maintained by the contractor in an approved manner in a register which shall be open for inspection by the Engineer-in-charge at all times.

1.4.18 The rate shall include all stipulations mentioned under 1.1 over and above these stipulations, the rate shall also include excavation by chiselling or controlled blasting as required for the work.

1.4.19 The necessary permission of the concerned district authority shall be obtained by the contractor prior to the blasting operation and all safety and necessary arrangements shall be made as per his directions before the blasting operation is actually started. The rate shall be paid per Cu.M. and will be inclusive of necessary shoring, strutting, scaffolding, bailing out water, dewatering barricading etc. complete.

1.5 REFILLING THE PIPE TRENCHES BY THE EXCAVATED STUFF IN 15CM TO 60 CM THICK LAYER, CONSOLIDATING UP TO POSSIBLE EXTENT AND DISPOSAL OF SURPLUS STUFF AS DIRECTED WITHIN THE PRESCRIBED LIMITS OF CORPORATION OR AS DIRECTED BY THE ENGINEER-IN- CHARGE.

1.5.1 After the sewer pipes have been laid and jointed and the manholes and vent shafts are constructed and as soon as the joints have been inspected and passed by the Engineer-in-charge and after all concrete work thoroughly set the trenches shall be fulfilled with the materials taken there from. In refilling the trenches the utmost care shall be exercised so as not to disturb, break or damage the jointed pipes. Over and around every pipes the finest selected material shall be put. No lumps of rock earth or other material shall be put around the pipe or be thrown into the trenches until the same has been broken to specified size and pipes covered by the fine material above referred to. The selected fine material shall be carefully placed next to the permanent work and well packed and well rammed in layers of 150mm for a depth of at least 300mm over the top of the pipe. The remaining of the excavation shall be filled in with the best and most suitable portions of the excavated material in layers of not more than 600 mm deep or as decided by the engineer in charge. Surplus soil shall be piled on top of the filling to the extent possible for expected subsidence. All road materials to from a compact neat surface. The contractor shall maintain all refilling and surfaces until completion of entire work. The contractor shall be responsible for claims arising from accidents due to subsidence or inadequate maintenance or improper refilling work. Where excavated material is not considered suitable for refilling by the Engineer-in-charge, the Contractor will be required to cart selected surplus excavated materials in place of unsuitable materials. The contractor may also be instructed to supply suitable granular or other hard filling material for use in refilling such imported filling material shall be paid for at the rates given in the Bill of quantities or as per S.O.R. of Rajkot Municipal Corporation.

When trench is excavated under or near any existing work likely to be affected by subsidence of the material in the trench, or where any permanent work will be constructed later of the trench. The contractor shall fill in the trench with M 100 concrete or take such other precaution means to prevent damage by subsidence as. The Engineer-in-charge may direct, Whether such work is shown in the drawing or

not, whether it is billed in the quantities or not. Any extra work necessitated will be paid for according to the provisions of the conditions of Contract. Unless in the opinion of the Engineer- in-charge, it is necessitated by the contractor negligence, bad workmanship faulty materials or lack of reasonable foresight.

1.5.2 Subsidence in filling:

Should any subsidence take place in the filling up of the road on or about any part of the work whatsoever up to the completion of contract works the contractor shall make good the same at his own cost. In case of failure of the contractor to attend to the work, the Engineer-in-charge without notice to the Contractors shall make good the same in any way and with any material that the (Engineer-in-charge) may consider proper at the cost of the contractor. The Engineer-in-charge may, if he anticipates the occurrence of any subsidence employ watchman to give him timely notice of the necessity of making good the subsidence, and the cost of such watchman shall be charged to the contractor.

2 PROVIDING AND LAYING CEMENT CONCRETE FOR BEDDING FOR PIPES INCLUDING CURING, FORM WORK ETC., AS PER TYPE DESIGN SPECIFIED.
BEDDING AS PER TYPE DESIGN.

2.1. ENCASING / BEDDING:

Bedding of cement concrete 1:3:6 as detailed in the drawing (DRG No.13) shall be provided below the pipes. In cases near nallas and where ground water is encountered, encasing of pipes as shown in the detailed drawing shall be provided in C.C.-1:3:6. The concrete work shall be carried out as detailed in the item of cement concrete in this specification and shall also include form work as is found
necessary. The concrete shall be laid as required as per the outside
diameter of the pipes so as to provide a uniform and firm bedding to the pipe.

The measurements shall be in cubic meters after deducting the pipe portion resting in the bedding. The cement concrete bedding shall be constructed as per the detailed drawing removing surplus excavated material as stipulated here and all necessary matters and things connected with or rendered necessary or otherwise involved by the excavation. It also includes shoring and strutting and dewatering as necessary.

3 PROVIDING SAND / GRANUIAR BEDDING INCLUDING

RAMMING, WATERING, CONSOLIDATING ETC. COMPLETE.

The sand to be used for bedding shall be got approved from Engineer-in-charge before using the same for providing bedding on trench bed.

The providing of send for bedding shall be done in required thick area as per drawing (DRG No.14) or as instructed by Engineer-in- charge. It shall not contain dust, clay or other such harmful materials. If directed the sand shall be washed with water and screened before being used. The sand containing big clods shall be broken into small pieces. The tree's roots, meets, bit stones and other objectionable materials liable to decay shall not be used in the work. Sand brought from approved source shall only be used.

4 TECHNICAL REQUIREMENT & PROCEDURE ADOPTED FOR LOWERING LAYING AND JOINTING OF RCC & SWG PIPES

4.1 Sight Rails and Boning Staves:

4.1.1 In laying the pipe sewers and constructing drains, center for each manhole must be marked by a peg. Or Otherwise as may be determined by the Engineer-in-charge. The contractor shall then dig holes and set up two posts (about 100mm X 1800mm) at each manhole at nearly equal distance from the center of the manhole. The distance shall be such that they shall be well clear of all intended excavation. They shall be so arranged that a sight-rail when fixed level against the posts will cross the center of the manhole. The posts shall also be so set up that the longitudinal direction of the rail may be as clear as possible to the direction of any of the lines pipes or drains converging to the manhole. If walls of buildings afford suitable means of fixing the sight-rail the post may be dispensed with. The sight-rail, must not in any case be more than 30 M apart. If intermediate rails between two manholes be found necessary, the same shall be put up.

4.1.2 Construction of boning staves:

Boning staves shall be prepared by the Contractor about 75mm X 50mm of various lengths, each length being of a certain number of meter and with a fixed tee-head and fixed intermediate cross piece, each about 300mm long. The top-edge of the cross piece must be fixed at a distance below the top-edge of this tee-head, equal to the outside diameter of the pipe or the thickness of the concrete bed to be laid. The boning staff must be marked on both sides to indicate its full length. According to the requirements of each case, a

suitable length of boning staff will be fixed and the reduced level of the bed of the pip or bottom of concrete of drain at each sight-rail place added to the selected length of boning staff, and marked by a horizontal line in both posts, or on walls or fences to which the sight-rail is to be fixed.

4.1.3 Sight Rails:

The sight rails (about 25 mm wide and 40 mm thick) are to be screwed with the top-edge against the level marks. The center line of the pipe sewer or the drain will be marked on the rail and this mark will denote also the meeting point of the center of any converging drains or pipe sewers. Line drawn from the top-edge on rail to the top-edge of the next will be vertically parallel with the bed of the sewer or drain at any intermediate point. This could be easily determined by letting down the selected boning staff until the tee-head comes in the line of sight from rail to rail.

The posts and rail are to be perfectly square and planned smooth on all sided and edges. The rails are to be painted write on both sides, and the teak-hands and cross pieces of the boning staves are to be painted black. If the pipes or domains converging to a manhole come at different level there must be a rail fixed for every different level. When rail comes within 1.6 M of the surface of the ground a higher sight-rail shall be fixed for use with the rail over the next point. Posts and rails shall in no case be removed until the trench is excavated. The drains are constructed, the pipes are laid and permission given to proceed with the filling in.

4.2 LOWERING LAYING AND JOINTING OF PIPES:

4.2.1 Contractor to obtain permission before laying pipe, concrete or Construction of masonry:

When any portion of the excavation shall have been carried out to the necessary depth, the contractor shall obtain permission in the Engineer-in-charge before commencing the work of laying of pipes or concrete or the construction of masonry. No sewer pipe shall be allowed to be laid over and parallel to the water supply pipeline. Sewer line shall be laid below the water supply pipeline irrespective of the size of the pipeline.

4.2.2 Handing of pipes:

At every point of loading or unloading, pipes or fittings shall

be handled by approved lifting tackle. Unloading by rolling down planks or any other form of inclined ramp shall not be allowed unless the written approval of the Engineer-in-charge is obtained regarding the same. Pipes shall be carefully stacked on site with timber packing under and between the pipes without causing nuisance or obstructions to traffic of walkway.

4.2.3 Laying:

The pipes shall be laid up the gradient beginning at the lowest end. No pipe shall be laid until the trench has been excavated to its required depth for a distance of 20 M in front of the pipe to be laid (This distance may vary as directed by the Engineer-in-charge). All the pipes shall be laid perfectly true, both in line and in gradient. The pipes in a trench shall be all laid and fitted previous to the jointing being commenced properly fitted temporary wooden stoppers shall be provided and constantly added to close the ends of all in- completed pipelines. The stoppers are to be removed only when pipes are laid and jointed.

4.2.4 Jointing of stoneware glazed with Socket and Spigot Joints:

The laying and jointing of pipes shall conform to IS:4127 (1967) The pipes shall have socket and spigot joints. The trench shall be checked for proper level, gradient and alignment before lowering the pipes. The laying of the pipes shall properly up-grade of slopes. The socket end shall always be facing the up-stream end of the trench.

All joints shall be filled up with hemp yarn dipped in sufficient quantity of cement slurry, cement mortar 1:1 shall be forced into joint by using cocking tools etc as directed by Engineer-In-Charge until the whole space around the spigot between it and the spigot is full so as to form a neat fillet round the pipe.

The cement mortar joints shall be cured at least for seven days.

4.2.5 Jointing of RCC pipe with Socket and Spigot Joints:

The RCC pipe with the rubber ring accurately positioned on the spigot shall be pushed well home into the socket of the previously laid pipe by means of uniformly applied pressure with the aid of a jack or similar appliance. The RCC pipes shall be of spigot and socket type and rubber rings as specified in IS-458-2003, shall be used, and the manufacturer's instructions shall be deemed to form a part of these specifications. The rubber rings shall be lubricated before

making the joint and the lubricant shall be soft soap water or an approved lubricant supplied by the manufacturer.

Socket & Spigot NP3 & NP4 pipe with rubber ring roll on joint for diameter upto 900 mm should be provided as per table 14 of IS 458:2003. Socket & spigot NP3 & NP4 pipe with rubber ring confined joint for diameter 1000mm to 2600 mm should be provided as per Table-17 of IS 458:2003.

4.2.6 All works to be Water Tight:

The drains, manholes and all joints of pipes shall be made thoroughly sound and water tight and any joint which may be observed to be leaky at any time during the progress of the works or during the contractor's subsequent period of maintenance shall be immediately made good by the contractor at his own cost. The contractor at his own cost shall have to carry out satisfactory flow test as directed by the Engineer-In-Charge. In case of any dispute in this regard, the decision of Engineer-In-Charge shall be final and binding to the contractor.

4.2.7 Inspection of joints:

After the joints of any pipes in under ground work have thoroughly set the Engineer-in-charge (or any person whom he may appoint) may inspect the joints and if he has any doubt as to their soundness he may request the contractor to open out and clean the cement. Contractor shall not be required to open more than one joint in 20 M of pipe. However, if the defect is found, the Engineer-in-charge may direct him to open as many joints as he may deem necessary.

4.2.8 Cleansing of the pipes:

As soon as a stretch of pipeline whether of stoneware or cast iron or RCC pipes has been completed between two manhole, the contractor shall run through the pipes both backwards and forwards a double disc / solid / closed cylinder 75mm less in dia, than the internal dia of the pipes wherever required and suggested by the Engineer-In-Charge. The open end should be closed as may be directed by the Engineer-in-charge to prevent, entry of mud or silt etc. If as a result of the removal of any obstruction in the pipe line the Engineer-in- charge considers that damages may have been caused to the pipeline, he shall be competent to order the length to be tested at the expense of the contractor. Should such retest prove unsatisfactory the Contractor shall at his own expense amend the work and carry out such further tests as may be required by the Engineer-in-charge. It shall also be

ascertained by the Contractor that each stretch from manhole to manhole is absolutely clean and without any obstruction by means of visual examination of the interior of the pipeline suitable illuminated by projecting sunlight or artificial light.

4.2.9. Cracks in Pipes:

In the event of pipes being cracked after being properly laid either due to improper loads having been encountered or the material of refilling having been improperly selected or because of any other cause, the Contractor in every case shall be held responsible and will be called upon to replace such cracked pipes at his own cost during the expiration of period of maintenance.

Any pipe or length of pipes found to be defective shall be immediately removed and replaced at the Contractor's expense and leaking joints shall be remade. The inspections and tests shall them be repeated as often as necessary until the whole line under inspection or tests is accepted by the Engineer-in-charge.

4.2.10 All works to be clear, clean and perfect:

The contractor shall after completion or whenever required by the Engineer-in-charge, prove all pipes and fittings to be clear and perfect, for this purpose he shall at his own expense and in the presence of the Engineer-in-charge or his appointee, provide suitable instruments and appliances and pass them through the pipes and if required shall pass water and show that it passes freely through every portion of the work. Brick mortar and rubbish shall not be allowed to fall into the manholes of sewer lines while fixing or if fallen shall be removed by the Contractor at his own expense.

4.2.11 Pipe entering and leaving manholes :

Whenever a pipe enters or leaves manhole, the ends of all pipes shall be properly built-in and neatly finished with cement mortar. The pipe projections are to be cut so that the ends are flush with plastered surface of the manhole, nothing extra shall be paid for this. The rate of pipe laying include this work also.

4.2.12 Fittings:

The terms fittings as used in this specification is intended to apply to any and every article used in combination with straight

pipe itself.

In the areas subject to subsidence, the pipe sewer should be laid on suitable supports or concrete cradle supported on piles.

4.2.13 Measurement of pipe lines:

(a) All pipelines shall be measured according to the work actually done and no allowance shall be made for sockets and any wastage in cutting to the exact length required. A bend, junction, or any other piece of fitting which may have necessarily been out for the exigencies of the work will be taken into account as if whole, provided that the cutting has been done properly and that portion used in the work is sound. This clause shall not apply to a straight pipe under any circumstances. In measuring the lengths of pipes laid, deductions shall be made for the lengths of channels between the inside faces of the walls of manholes.

(b) Payment for providing, supplying, lowering, laying, jointing and testing of R.C.C. and SWG pipes shall be made as under:

(b1) Payment for providing and supplying of R.C.C. and SWG pipes.

(i) 80% payment of pipes supply item shall be paid after supply of pipes as per specifications at site of work. The payment for supply of pipes will at any time be limited to a maximum up to 10% length of total length of item of respective diameter in e-Tender schedule- B.

(ii) 10% payment of pipes supply item shall be paid after satisfactory lowering, laying and jointing of pipes.

(iii) Remaining 10% payment of pipes supply item shall be paid after satisfactory flow test.

(b2) Payment for lowering, laying, jointing and testing of R.C.C. and SWG pipes.

(i) 90% payment of lowering, laying jointing and testing item of pipes shall be paid after lowering, laying and jointing pipes as per specifications.

(ii) Remaining 10% payment shall be paid after satisfactory flow test.

(c) For providing, lowering. laying. jointing and testing work, payment shall be made only for completed section between manhole to manhole. No payment shall be made for incomplete sections.

5 . REMOVING SURPLUS MATERIALS:

After refilling all surplus excavated stuff shall have to be carted by the contractor within RMC limit including loading,

transporting, unloading, spreading etc complete as directed by the Engineer-In-Charge. Measurement: - Removal of surplus material shall be measured in Cu.m. of surplus material removed and rate will be paid per Cu.M.

6 APPURTENANCES :

(Manholes, drop manholes and scraper Manholes & house connection chamber) providing and constructing sewer manholes as per the type design in brick masonry in CM 1:3 including C.C. 1:3:6 in foundation and M-150 in benching, inside plastering C.M. 1:3 and outside plastering in C.M. 1:3, coping in R.C.C. M-250 on all manholes, providing and fixing manhole frame & covers (but excluding supply of manhole frame & covers) complete, as per the stipulation in the type design complete.

(a) Manhole type 'A1', 'A', 'B', 'C', 'D1', 'D2', 'S1', 'S2',.
(b) Brick masonry chambers for house connections. HC-1 and HC-2

The type of Manhole to be constructed shall be decided by the Engineer- in-charge depending upon the technical requirement, actual site condition, likely future expansion, economy etc. and the contractor shall have to carry out the work according to the instructions of the Engineer-in-charge.

6.1 THE MANHOLE AND DEPTH OF MANHOLES:-

The manholes on the sewers shall be constructed in the form and of the dimensions shown in the Drawing. The depth of the manholes shall be measured from the top of cover to the invert level of the manhole.

The manholes shall be constructed at places shown on the drawings or whatever directed by the Engineer. Type designs for these manholes are shown on the drawings but the actual type and dimensions shall in each case be determined by the Engineer as the circumstances may require. (Refer drawing No. 3 to 11.- DRN - PHASE-II PART-II)

6.2 CONSTRUCTION OF BRICK MASONRY MANHOLES:

The brick masonry shall be constructed as per the type design shown in the drawing enclosed. The various types of manholes to be adopted as per the requirement have been indicated in the L-section and sewer layout drawing in general. The manhole will be fitted with R.C.C. pre-cast medium or heavy duty manhole frame

and cover as the case may be. The brick masonary manhole shall be plastered from inside and outside as shown in the drawing and as shown CM proportion and thickness. .

6.3 FLOORS AND 0.80 ID CHANNEL PIPES:

The floor shall consist of cement concrete. Concrete of R.C. 0.80 ID channel pipes of the required size and curves shall be laid and bedded in cement on the concrete base to the same lines and fail as sewers unless otherwise directed. Both sides of the channel pipes shall be trenched up in concrete and rendered in cement mortar 20 mm thick and formed to a slope of not less than 1 in 12 to the channel.

6.4 STEPS:

Where the depth of the invert exceeds 0.90 M below the surface of the ground, HDPE reinforced steps of approved pattern shall be provided as per type design shown in manhole drawings.

6.5 RATE OF MANHOLES:

The rate for construction of manhole to be quoted in the bill of quantities shall include complete masonry, structure, concrete cap, plastering with cement from inside and outside, bottom concrete or channels including providing and fixing of HDPE reinforced steps and fixing of R.C.C. Manhole frame & covers (but excluding supply of manhole frames and covers) complete as per type design drawing and cutting the pipes flush with the inside plaster of the wall. The manholes will be paid per numbers up to the minimum depth shown in the type design and for depth beyond the specified minimum depth for a particular type of manhole; extra will be paid per running meter depth. The rates include dewatering during all stages of construction.

6.5.1 The brick masonry chambers for house connection will be paid per number excluding excavation but including masonry, bottom concrete, plastering, benching channel fixing of RCC frame and covers (but excluding supply of manhole frames and covers). (Refer. R.M.C. DRG No.- & - for H.C.1, H.C.2)

7 BREAKING OF ASPHALT SURFACE:-

In this works, breaking of Asphalt surface is to be done as directed by Engineer-in-charge. For any damage to Gutter or Manhole due to

breaking of asphalt surface, contractor is responsible for repairs. No extra payment will be paid for such work.
Payment will be made per square meter of work done.

EXCAVATION OF ASPHALT PAVEMENT
Under this item contractor shall demolish existing asphalt or WBM pavement met with during laying of RCC or SWG pipes. Only area of pavement intercepted in pipe laying shall be demolished. If excess area is demolished same shall be reinstated by the contractor. Work done to the extent of requirement for laying of drain and as per specifications shall measured in sq.m. and paid at the tender rate.

C GENERAL MATERIAL SPECIFICATION

1.0 CONCRETE:-

1.1 Cement Concrete (plain or reinforced) :

All cement concrete to be used in the work shall conform to the requirements of I.S. 456.

1.2 Materials:

1.2.1 Cement:-

All cement for use on the works except otherwise stated shall be the standard ordinary Portland cement manufactured in India and shall confirm to the IS:269, IS : 8112, IS:12269 or latest versions. It shall be of the make and quality approved by the Engineer.

(For this work, approved makes are Ambuja, Sidhi, L&T, Sanghi, Lotus, Hathi or equivalent. Mini cement plant cement shall not be allowed).

The cement shall be stored in weather proof godown or cement store specially constructed for the purpose in such a manner as to prevent deterioration due to moisture of instruction of foreign matters.

The weather proof godown shall have a soil impervious floor raised 300mm above the general ground level so that the cement stored thereon shall not come in direct contract with sub soil moisture. The passage and the general construction shall be such that it offers full protection from weather effects. Large stocks of cement shall not be kept at the works but only sufficient quantities should be kept to maintain continuity of the work.

1.2.2 Storage of Cement:

No cement that has been stored for more than 90 days shall ordinarily be allowed to be used in the works Cement stored for longer period than 90 days shall be used only after approved by the Engineer-in-charge who shall ascertain its quality before giving such permission.

The Contractors shall offer every facility to the Engineer for inspection of cement. The cement go down shall be so arranged by the contractor that each consignment could be stacked separately and in such a manner so as to allow counting of bags in each row with ease.

The cement, used in any type of concrete shall always be measured by weight and one cubic meter shall be taken as weighing 1440kgs. (Table 30 of A.C.C. hand-book)

1.2.3 Aggregates:

All the aggregates shall confirm to the latest IS : 383 The aggregates shall consist of naturally occurring sand and gravel or stones crushed or uncrushed or a combination thereof. They are classified broadly under two categories viz.(i) sand of fine aggregates and (ii) coarse aggregates, depending, upon their sizes. The fine aggregates, those which pass through Is sieve No.480 and the coarse aggregate are those which are retained on the IS sieve No.480.

1.2.4 Storage of aggregate:

The fine and coarse aggregate shall be stored separately and in such a manner that segregation of the various sized particles shall not occur, the stock piles shall be formed on platform of weak concrete timber of similar approved hard standing and aggregate shall be kept clean and free from foreign substances. Storage piles of aggregate shall be arranged with proper drainage and protection from rainfall in order to prevent excessive changes in moisture content taking place during concreting.

The aggregate both fine and coarse shall be hard, strong, durable, clean, free from veins and adherent coatings. The use of flaky and elongated pieces of aggregates shall be prohibited.

The aggregates shall not contain deleterious materials such as iron pyrite, coal mica, shale or similar laminate material, clay, alkali, soft fragment sea shells, organic impurities etc in such quantity as to effect the strength of durability of concrete or the reinforcement embedded in such reinforced concrete.

1.2.5 The maximum quantities of deleterious materials that may be permitted shall conform to the following limits by weights.

Deleterious Substances	**Fine** P.C. by weight		**Coarse aggregate** P.C. by weight	
	Uncrushed	**Crushed**	**Uncrushed**	**Crushed**
1) Coal and lignite	1.00	1.00	1.00	1.00
2) Clay lumps	1.00	1.00	1.00	1.00
3) Soft fragments	---	---	---	---
4) Materials passing through 75 micro sieve	3.00	3.00	3.00	3.00
5) shale	1.00	---	---	---

The total of various deleterious materials in any sample shall in on case exceed 5per cent. If the aggregate supplied is unclean, it shall be washed. If it is not properly graded, it shall be screened

by hand or by mechanical means and the various sizes proportioned to get the required grading.

Storing of aggregates on dusty, muddy and grassy sports shall be avoided. They shall be stored on the works in such a manner as to prevention of foreign matter and protected from exposure to dust. They shall be placed in stock piles in individual units of suitable sizes and in suitable layers to prevent segregation. They shall no be allowed to run down slopes.

1.2.6 Sand or fine aggregates:

All fine aggregates shall consist of clean, hard strong durable uncoated siliceous gritty materials consisting of well graded particles obtained from rock, fragments If shall be free from clay lumps, injurious amounts of dusts, mica shells, soft or flaky particles shale, alkali, organic matter, lead or other deleterious substances.

The sand shall be taken from source approved by the Engineer. The sand or fine aggregates shall confirm to the latest IS No.383. If the Engineer considers it necessary, it shall be washed and or screened before use, all the expense of the contractors.

The sand shall have a fineness modules of not less than 2.5 and not more than 3.0 and the grading shall confirm as far as possible to the following analysis :

I. S. Sieve No.	**Percent passing Natural sand or Crushed gravel.**	**Crushed Stone.**
180	95 - 100	90 - 100
240	70 - 95	60 - 90
120	45 - 85	40 - 80
60	25 - 60	20 - 50
30	5 - 30	5 - 30
15	0 - 10	0 - 15

The specific gravity of sand shall not be less than 1.6. In on case shall fine aggregate be accepted containing more than 2 per cent by dry weight, not more than 2 ½ % by dray volume, not more than 5 percent by wet volume of clay, loam or silt, any sample of fine aggregate shows more than 5 per cent of clay, loam or silt, in one hour's settlement after shaking in an excess of water the lot represented by the sample shall be rejected.

1. The following two field tests are recommended for ascertaining the percentage of clay lumps and impervious organic material and the contractor shall carry out the same if the Engineer-in-charge deems necessary.

(1) Test for determining silt in sand :

Fill a calibrated tumbler with same to half its volume and add water there to until the fill a calibrated tumbler is three quarter full shake up the mixture vigorously and allow it to settle for about an hour. The volume of silt visible on top of the sand shall be measured. If the volume of the its standing over the sand exceeds 5 per cent of the total volume of sand same shall be rejected.

(2) Colorimetric test for organic impurities :

The sample of sand shall be mixed with equal volume of 3p.c. solution (about one ounce in a quarter of water) of caustic soda / sodium hydroxide taken in a plain glass an the mixture shall be allowed to stand for 24 hours. The liquid standing above the sand shall not be darker than lights straw (pale yellow) colour. If the color is marked yellow of brown, then test would indicate presence of organic materials in excessive amount.

In case suitable sand is not available in adequate quantities within a reasonable and economical limit, the contractors may be allowed the use of crushed or pulverized stone of gravel either along or mixed with natural sand in parts. The stone or gravel shall be clean, sharp and free from dust etc. and shall conform to the latest I.S. 383. In this case, approval of Engineer-In-Charge shall be obtained.

The percentage of crushed stone to be mixed with sand shall be such as to obtain the fineness modulus of the blended sand within the limits specified above, and or approved by the Engineer after Laboratory tests.

1.2.7 Coarse Aggregates:

All coarse aggregate used in concrete works shall consists of crushed rock gravel or other approved inert materials.

Broken or crushed rock from sound blue basalt or black trap zeolite shall be used in concrete as coarse aggregate. The particles of aggregate shall be clean hard, tough, durable free from deleterious substance and shall contain no soft flat or elongated pieces. The coarse aggregate shall have specific gravity not less than 2.6 and the water absorption measured after being immersed for 24 hours in water shall not be more than 6 per cent by weight. The maximum percentage of deleterious materials in the coarse aggregate shall not exceed 5 per cent by weight in the aggregate when tested in conformity with IS No. 363

The nominal size of the coarse aggregate for reinforced concrete work shall be 10 to 20 mm. Larger coarse aggregate up to 40mm size may be used if approved by the Engineer in plain concrete work. The maximum size of coarse aggregate shall be large as possible within the limits specified but in no case shall be greater than one quarter of the minimum thickness of the member, provided that the concrete can be placed in the form work without difficulty so as to surrounded to reinforcement thoroughly and to fill the corners of the form-work. The minimum size of coarse aggregate shall be as mentioned earlier such as to retain most of the material (90 per cent, 95 per cent maximum) on IS sieve No. 480. Aggregating shall be screened and, if necessary blended to give the required grading when tested in the Laboratory at Contractor's cost by means of standard mesh sieves, the grading shall fall within the following limits:

Sieve size	**Percentage retain by weight**	
	Plain C.C.	**R.C.C.**
40 mm	----------	----------
25 mm	10 to 15	----------
20 mm	35 to 40	15 - 0
10 mm	37 to 80	100 - 80
No.480	98 to 100	100 - 95

The percentage given above are for guidance and the Engineer-in-charge reserves the right to modify the same to any other lower of higher value if considered necessary by him, according to the requirements of the work.

In the event of undesirable segregation occurring in coarse aggregating in two or more suitable fractions as directed.

The grading so specified shall be such as to give a dance, water tight concrete of specified proportion and strength and required consistency. The Engineer shall have the right and authority to carry out routine control tests and analyses of the broken rock at any stage of the work processing and / or concerting operations and the contractors shall give necessary facilities in respect of such testing. The sampling and testing shall be carried out, as per standard IS practice entirely at the cost of the contractors.

1.2.8 Water:

The water used for the preparation of concrete, for washing sand etc. and for curing shall be clean and free from objectionable quantities of silt, organic materials, acid, alkali, salts, oil and other deleterious impurities and it shall be obtained from the

source approved by the engineer. Potable water shall be obtained from the source approved by the Engineer. Potable water shall generally be found fit for preparation of concrete. The quantity of water to be added for making concrete shall be properly measured and controlled.

1.3 Water Cement Ratio:

Suitable water cement ratio for the different mixes and use shall be determined in consultation with the Engineer and shall generally not be exceeding 0.5 (i.e. 50 percent by weight) The exact value being fixed after taking into account all relevant factors such as strength required, weather condition, water absorbed by material, workability and slump required consistent with the work requirements, methods of compaction etc.

1.4 Concrete:

All cement concrete whether used in R.C.C. work or plain concrete work shall be designated in grades by the strength at the age of 28 days) M 100, M 150, M 200 & M 250 where M refers to the mix and the number 100, 150,200 and 250 represent the specified 28 days works cube compressive strength of the mix under reference, expressed in Kg/sq cm. The proportions of cement, aggregate water for ordinary cement concrete shall be as designated below and shall generally consist of quantities as given in the table below per bag of cement.

TABLE No.1:– Concrete mix proportion for ordinary concrete.

Grades of Concrete	Total quantity of dry aggregates (Fine and coarse) by volume per 50kg. (Max.in liters).	Quantity of water per 50 kg. Of cement (Max. in liters)
M-100	300	34
M-150	220	32
M-200	160	30
M-250	100	27

The proportion of fine aggregate to coarse for the various mixes listed above shall generally be 1:2 by volume but variation from 1:1 ½ to 1:3 depending upon the grading of the aggregates may be permitted by the Engineer. The quantity of fine and coarse aggregates, however, shall not in any case exceed the quantity given in the above table No.1.

The cement concrete shall be tested for compressive strength at the age of 28 days on 15 cm. Cubes in accordance with the latest IS : 516 and the strengths developed for all type of concrete shall not be less than those given in Table-2.

TABLE –No.2:- Strength requirement of concrete

Grades of concrete	Minimum Compressive strength of cubes at 28 days in kg/cm2	
	Preliminary	Works Test
M-100	135	100
M-150	200	150
M-200	260	200
M-250	320	250

For quick results the contractors shall carry out compression tests on 15 cm cubes cast in accordance with relevant IS 516 at 7 days in addition to the normal 28 days compressive strength. The 7 day strength of the various concrete mixes shall not be less than the values given in the Table NO.3 below. However the 28 days compressive strength alone shall be the criterion for acceptance or rejection of the concrete unless the Engineer is satisfied of the relation between the 7 days compressive strength and the 28 days compressive strength, established by carrying out a number of tests, in which case, he may relax the test frequency of 28 days compressive strength specified hereinafter.

TABLE –No.3:- Optional test requirement of Concrete

Grades of concrete	Minimum Compressive strength on 15 cm cubes at 7 days in kg/cm2
M-100	70
M-150	100
M-200	135
M-250	170

All test strength specified above are exclusively for 15 cm size cubes and they shall be adequately modified to suit the requirement of 15cm dia and 30 cm long cylinder moulds wherever used in the case of cylinder the strength values obtained should be multiplied by 1.25 to obtain the equivalent cube strength.

1.5 Control and Testing of concrete.

The following tests shall be carried out at site whenever required by the Engineer in accordance with IS:516

1. Works tests – 7 days and 28 days compressive strength
2. Consistency test.

3. Moisture contents in aggregates.
4. Unit Weight of concrete.

(1) Works test:

During concreting operations samples of concrete as placed in the work shall be taken every day and set of six cubes or cylinder shall be made there from for being tested for their compressive strength. The consistency (slump) test shall also made and the slump recorded.

All concrete cubes or cylinders shall be tested for compressive strength as specified under IS 456 and 516 at the approved material testing Laboratory generally as per specification under the latest IS 456 and IS
516. The above, specification cover concrete mixes of grade M-100 and above. Ordinarily it is not necessary to test the compressive strength of mix of grade M 100 as it is generally used for non structural purposes. However, where this mix (M 100) is used extensively on works (i.e. more than 75 cu.m. of concrete is to be placed one time in any work) it shall be tested in the same manner as other grades of concrete used for structural purposes. The minimum strength of various grades of concrete both at the age of 7 days and 28 days are given in Table 2 and 3.

In the case of concrete of mix M 150 and above, the above, the Engineer- in-charge may not insist on the testing of concrete if the quantity of concrete to be laid on any particular day is less than 10 cum. if however the quantity exceeds 10 cum, test specimen must invariably, be taken and sent to the Laboratory for testing.

Specimen shall be made for every sample and three of them tested for 7 days strength as mentioned earlier the 28 day strength of concrete shall alone form the criterion for acceptance on rejection of the concrete. With this point in view, the concrete sample shall be tested both for 7 days strength as well as 28 days strength at the start of the work and this shall be continued until the Engineer is satisfied that proper relation between the 7 days compressive strength is established, in which case he may decide to relax frequency of testing the concrete cubes for the 28 days compressive strength.

If the average strength of the specimen tested at the time of 28 days is not less than the strength specified in Table – 2, the test shall be considered satisfactory subject to the condition that only one out of 3 consecutive tests may give a value less than specified strength but not less then 90 per cent of the specified strength. If the tests are unsatisfactory, the contractors shall take immediate steps to carry out remedial measures as may be

directed by the Engineer in respect of such works, entirely at the risk and cost of the contractor. Failure of a sample in test may entail partial or whole demolition of such work, heavy penalties, black listing of the contractors concerned and or such other similar steps. The results of the tests conducted at the approved material testing Laboratory shall be taken as final and binding on the contactors. In case of any dispute, the decision of the municipal commissioner shall be binding to the contractors.

A record showing the location of test specimen and daily progress of the work done shall be maintained by the Engineer-in-charge and shall be countersigned by the contractors or their representative. In case record maintained by the Engineer-in-charge is not signed by the contractor or their representative the record kept by the Engineer shall be considered as correct and binding on the contractor. In the case of any disputes, the decision of the Rajkot Municipal Corporation shall binding to the contractor. The contractor shall deliver the specimen for testing at the approved Laboratory at the own cost in their moulds. The contractors shall pay usual testing fees for the tests carried out in the Laboratory. These fees may very as sanctioned by the competent authority.

(2) Consistency slump test:

The workability of concrete shall be cheeked at frequent intervals. The slump test shall be carried out in accordance with the standard methods given under I.S. specifications mentioned above. The slump shall be as small as practicable consistent with the efficient working and compacting of concrete. The slump shall not exceed 64 mm but the Engineer may under exceptional conditions, permit higher slump up to a limit of 150 mm.

The standard consistency test shall be applied very time at each mixer when test cubes are taken for the works of compressive strength test.

(3) Moisture Contents in the aggregates:

The moisture contents in the aggregates shall be determined in the field in accordance with the latest I.S. 2286 (Part – III) methods of test for aggregate for concrete.

(4) Unit weight of concrete.

It shall be determined by placing representative samples of concrete in a unit measures capacity and vibrating at extremely

by shall vibratory or hand compacting to represent actual placing by conditions. The top of the concrete shall then be made truly flush with the top of the mould and the weight of concrete per cum. determined after curing and draying. The weight of dry concrete shall be between 2400-2625 kg / cum.

A complete record regarding various tests carried out at site and in the Laboratory shall be kept by the Engineer. The contractors shall provide at their own cost facilities for labour, material, and transport etc, required for the proper execution of the above tests. Any concrete, which does not comply with the above requirements, shall be liable for rejection by the Engineer.

1.6 Transporting Concrete:

The concrete shall be transported in clean metal buckets burrows, dumpers or trucks and the written approval of the Engineer must be obtained before any method involving the use of concrete pumps, placers, pipeline, chutes, or spouts may be used.

1.7 Placing Concrete:

(a) Unless otherwise approved, concrete shall be placed in a single operation to the full tackiness of slabs, beams and similar members and shall be placed in horizontal layers not exceeding 600mm deep or 230 mm when manually compacted in walls columns and similar members.

(b) The contractor shall so organize has work that once concerting of a particular section of the work has started the operation shall be continued and each operation shall be completed prior to a stoppage for meal, etc. the contractor's attention is drawn to the requirements regarding the formation of construction joints.

(c) Where concrete is to be placed directly against the surface of excavations all soft material and debris shall be removed from the contact surfaces which shall be made dry, clean and firm. If the contact surfaces have become softened due to delay in placing the concrete or any other cause, they shall again be excavated to firm material and trimmed as directed immediately before the concrete is placed. The contractor in such event shall receive no payment for the additional excavation and trimming or for any additional concrete required to replace the material so removed.

(d) Concrete shall be well compacted between and round the steel reinforcement by approved means so as to ensure

compact concrete with smooth surfaces, without air holes, flaws or voids. Great care shall be taken to prevent the displacement of the steel and form work before during or after concreting. Whenever possible all reinforcing members shall be fixed in position before the concreting has been started and securely wired together to prevent movement. Reinforcing members which must be inserted during the concreting shall be placed with the greatest care to ensure their perfect location in the finished work.

(e) Care shall be taken to prevent men engaged in placing concrete from introducing clay or other foreign matter into the concrete of form work by means of their body in any other way.

1.8 Compacting:

Concrete shall be properly compacted by use of vibrators or by rodding and spreading as directed by the Engineer. Tamping as above shall be continued until all the entrained air is removed and the concrete has been compacted and completely fills the form. The sides of the form work shall be gently tapped by spades during concreting.

1.9 Curing of Concrete:

All concrete work shall be protected from directed rays of the sun. The exposed surface shall be kept wet for a minimum period of 10 days or for such longer periods as may be directed by the Engineer-In-Charge, Concrete laid shall not be disturbed and shall be suitably protected from any injury until completely set, particular care shall be taken at all corners and edges of the member. All horizontal concrete shall be constantly wet by ponding or in any clear manner approved by the Engineer till the time of next pouring regardless of time. Concrete surface shall be cured either by sprinkling or by spraying water or by adopting any other method to keep the area moist. Flat or fine vertical surfaces may be covered with dump gunny bags and watered frequently water used for cut for shall be clean and free from any excessive silt, coloring matter or other impurities which may stain the finished work. In order to ensure adequate quantities of water for curing, the contractors shall make necessary arrangements such as providing sufficient lengths of temporary pipe lines of suitable size, storage of water in tanks and / or sufficient nos. of bhisties.

1.10 Concreting through water:

Concrete shall not be deposited under water without the prior consent in writing of the Engineer-In-Charge. In the event of

permission being given the amount of cement in every batch shall be increased by twenty five per cent entirely at the expense of the contractor and he shall take every reasonable precaution to ensure that cement or fine aggregate is not washed out of any concrete so deposited by any flow of water.

1.11 Finish of Concrete:

On removal of the shuttering and after the approval of the Engineer-In- Charge, honeycombed surfaces shall be made good immediately by the method approved by the Engineer. Superficial water and air holes shall be filled in. Unless instructed to the contractor the faces of exposed concrete placed against shuttering shall be rubbed down with a carborandum stone immediately upon removal of the shuttering to remove fins or other irregularities. The face or concrete for which shuttering is not provided other than a slab, shall be smoothed with a wooden float to give finish equal to that of the rubbed down face where shuttering is provided. No cement wash master or paint may be applied to any concrete surface without the express instruction or permission of the Engineer.

1.12 Sulphate resisting and rapid hardening cement concrete:

Where sulphate resisting or rapid hardening Portland cement is specified or ordered by the Engineer in writing, extra cost will be paid over the price for a Portland cement concrete of similar grade.

1.13 Permission for starting the concrete work:

The surface where concrete or rock or form etc. on which concrete is to be placed, shall be got inspected and approved by the Engineer who shall then issue the permission for starting the work. Any concrete work done without such a permission shall be cut out and removed at the cost of contractors.

No concreting shall be started unless the surface of the foundation is first inspected and approved by the Engineer as stated above. If concreting is to be done on concrete previously laid, the surface of the old concrete shall be cleaned with wire brushed and all laitance removed to expose the original surface of metal and sand particles, etc. it shall then be covered with a 7 mm thick layer of cement mortar (1:2) before laying the fresh concrete.

1.14 Defective concrete:

The defective concrete shall be cut out and the work reconstructed with fresh concrete required quality in the presence of the Engineer. The concrete thus cut out shall not be reused under any circumstances. Should any concrete become permanently damaged due to creaking or broken or damage from whatever cause or should any concrete be found defective in quality due to honey combing or bad workmanship, it shall be removed forthwith and replaced by concrete of required quality at the cost of the contractors of the satisfaction of the Engineer.

2.0 FORM WORK:

2.1 Material:

All form work for concrete works shall be made either of planned and matched timber or MS plates. The timber for the form work shall be hard word dry and well seasoned. It shall not be so dry as to absorb water from concrete not shall it be so green as to shrink after erection. When steel plates are used for forms, the plates shall free from wrinkles, bents, lumps or other imperfections. The timber Corporations or steel plates shall have sufficient thickness to withstand the construction loads and the pressure exerted by the wet concrete as well as vibration during placing of concrete.

Normally the thickness shall not be less than 38mm for timber and 18 gauges for M.S. plates. However, in case where the depth of concrete to be pored in the form work is small the thickness of timber planks may be reduced in consultation with the Engineer.

2.2 Removal of form work:

In no circumstances shall forms to be strict off until the concrete reaches adequate strength as required or without obtaining permission of the Engineer. All form works shall be removed without such shock or vibration as would damage the concrete. Before the soffit and the struts are removed, the concrete surface shall be exposed where necessary in order to as certain has hardened sufficiently.

2.3 Surface treatment and finish:

When the form work is struck all the faces of concrete shall be smooth and sound, free from voids and air holes. Any roughness or irregularity on the exposed surfaces shall be immediately filled up while the concrete is still green with cement wash and or 1:1 ½ cement mortar properly trowel led and finished. Such patching of the concrete face shall be carried out with the permission of the Engineer. If the concrete is found honeycombed the honey combed

portion and whatever surrounding the Engineer shall be dismantled and fresh concrete of proper quality shall be reinstated at Contractor's cost.

3.0 REINFORCEMENT:

The total reinforcement to be used on the work shall confirm to the specification of the latest IS: 1139, IS: 1786, IS: 226, IS: 432 as the case may be in respect of physical properties, chemical requirements tolerance limits etc.

All steel reinforcement and wire, nails etc, required for the works shall be supplied by the contractors who shall make their own arrangements for the procurement of reinforcement bars from the open market.

4.0 BRICK MASONRY WORKS:

4.1 Materials:

(1) Bricks: brick to be sound, well burnt, free from cracks, to ring when struck and not to crack or break when soaked in water or thrown on the ground on their flat face from a height of 60 cm, or when soaked in water in a saturated condition, regular in shape and uniform in size. They shall be of the best description obtainable in market and of the best quality and colour. They shall not absorb water more than 20 percent dry weight**,** when immersed in water for 24 hours. They shall have a crushing strength of not less than 35 kg / sq,cm.

(2) Sand: sand shall conform to the specifications detailed already for sand.

4.2 Cement Mortar:

All cement mortar to be used on this work shall be in proportion as specified and directed by the Engineer. The ingredients shall be in proportion as specified and directed by the Engineer. The ingredients shall be measured dry, by means of properly made gauge boxes on a covered platform and shall be thoroughly mixed dry before adding water to get the required consistency. Only such quantity of mortar shall be prepared at a time as can be used up immediately. Mortar after it has begun to set shall not be allowed to be racked up again, but shall be rejected and the contractor shall remove the same from the work site immediately.

4.3 Workmanship:

The work of brick shall be carried out in a workman like manner and in a prefect plumb, line and level as required. Brick shall be thoroughly cleaned well watered or soaked in water for at least 12 hours before being used on the work. No broken bricks shall be

preserved throughout the work both laterally and transversely. All bed joints shall be horizontal in vertical walls, radial in arches and at right angle for the slopes in battered wells. In walling, the courses shall be kept perfectly horizontal and rise in plumb. The vertical joints shall break joints with the courses below and above. Use of bats shall be avoided as far as possible. The joints shall be close and regular and shall not exceed 12mm in thickness. The bond shall be English bond unless otherwise permitted by the Engineer. The contractors shall provide at their own expense all moulds, templates, centers, scaffolding etc. as may be required for the proper execution of the work and nothing extra will be paid for the same including dewatering where necessary.

The mortar used should be stiff. The brick work shall be kept wet while the work is in progress for at least seven days after completion, to the entire satisfaction of the Engineer. On Sundays and holidays when the work is not in progress, the masonry shall be watered continuously by engaging Bhisties. Watering shall be done carefully so as not to wash out the mortar of the joints. The Engineer shall be at liberty to engage Labours at contractor's cost to water/curing. If contractors fail to do so, the work shall be pulled down and rebuilt at the risk and cost of the contractors.

The whole of the masonry work shall be carried up at one uniform level through out but where breaks are unavoidable, the joint shall be made in good long steps raked so as to prevent cracks arising due to separation of old and new work. All junctions of walls shall be formed at the time the walls are being built and cross wells shall be carefully bonded into the main walls.

When the work is to be added to existing structure, the old work must be prepared to receive new work by roughening and grouting with a layer of rich mortar and both must be carefully bonded together.

During rains, the works to be carefully covered without extra charge so as to avoid fresh mortar being washed away.

4.4 Cement plaster:

Cement plaster shall be provided to brick masonry or rubble masonry wherever directed by the Engineer.

(a) Materials:

(1) Cement: cement shall conform to the specifications detailed earlier.

(2) Sand: sand shall conform to the specifications detailed earlier.

(b) Cement Mortar: All cement mortar to be used on this work shall

be in proportion as specified in the drawings and as directed. The ingredients shall be measured dry, by volume of properly made gauge boxes, on a covered platform and shall be thoroughly mixed dry before adding water to get the required consistency. Only such quantity of mortar shall be prepared at a time as can be used up immediately. Mortar after it has begun to set shall not be allowed to racked up again, but shall be removed from the work immediately. Cement mortar shall be used within 30 minutes after it leaves the mixing Corporation or mill.

(c) Workmanship:- All bricks shall be thoroughly wetted, joints and raked and well washed.

4.5 Pointing:

The whole of the exposed faces of the brick work, out stone work and stone paving when described as to be pointed are to have the joint raked out to a depth of 13 mm and pointed with cement and sand (unless otherwise described) in the proportion of one of cement to one of fine send flush with the face of the work and out straight, parallel and of uniform width.

The exposed faces of the rubble-work are to be similarly pointed (when described as to be pointed) but the joints shall be raked out to a depth of 20mm and shall be racked out to a depth of 20mm and shall be irregular in direction. The above description of pointing shall apply generally so all classes except only as the pointing materials which may in certain cases or otherwise described in this specification.

4.6 Protection of work from sun:

All cement work pointing, plastering and concreting shall be protected from the sun and the surface kept moisture until in the opinion of the Engineer-in-charge it is thoroughly set.

5. DEFINITION OF INCOMPLETE WORK:-

A line or trench of sewer pipeline (including the excavation thereof and all other accessories thereto) will be considered incomplete unless entirely laid, jointed and fully tested, encased wherever required the trench filled and consolidated and the manhole at each and completely finished with floors, channels, cover and all other detail. A manhole will be considered complete unless it is completely finished as above and at least one of the lines of pipe sewer to which it belongs or is attached is complete as described above.

The contractor shall have no claim for incomplete work and no incomplete work will be measured up for payment to the contractors.

5.1 Rates quoted in Bill of Quantities to cover everything necessary for complete Execution of work:

The rates quoted will be held to cover everything necessary of the due and complete execution of the work according to the drawings and the several conditions and the stipulations of the contract, including specification, or the evident intent and meaning of all or either of them or according to customary usage and for the periodical and final inspection and test and proof of the work in every respect and for measuring, numbering or weighing the same including setting out and laying or fixing in position and the provision of all materials, power, tool rammers, beaters, labour, tackle platforms with impervious lapped joints for scaffolding ranging rods, straight edges, centering and boxes, wedges, moulds, templates, post straight rails, boning-staves, measuring rods, page boards, shores, barriers, fencing, lighting, pumping apparatus, temporary arrangements of passage of traffic, access to premises and continuance of drainage, water supply and lighting (if interrupted by the work) lard temporary sheds and buildings nahanis roofed in or otherwise haulage, painting, varnishing, polishing, establishments for efficient supervision and watching arrangements for the efficient protection of life and property and all requisite plant, implements and appliances every kind, except only such matter and things as it may be distinctly stated here in are to be supplied by the contractors. A rate for anyone description of work is to be held to include such items of other classes of and for these on separate specific charge will be admitted. The contractors shall keep every portion of the work clear of accumulation from time to time and shall leave every portion of the work clean, clear, perfect and at the conclusion of whole, providing at their own cost all such material implement appliances and labour as the Engineer may require to prove if it is to be so.

6. CONTRACTOR TO OBSERVE ALL CONDITIONS:

The contractors are particularly directed to observe from the Articles of Agreement and the specifications, what is to be included in their rates for the several portions of the work and also under what conditions payments are to be made.

Addl. Asst. Engineer	**Dy.Ex.Engineer**	**CITY ENGINEER**
R.M.C.	**R.M.C.**	**R.M.C.**

Signature of Contractor