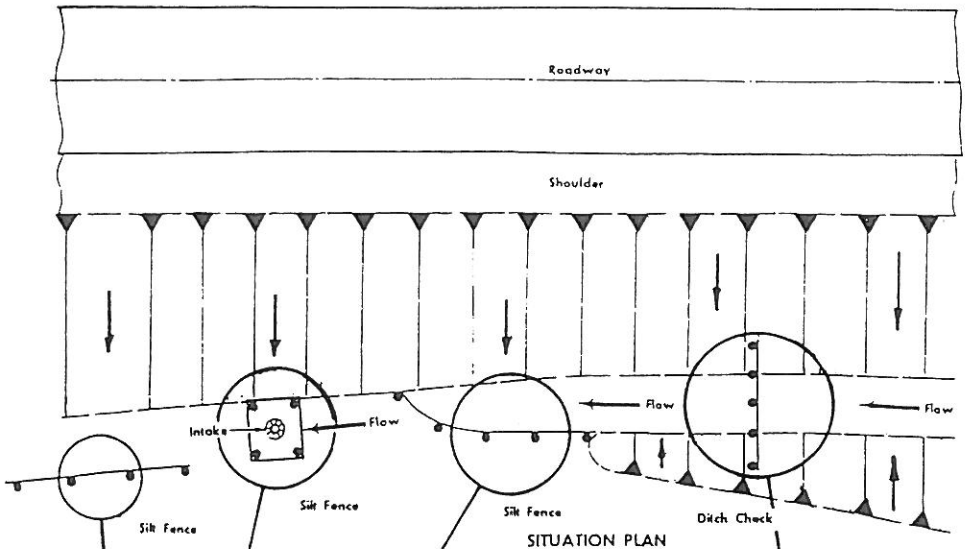
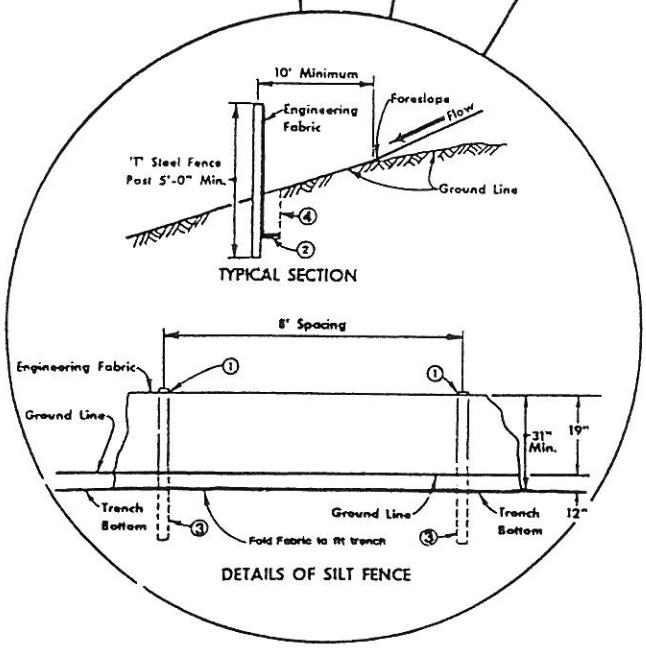
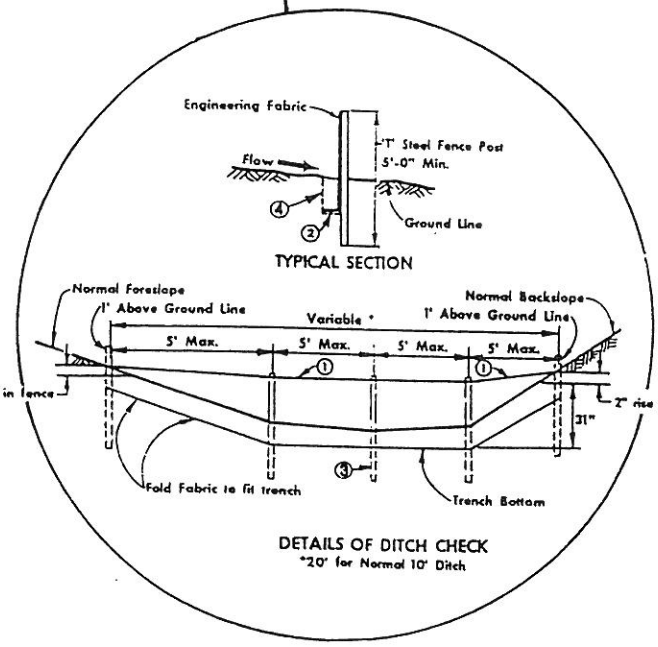
# STANDARD DRAWINGS




SITUATION PLAN




NOTES:

1. SECURE TOP OF ENGINEERING FABRIC TO STEEL POST, SEE DETAIL OF ATTACHMENT TO POST.
2. ENGINEERING FABRIC TO BE FOLDED ACCROSS THE BOTTOM OF THE TRENCH.
3. STEEL POST TO BE EMBEDED 28" BELOW TRENCH BOTTOM.
4. 12" DEEP x 4" WIDE MINIMUM TRENCH, BACKFILL TO BE COMPACTED.

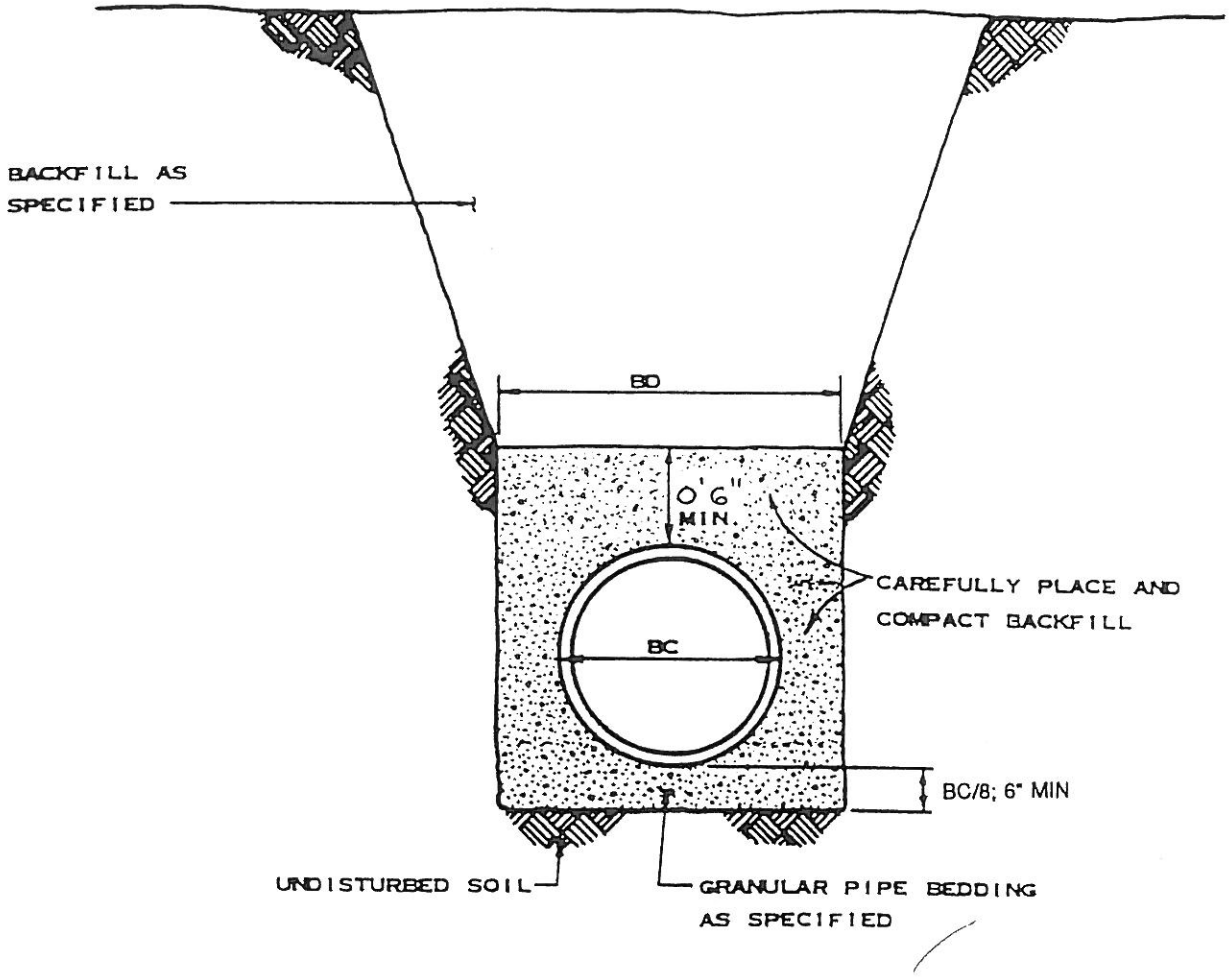
CITY OF WEST DES MOINES

"CROSSROADS OF THE INTERSTATES"

# SILT FENCE DETAILS

REVISED : 3-94

DWG. NO 21




NOTES

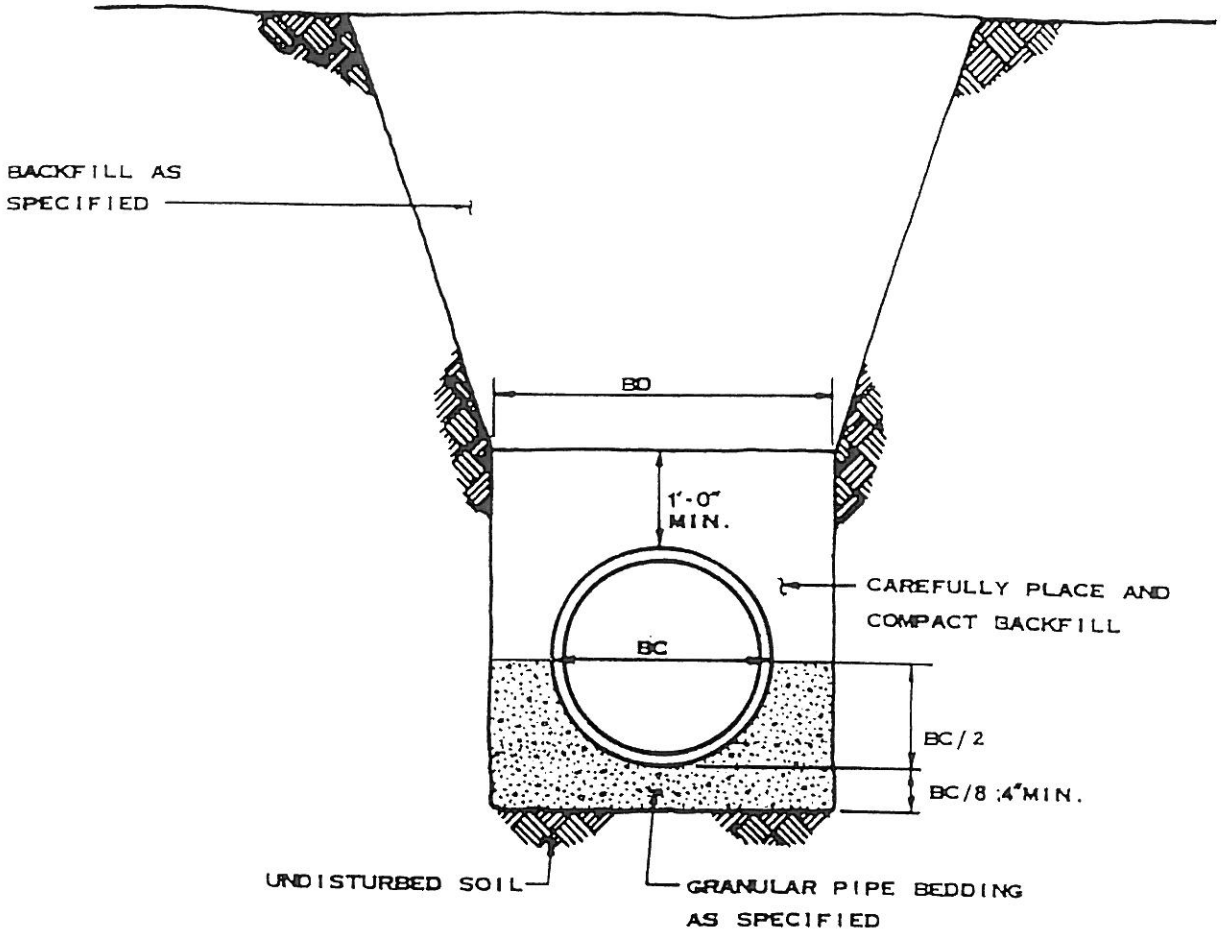
1. BC IS OUTSIDE DIAMETER OF PIPE.
2. BD IS TRENCH WIDTH AT TOP OF PIPE.
3. MINIMUM BD = BC + 12"; 2'-3" MIN.
4. FOR TRENCH DEPTHS EXCEEDING 20 FEET, PROVIDE PIPE BEDDING AS DIRECTED BY CITY.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

FLEXIBLE SEWER PIPE BEDDING

REVISED
3-94

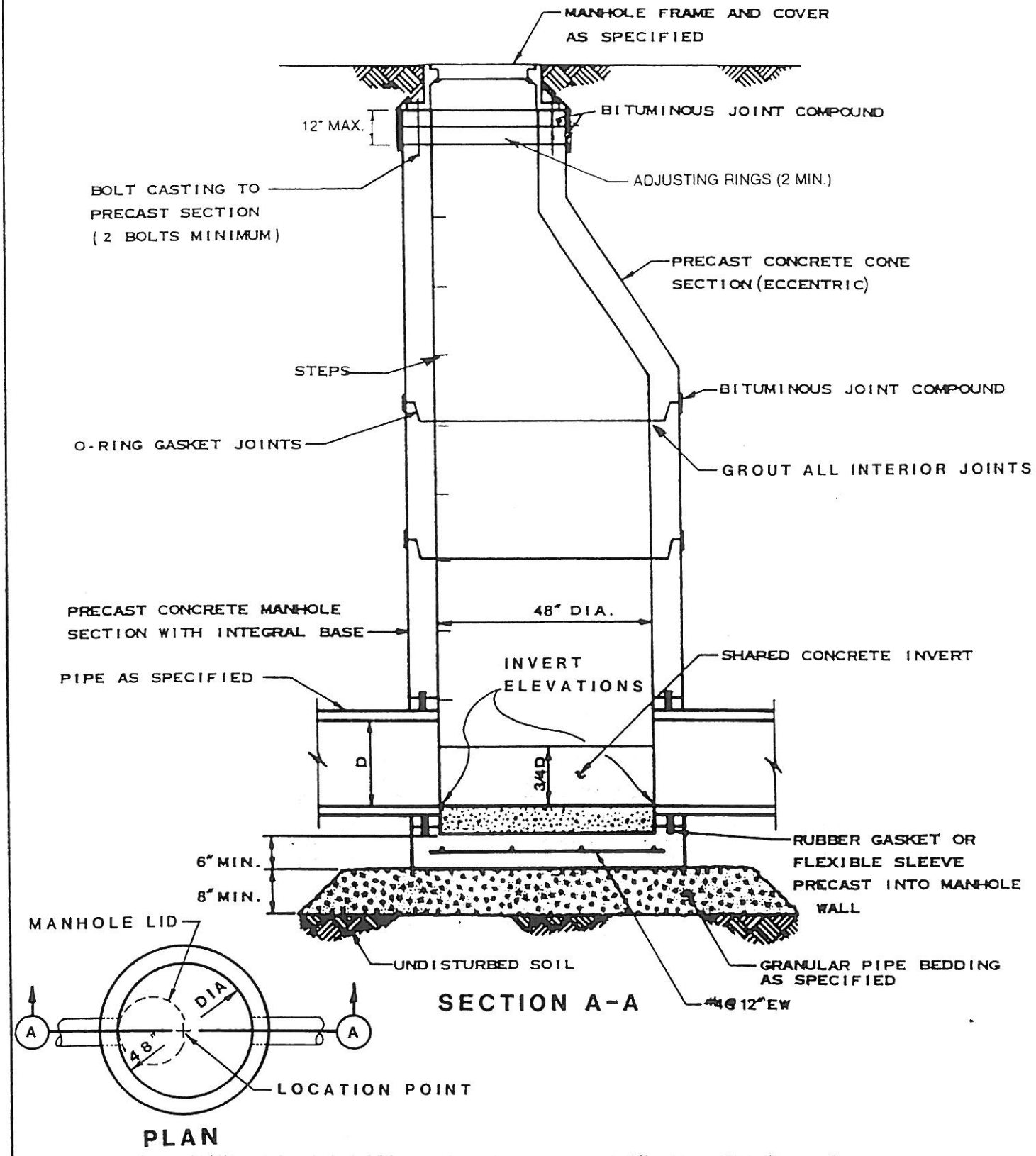
DWG. NO.
4.1




NOTES

1. BC IS OUTSIDE DIAMETER OF PIPE.
2. BD IS TRENCH WIDTH AT TOP OF PIPE.
3. MINIMUM BD = BC + 12"; 2'-3" MIN.
4. FOR TRENCH DEPTHS EXCEEDING 20 FEET, PROVIDE PIPE BEDDING AS DIRECTED BY CITY.

| | | |
|---|---|---|
| CITY OF WEST DES MOINES<br>"CROSSROADS OF THE INTERSTATES" | RIGID SEWER PIPE BEDDING | REVISED :<br>3-94<br>DWG. NO.<br>4.2 |



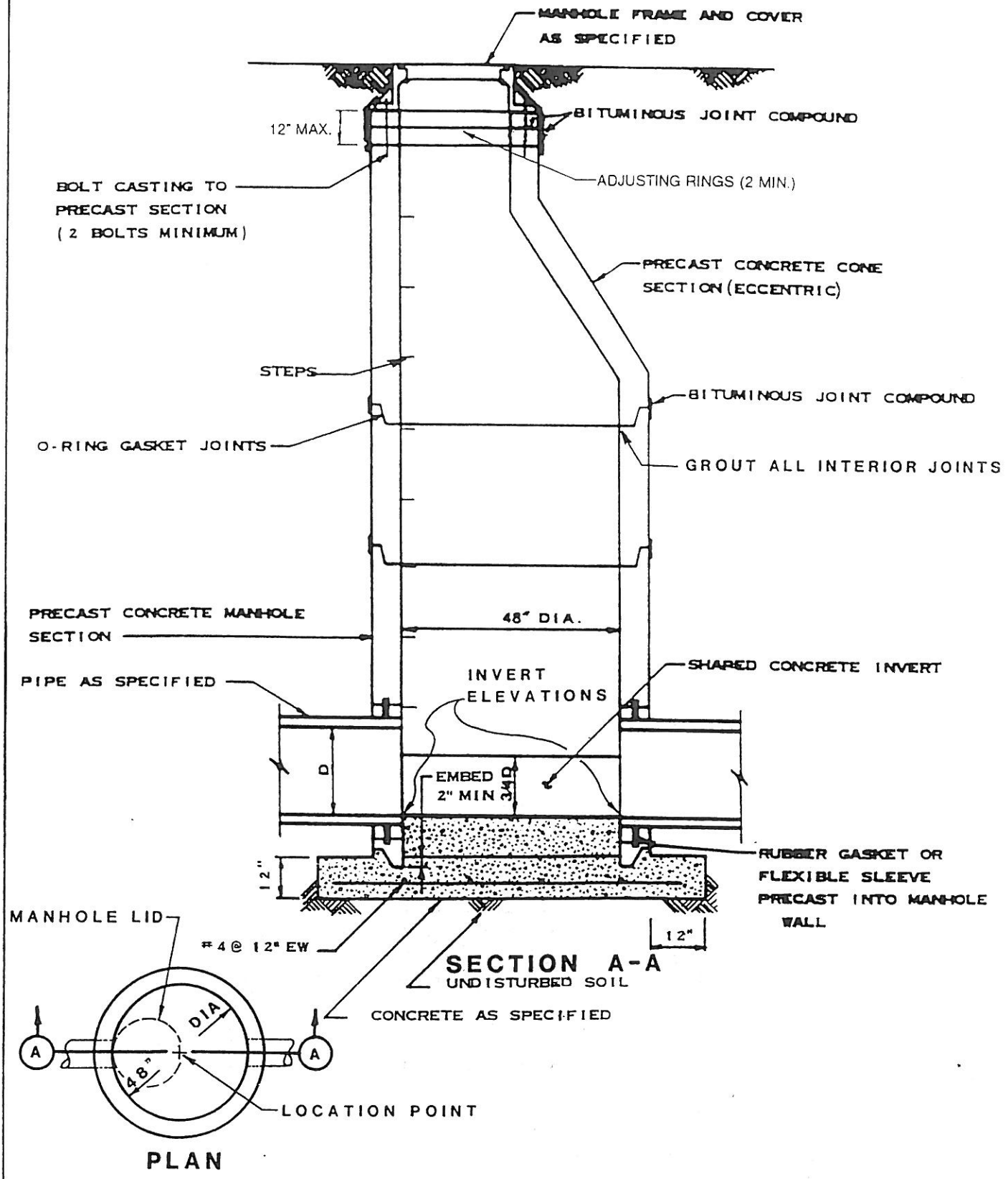

CITY OF WEST DES MOINES

"CROSSROADS OF THE INTERSTATES"

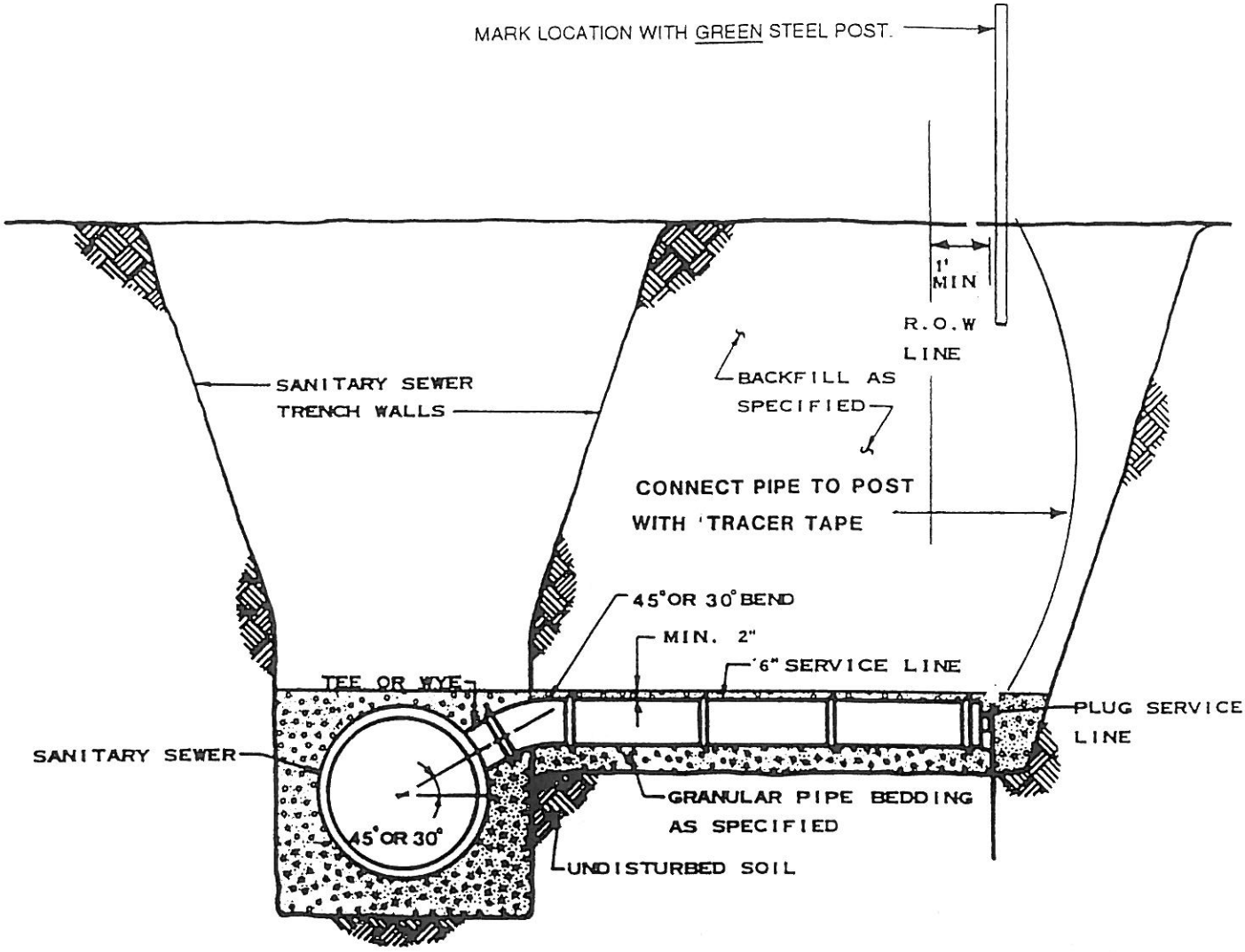
# SANITARY SEWER MANHOLE (PRECAST BASE)

REVISED : 3-94

DWG. NO.




| | | |
|---|---|---|
| CITY OF WEST DES MOINES<br>"CROSSROADS OF THE INTERSTATES" | SANITARY SEWER MANHOLE<br>(CAST IN PLACE BASE) | REVISED<br>3-94<br>DWG. NO<br>4.4 |




NOTES

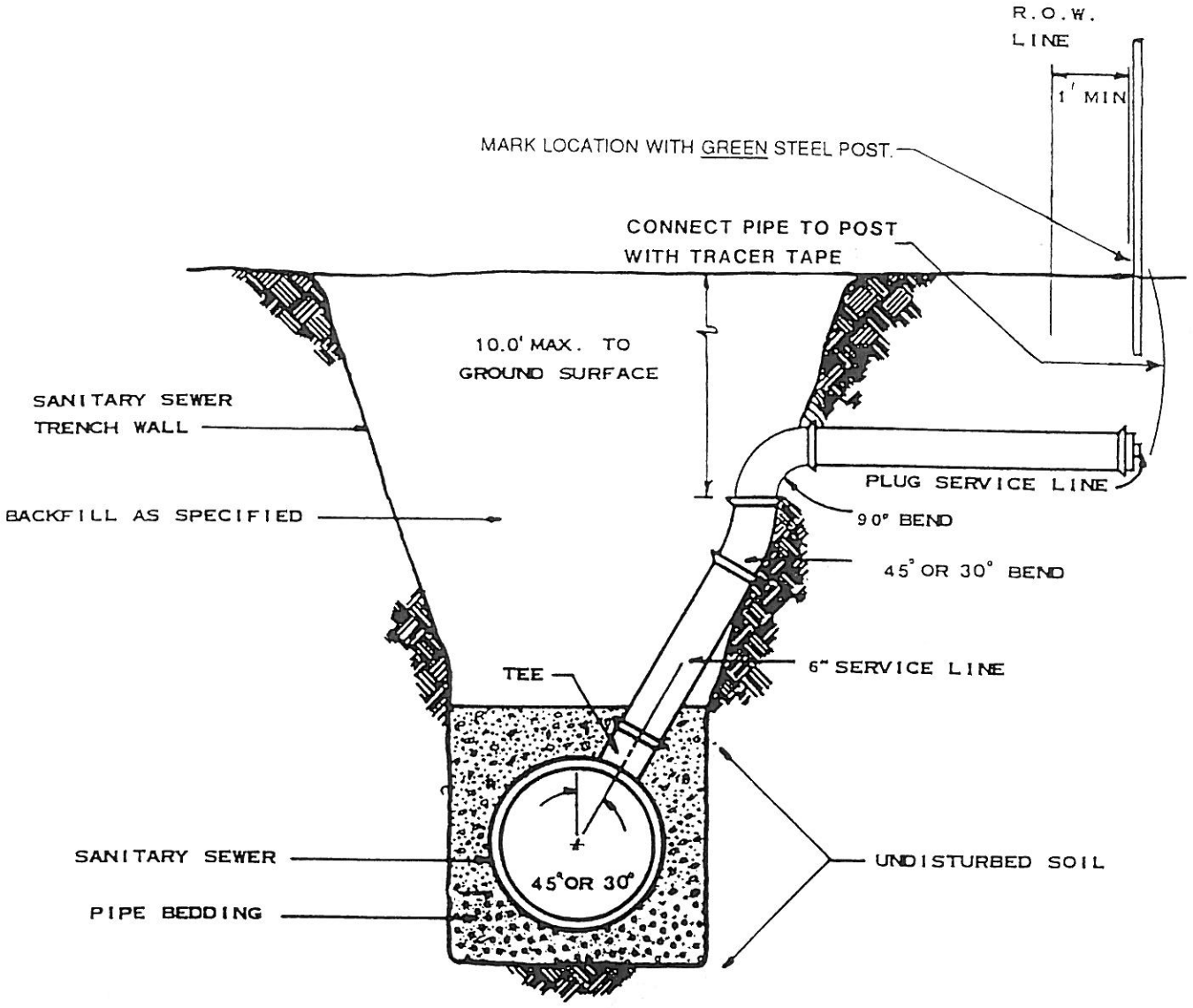
1. USE FOR SERVICE CONNECTION WHEN SANITARY SEWER DEPTH IS 12.0' OR LESS OR WHEN REQUIRED TO SERVE ADJACENT PROPERTY.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# SANITARY SEWER SERVICE

REVISED 3-94

DWG. NO 4.5




NOTES

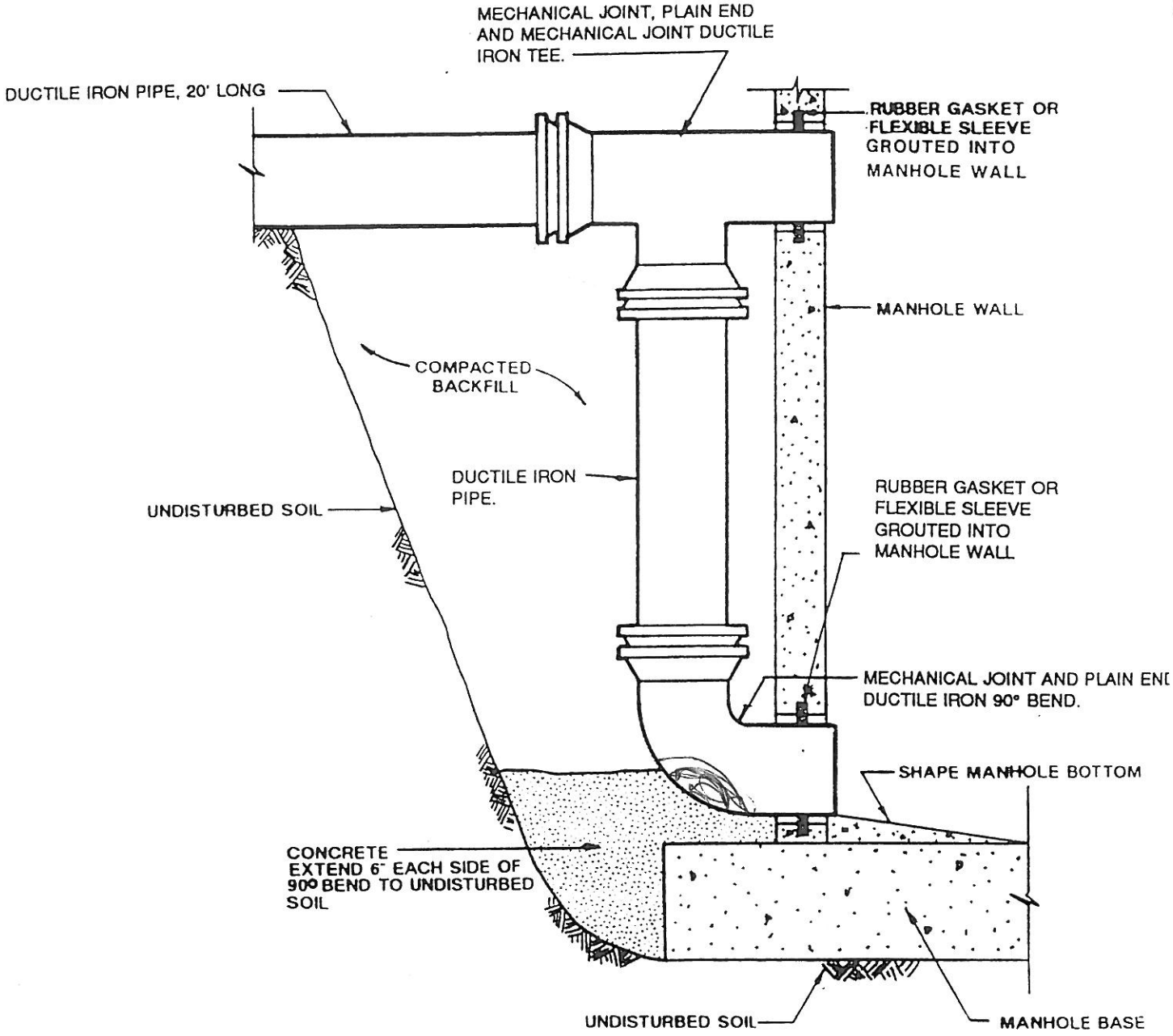
1. USE FOR SERVICE CONNECTION WHEN SANITARY SEWER DEPTH EXCEEDS 12.0' UNLESS ADDITIONAL DEPTH IS NECESSARY TO SERVE ADJACENT PROPERTY.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# SANITARY SEWER SERVICE RISER

REVISED : 3-94

DWG. NO. 4.6




NOTE:

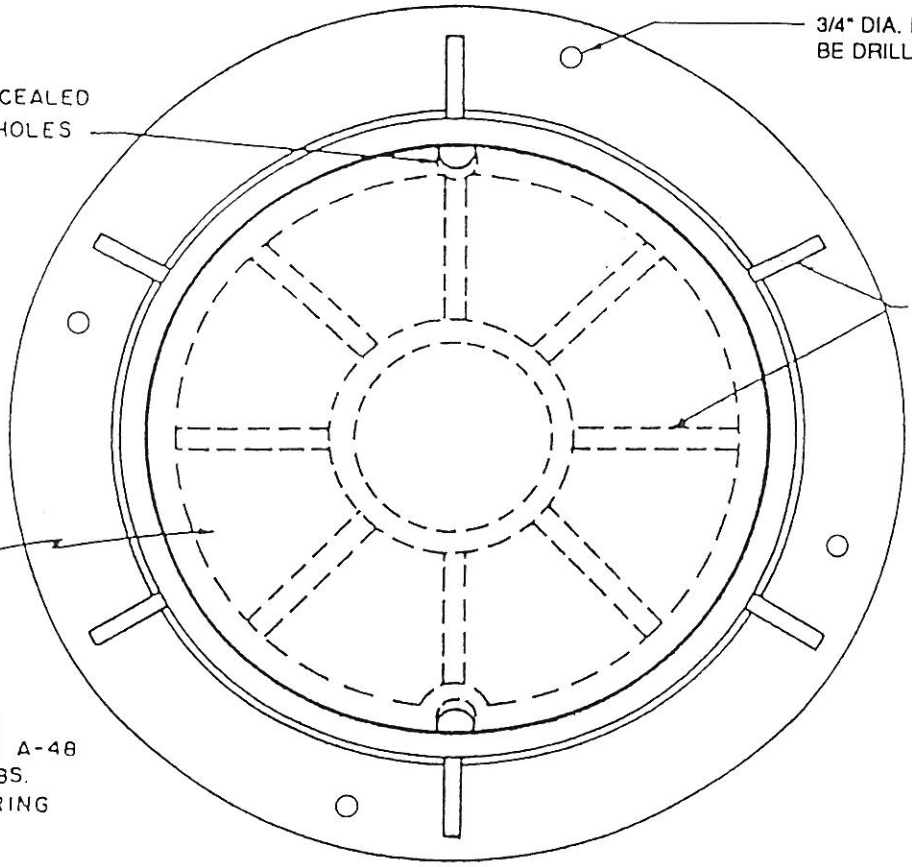
1. USE DROP CONNECTIONS WHERE REQUIRED
2. EXTEND CONCRETE 6" ON EACH SIDE OF 90° BEND TO UNDISTURBED SOIL
3. DUCTILE IRON PIPE: ANSI A21.50. AWWA C150.CLASS 52.
4. DUCTILE IRON PIPE AND DROP PIPE SAME SIZE AS LINE INTO MANHOLE.
5. MECHANICAL JOINT FITTINGS: ANSI A21.10, 150 PSI PRESSURE RATING. COAT WITH STANDARD COATING INSIDE AND OUT.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

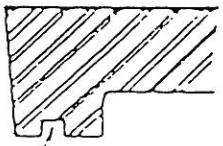
# SANITARY SEWER DROP CONNECTION

REVISED
3 94

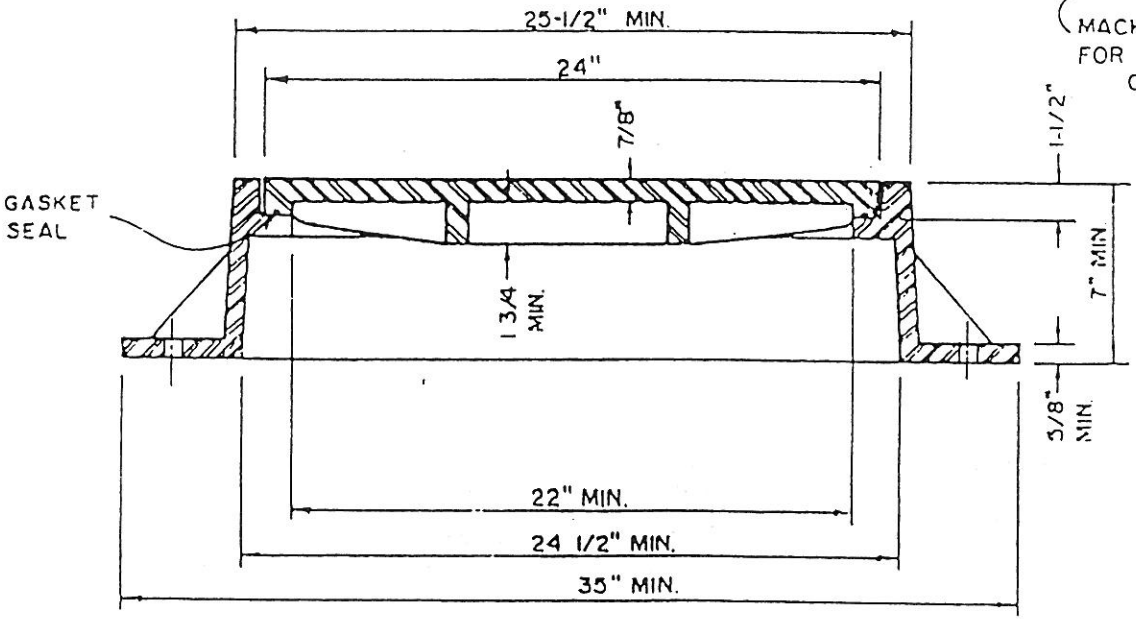
DWG. NO
4.7



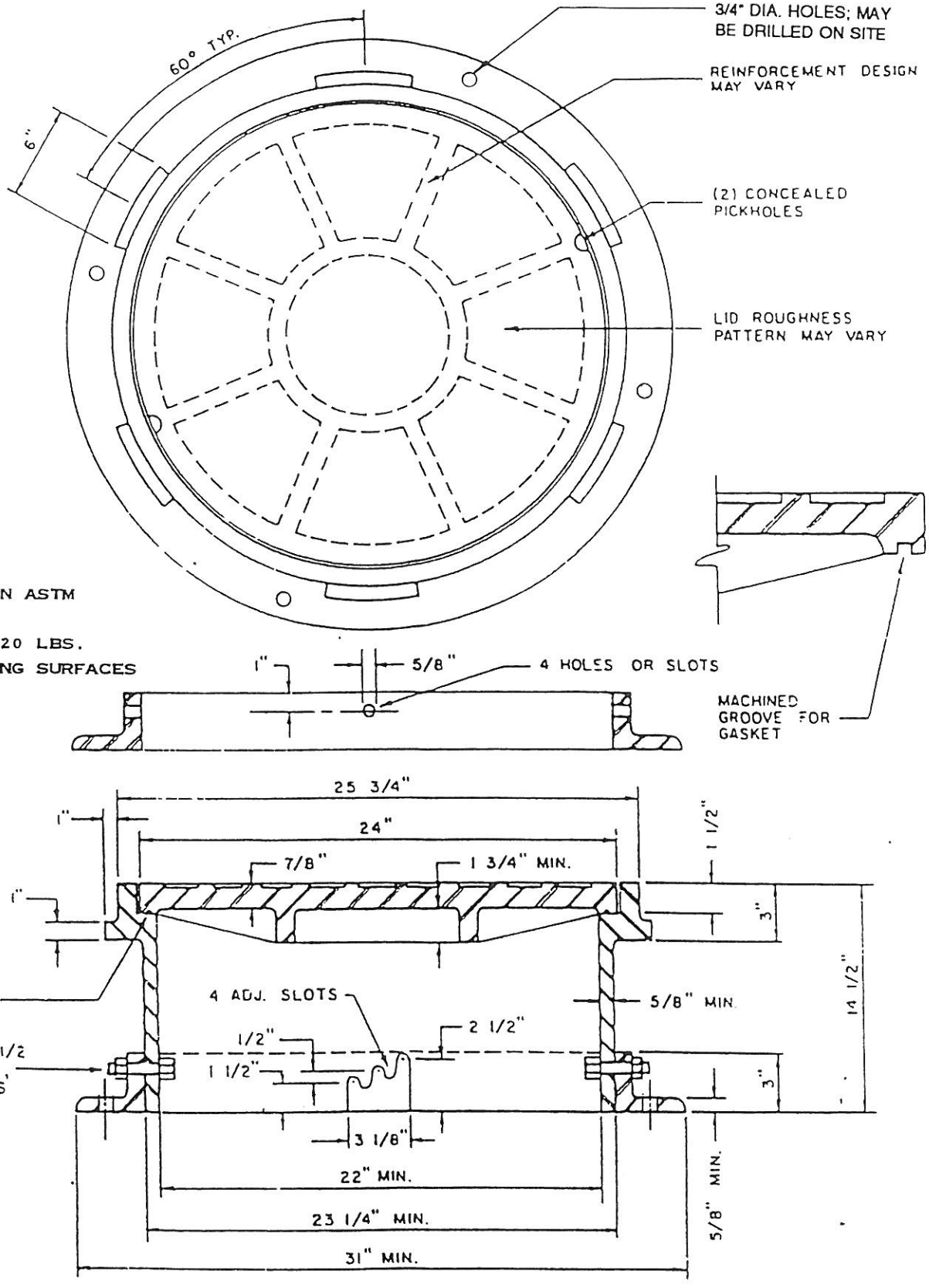

MATERIAL:
CAST GRAY IRON
CLASS 30, ASTM A-48
MIN. WGT. 350 LBS.
MACHINED BEARING SURFACES



MACHINED GROO FOR SELF-SEAL GASKET




| | | |
|---|---|---|
| CITY OF WEST DES MOINES<br>"CROSSROADS OF THE INTERSTATES" | **TYPE "A" CASTING SANITARY SEWER** | REVISED 3-94<br>DWG. NO 4.8 |




MATERIAL:
CAST GRAY IRON ASTM
A-48 CLASS 30
MIN. WEIGHT 420 LBS.
MACHINE BEARING SURFACES

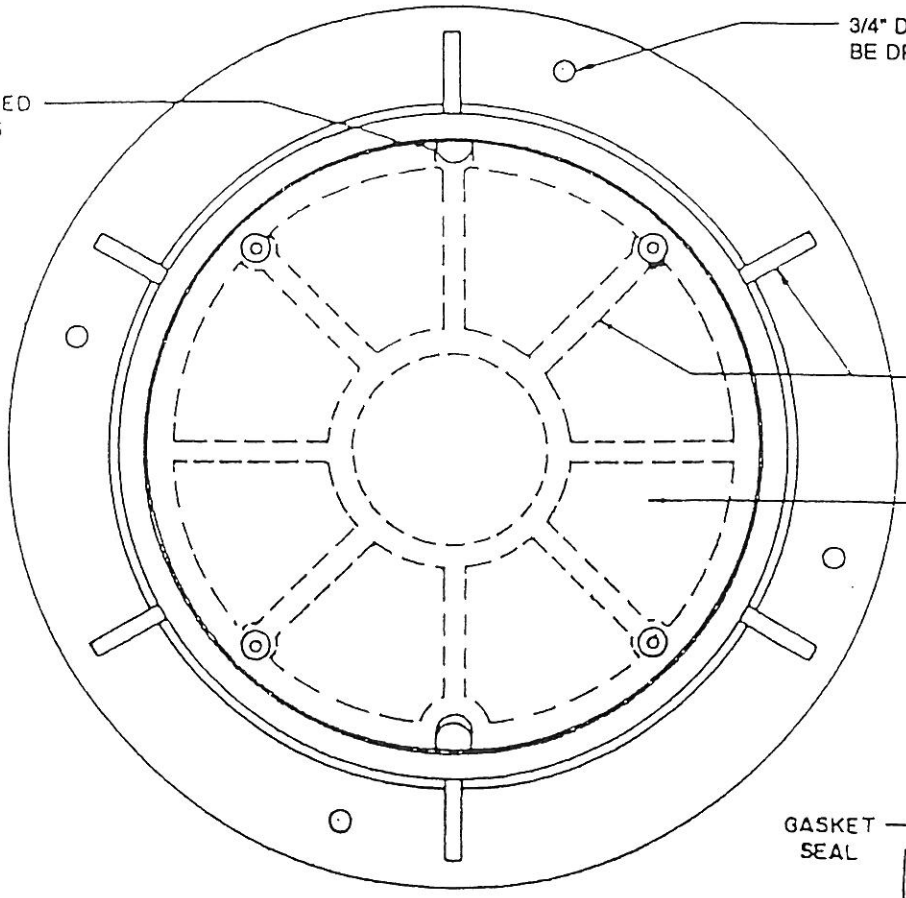
NOTE:
1. USE ONLY TYPE C CHECKERED TOP LID; RAISED DIAMOND PATTERN NOT ACCEPTABLE.

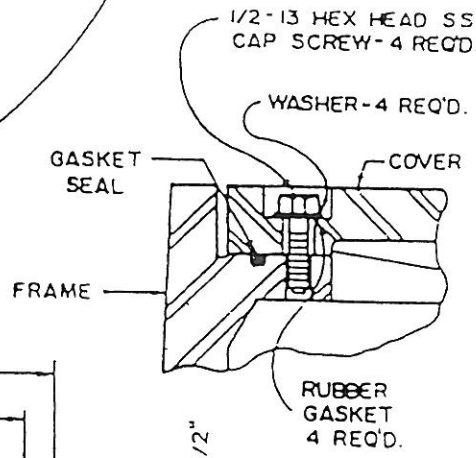
CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE "B" CASTING SANITARY SEWER

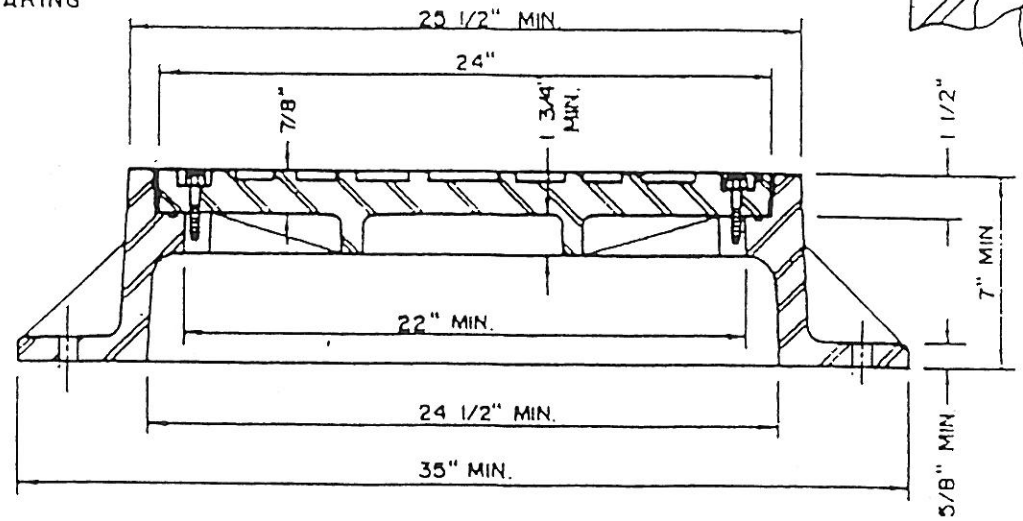
REVISED 3-94

DWG. NO 4.9




MATERIAL:
CAST GRAY IRON
CLASS 30, ASTM A-48
MIN. WGT. 350 LBS.
MACHINED BEARING SURFACES

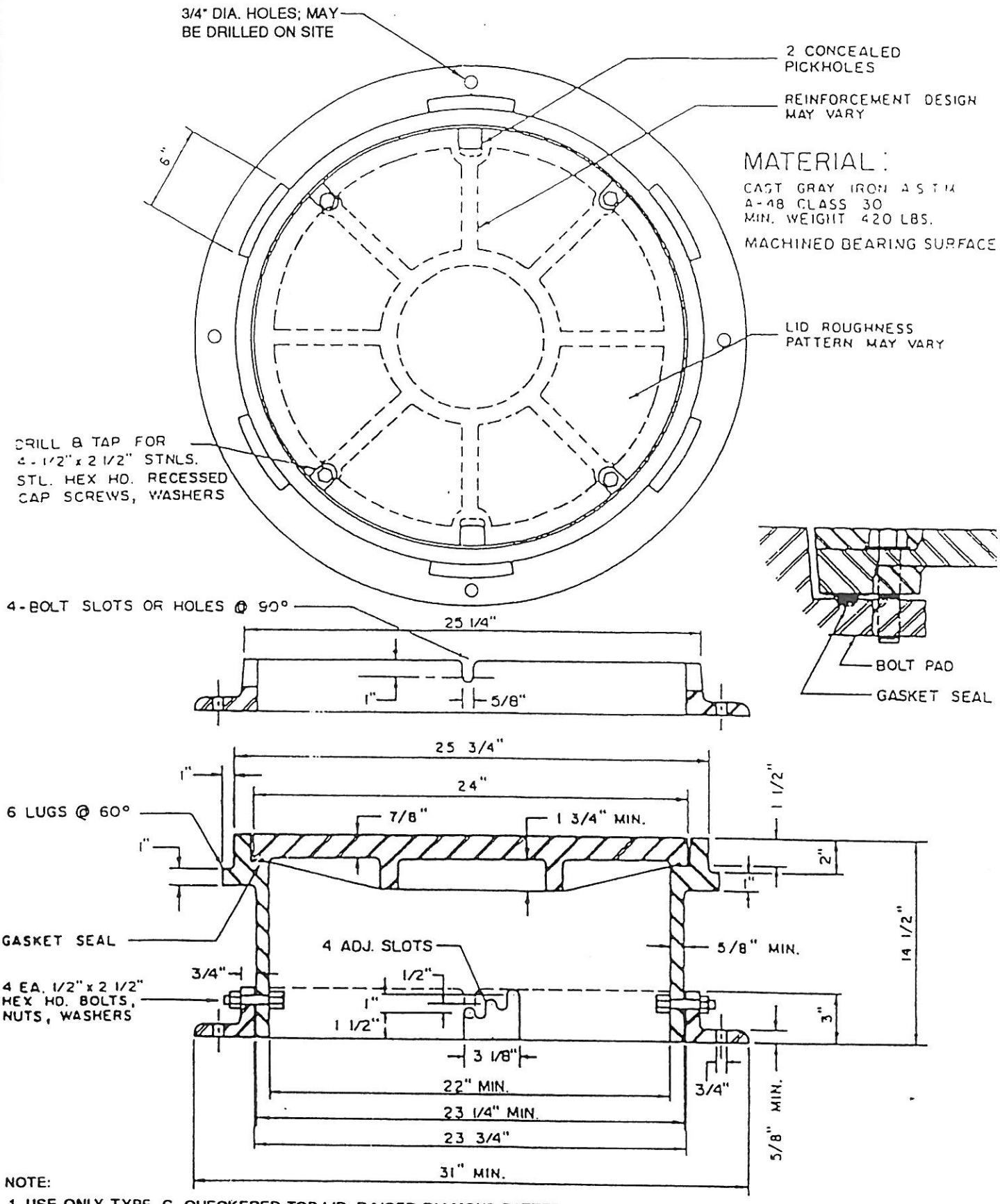



CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE "C" CASTING SANITARY SEWER

REVISED 3-94

DWG. NO. 4.10




NOTE:

1. USE ONLY TYPE C CHECKERED TOP LID; RAISED DIAMOND PATTERN NOT ACCEPTABLE.

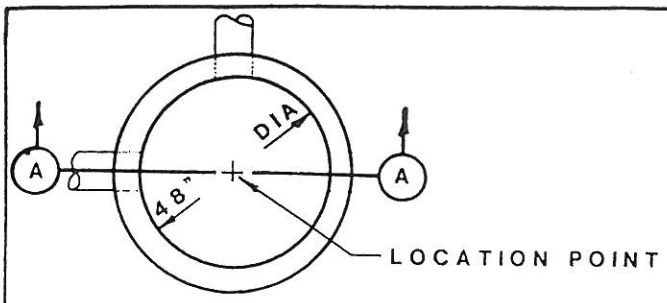
CITY OF WEST DES MOINES

"CROSSROADS OF THE INTERSTATES"

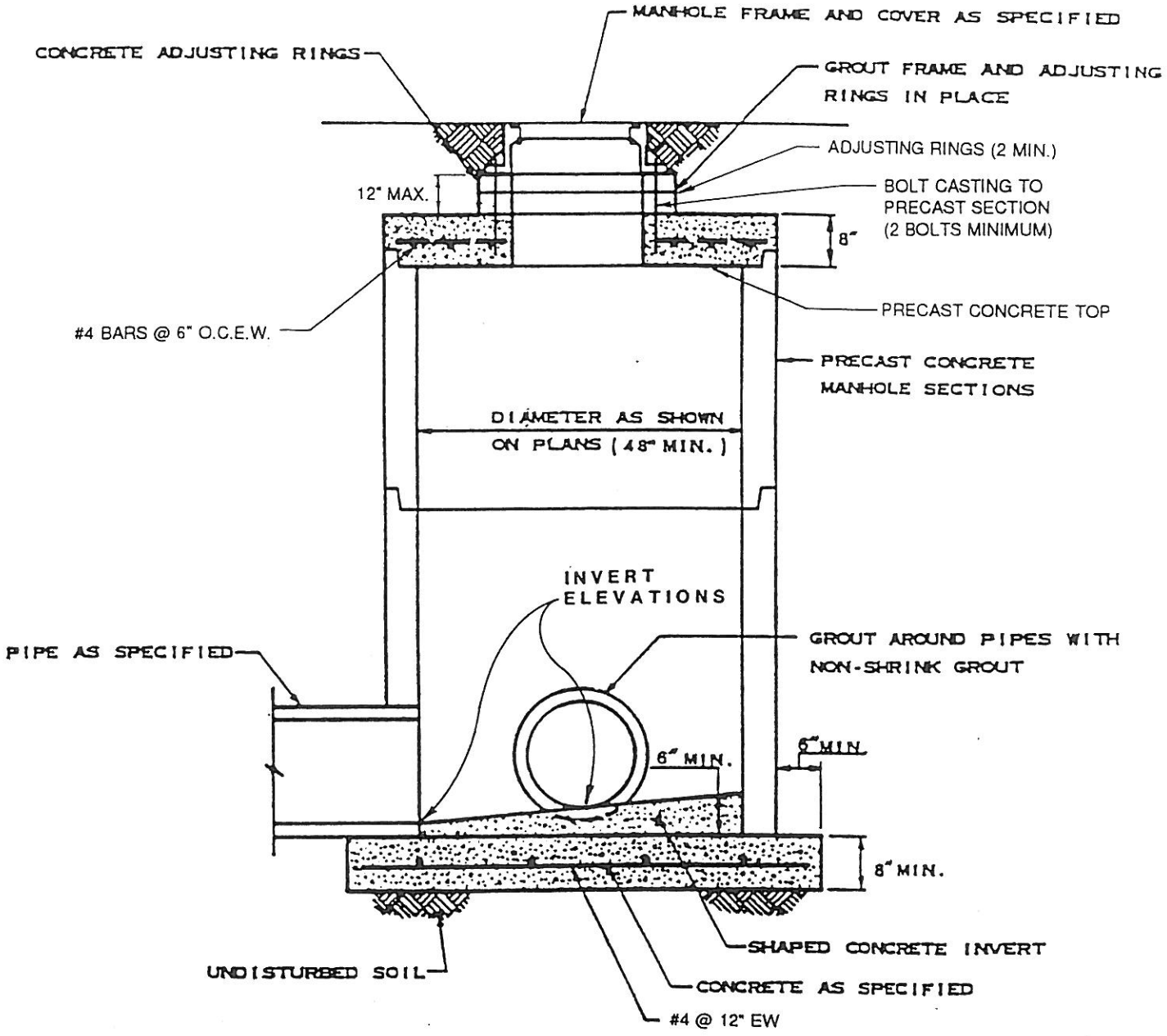
# TYPE "D" CASTING SANITARY SEWER

REVISED 3-94

DWG. NO. 4.11




PLAN




SECTION A-A

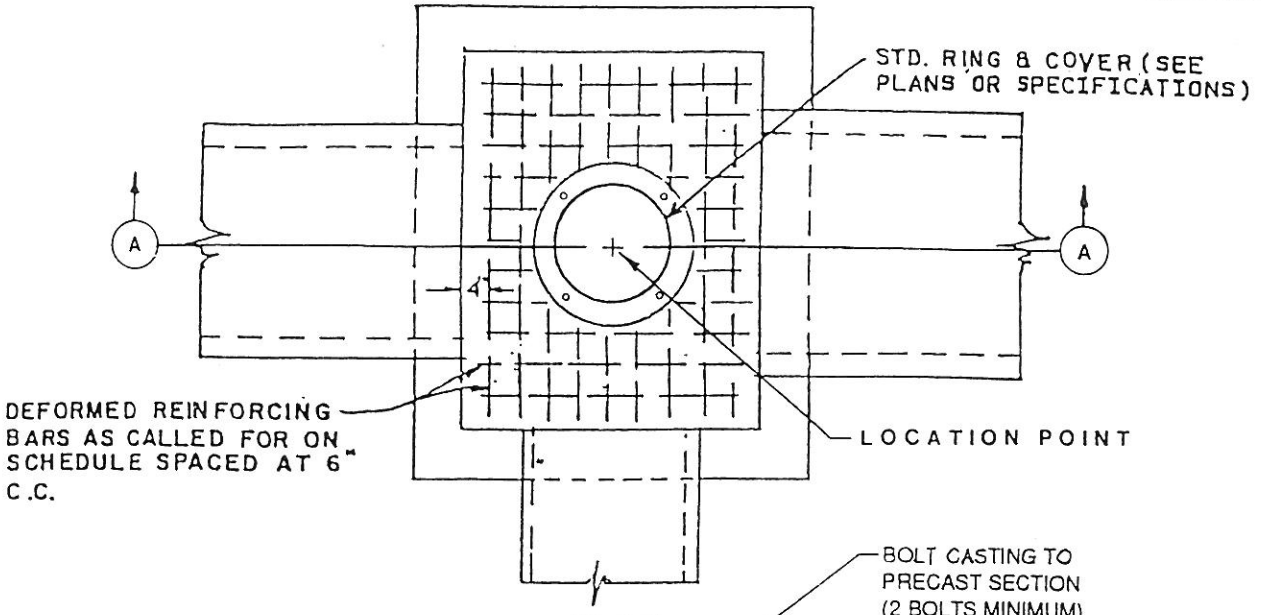
NOTES:
1. MINIMUM DEPTH: 4.5'
2. PRECAST CONCRETE TOP SHALL BE SUITABLE
3. BOLT CASTING TO PRECAST TOP (2 BOLTS MINIMUM)

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

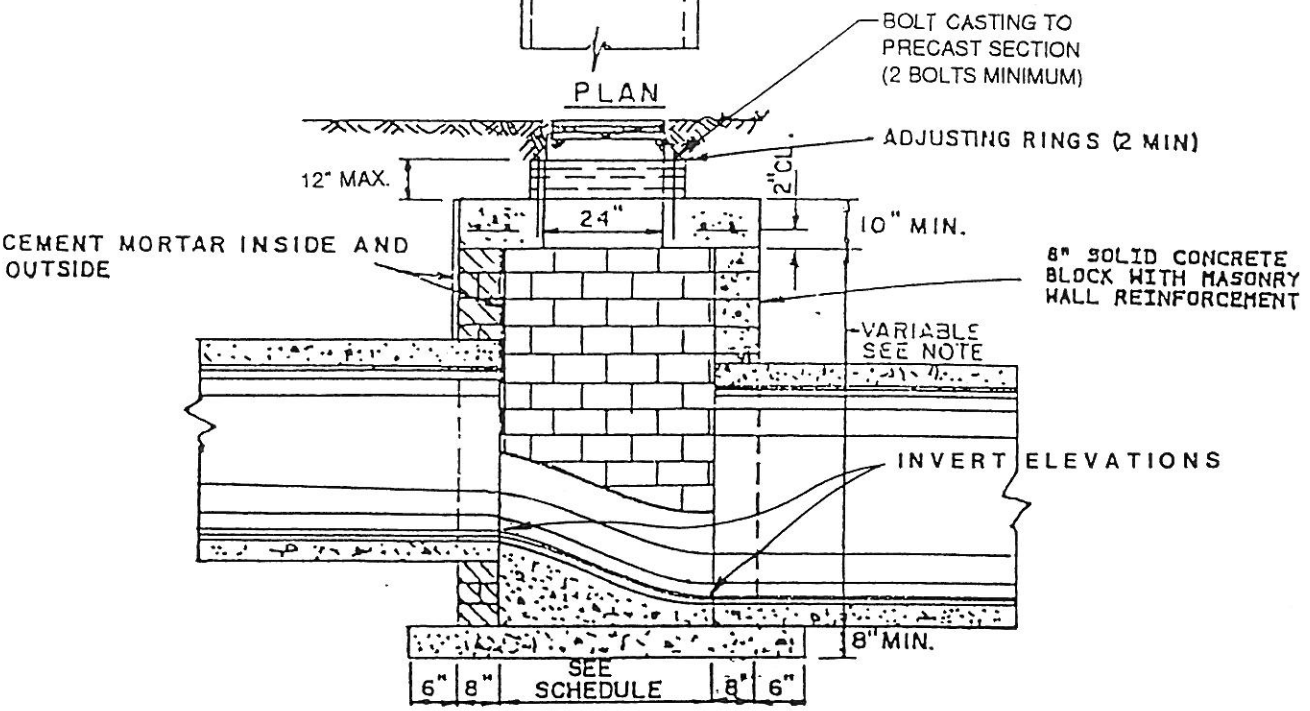
# TYPE A STORM SEWER MANHOLE

REVISED : 3-94

DWG. NO. 5.1




PLAN




SECTION A-A

## MIN. MANHOLE SIZE & STEEL SCHEDULE

| PIPE SIZE INSIDE DIA. | MIN. INSIDE DIM. ✳ | BAR SIZE UNDER PAVEMENT | BAR SIZE UNDER PARKING |
|---|---|---|---|
| 54" | 72" | 6 | 5 |
| 48" | 64" | 6 | 5 |
| 42" | 56" | 5 | 5 |
| 36" | 56" | 5 | 4 |
| 30" | 48" | 4 | 4 |
| 24" OR LESS | 40" | 4 | 4 |
| NONE | 40" | 4 | 4 |

✳ CORRESPONDING SIDE

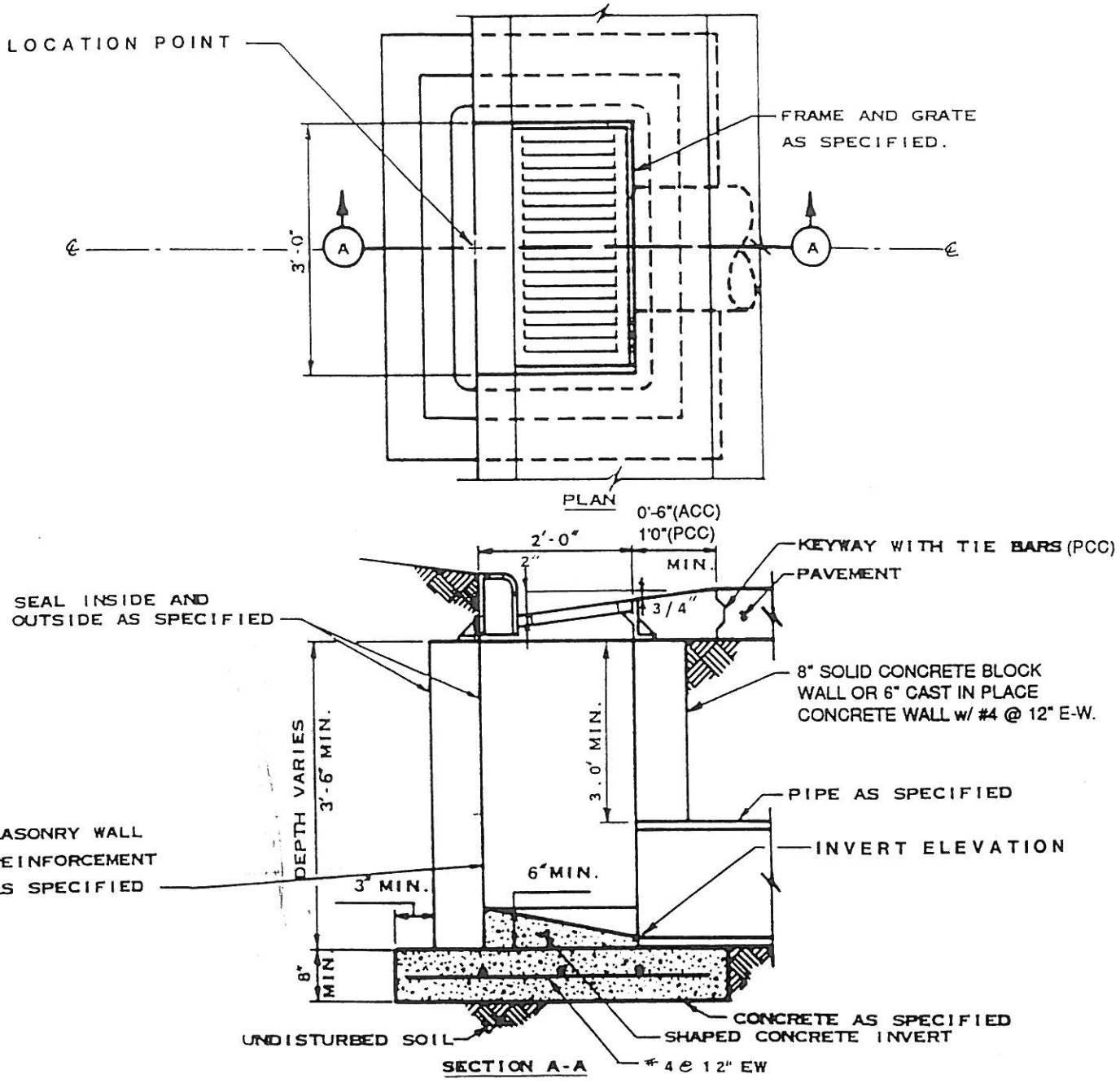
NOTES:
1. MAXIMUM DEPTH - 8' FROM CASTING RIM TO INVERT.
2. MINIMUM DEPTH - CHECK FOR PIPE SIZE SPECIFIED.
3. WHEN THE CASTING IS PLACED IN AN AREA OF UNDEVELOPED GROUND, OPEN FIELDS OR PASTURES, IT SHALL BE SET 9" ABOVE THE SURROUNDING GROUND.
4. BOLT CASTING TO PRECAST TOP (2 BOLTS MINIMUM)

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE B STORM SEWER MANHOLE

REVISED 3-94

DWG. NO. 5.1A




NOTES:
1. MAXIMUM PIPE SIZE: 27" DIAMETER FOR 3' SIDE.
   18" DIAMETER FOR 2' SIDE.
2. MAXIMUM DEPTH: 7' FROM TOP OF CURB TO INVERT.

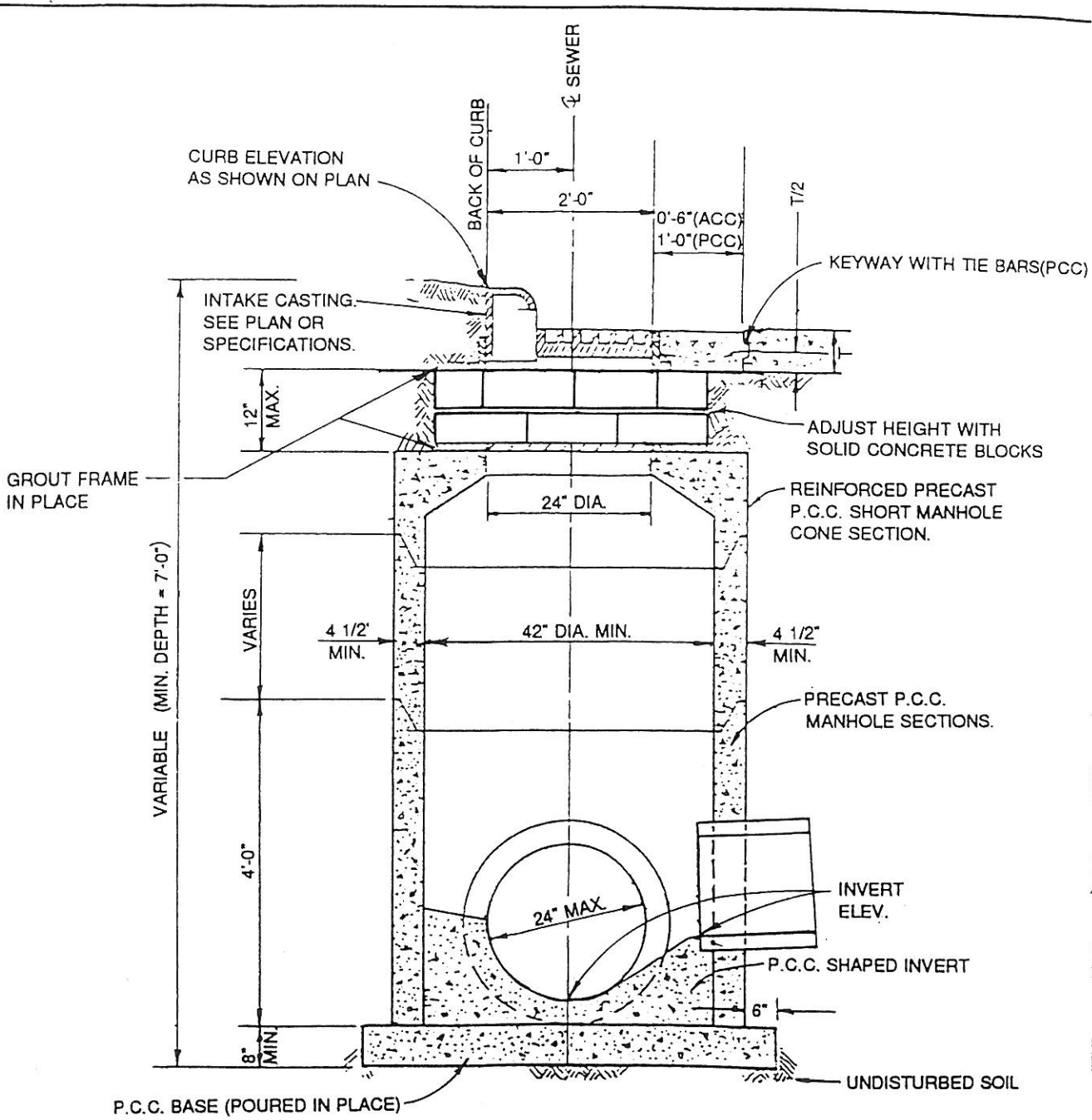
PCC = PORTLAND CEMENT CONCRETE OPTION
ACC = ASPHALTIC CEMENT CONCRETE OPTION

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE M-A INTAKE

REVISED
3-94

DWG. NO.
5.2




## HALF SECTION

NOTES:
1. MAXIMUM PIPE SIZE: 30" DIAMETER PERPENDICULAR TO CURB; 36" PARALLEL TO CURB
2. MAXIMUM DEPTH: 7" FROM TOP OF CURB
3. CONSTRUCT CONCRETE SHAPING AT THE TRANSITION BETWEEN PRECAST MANHOLE AND CONCRETE BLOCKS

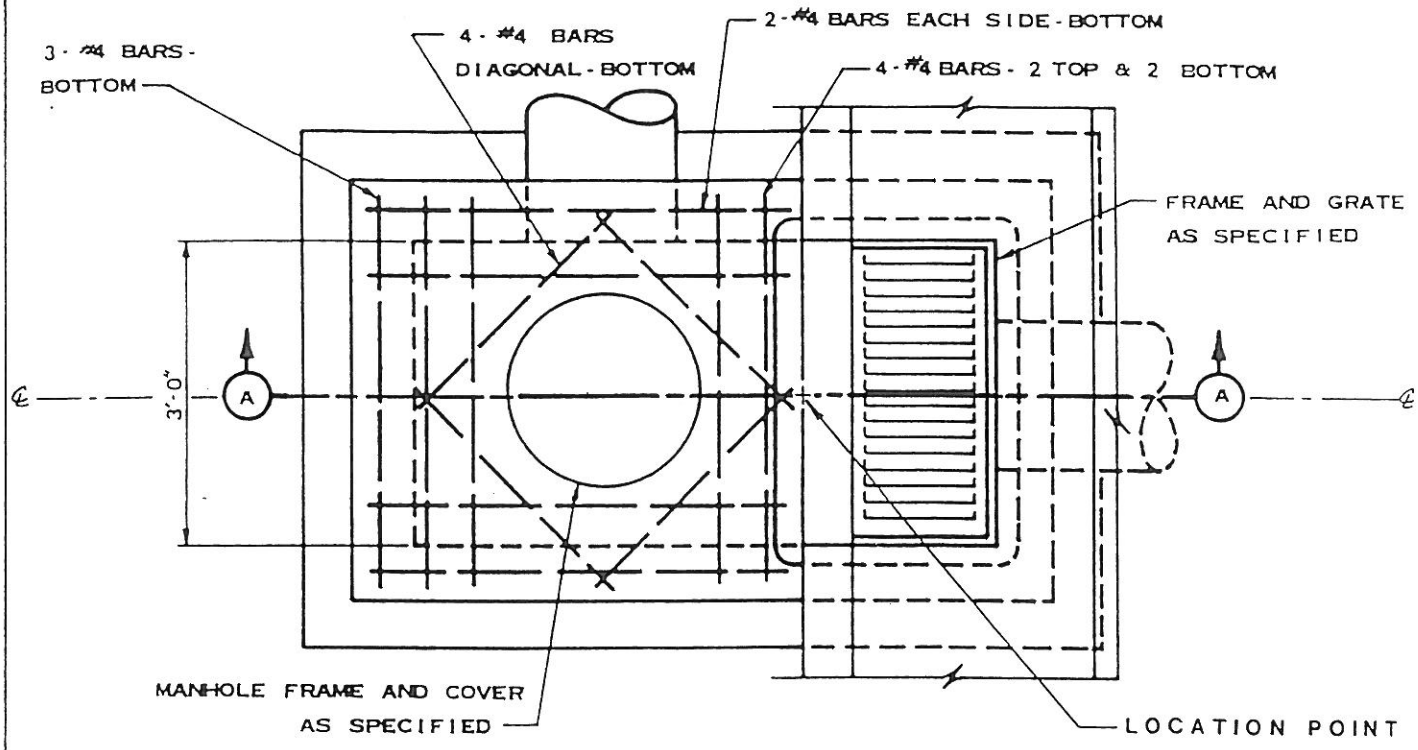
PCC = PORTLAND CEMENT CONCRETE OPTION
ACC = ASPHALTIC CEMENT CONCRETE OPTION

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

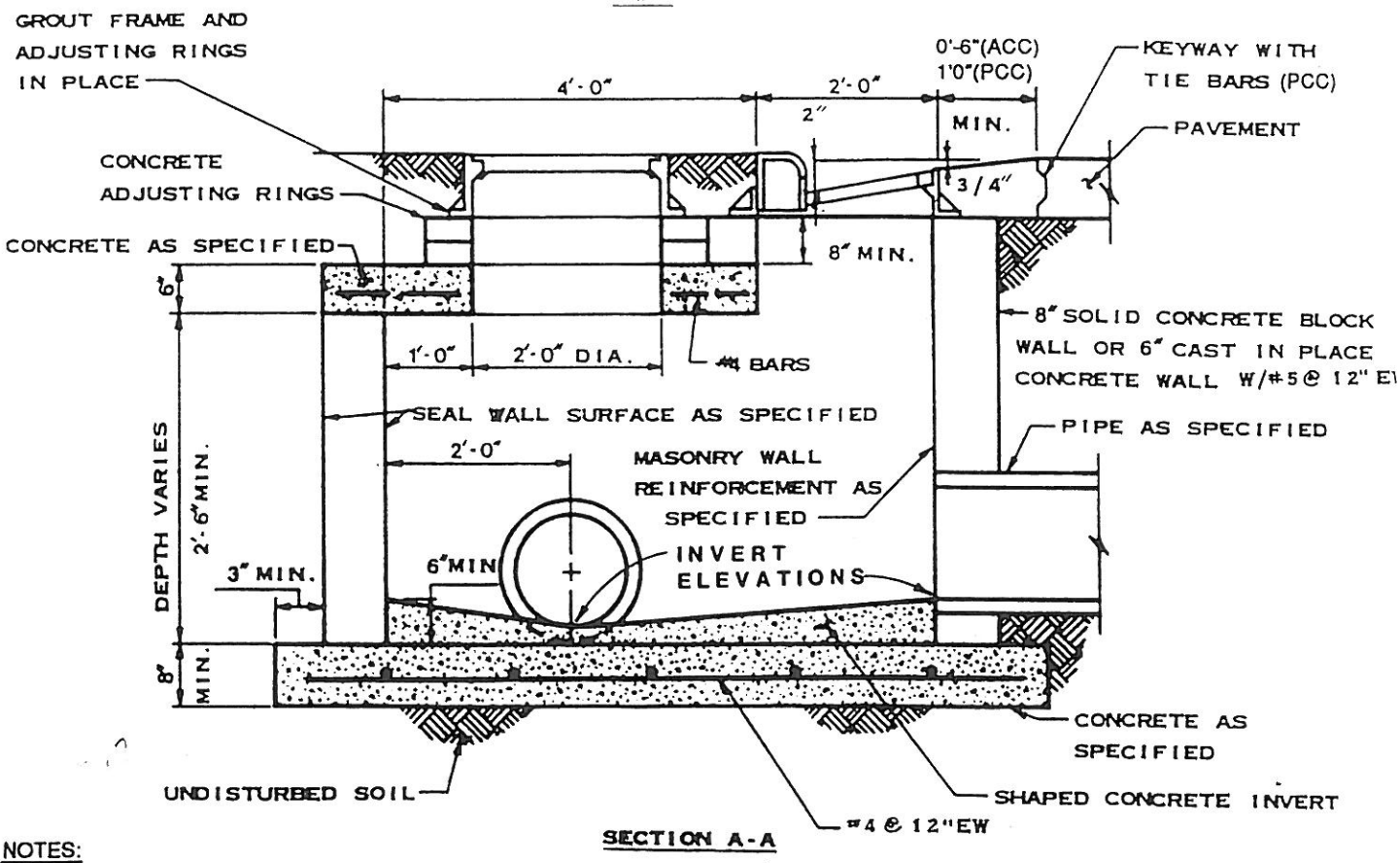
# TYPE M-B INTAKE

REVISED : 3-94

DWG. NO 5.2A




PLAN




SECTION A-A

NOTES:

1. MAXIMUM PIPE SIZE: 30" DIAMETER PERPENDICULAR TO CURB; 36" PARALLEL TO CURB.
2. MAXIMUM DEPTH: 7' FROM TOP OF CURB TO INVERT.

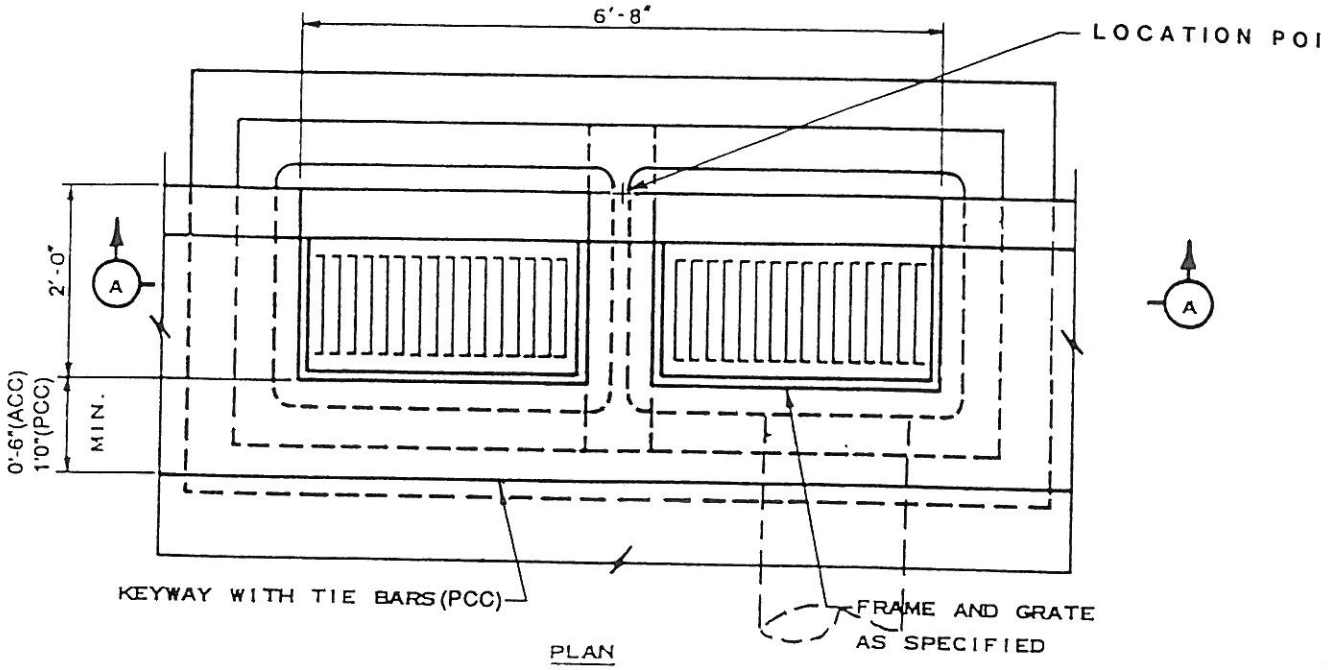
PCC = PORTLAND CEMENT CONCRETE OPTION
ACC = ASPHALTIC CEMENT CONCRETE OPTION

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

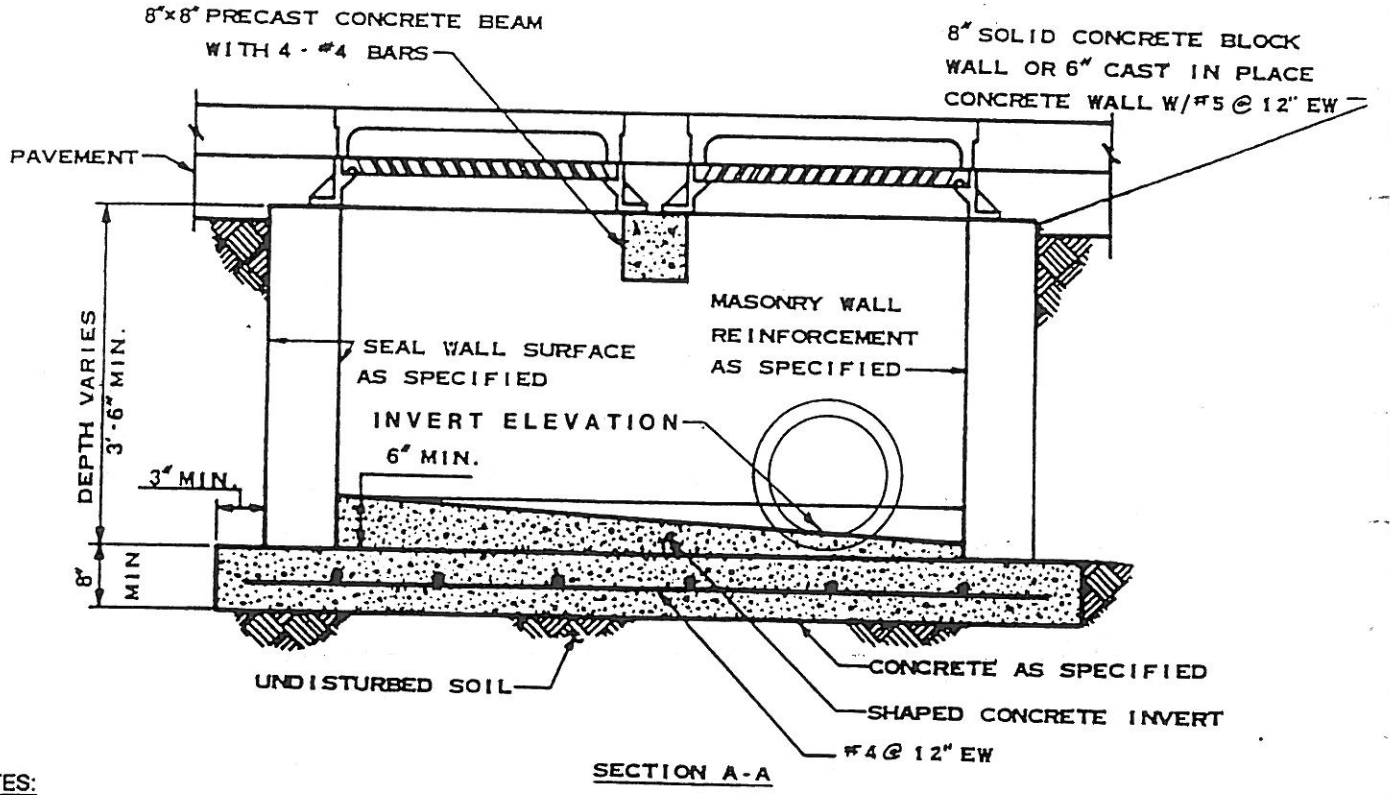
# TYPE M-C INTAKE

REVISED : 3-94

DWG. NO. 5.3




PLAN




SECTION A-A

NOTES:
1. MAXIMUM PIPE SIZE: 30" DIAMETER PERPENDICULAR TO CURB.
2. MAXIMUM DEPTH: 7' FROM TOP OF CURB TO INVERT.

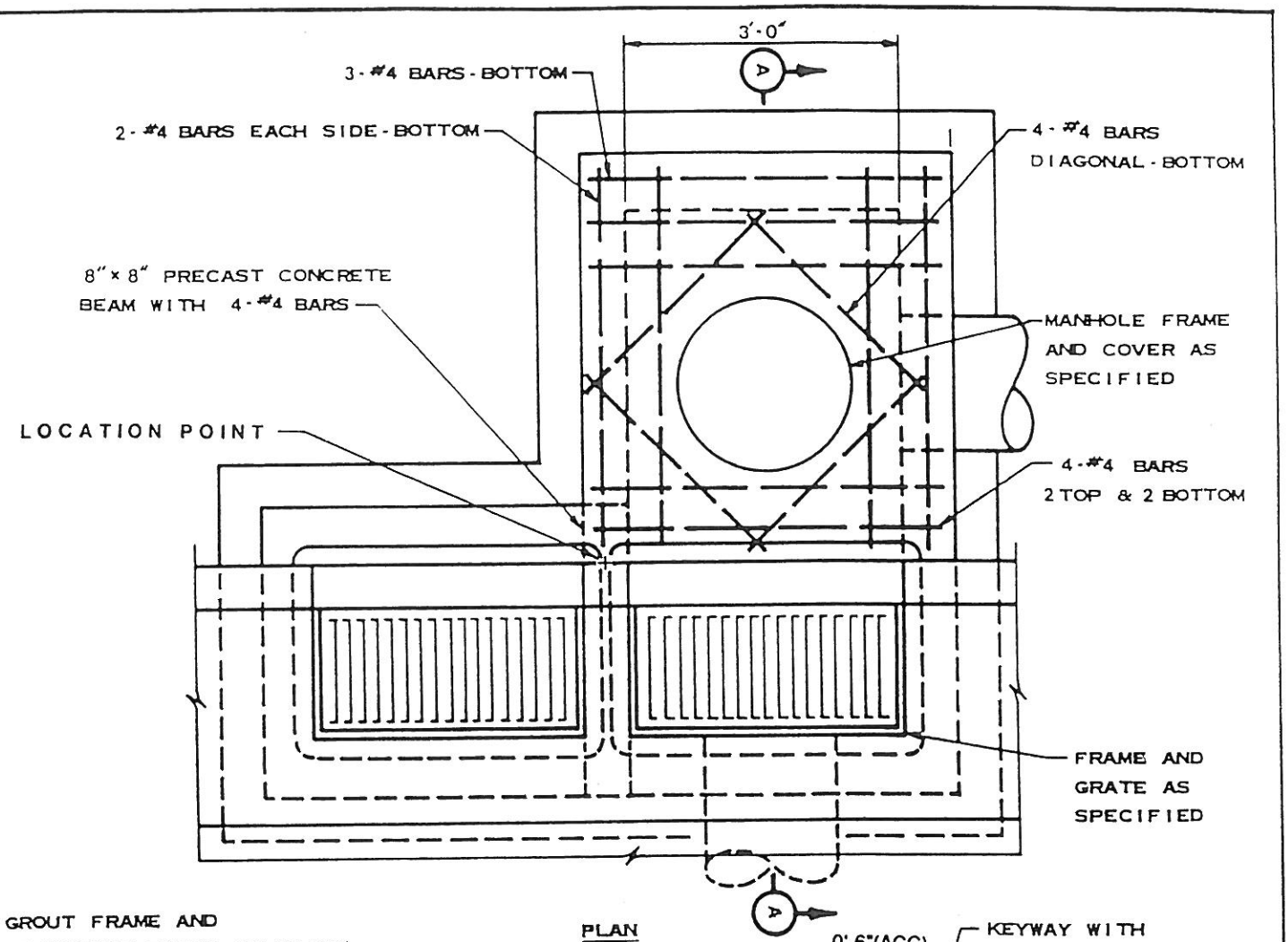
PCC = PORTLAND CEMENT CONCRETE OPTION
ACC = ASPHALTIC CEMENT CONCRETE OPTION

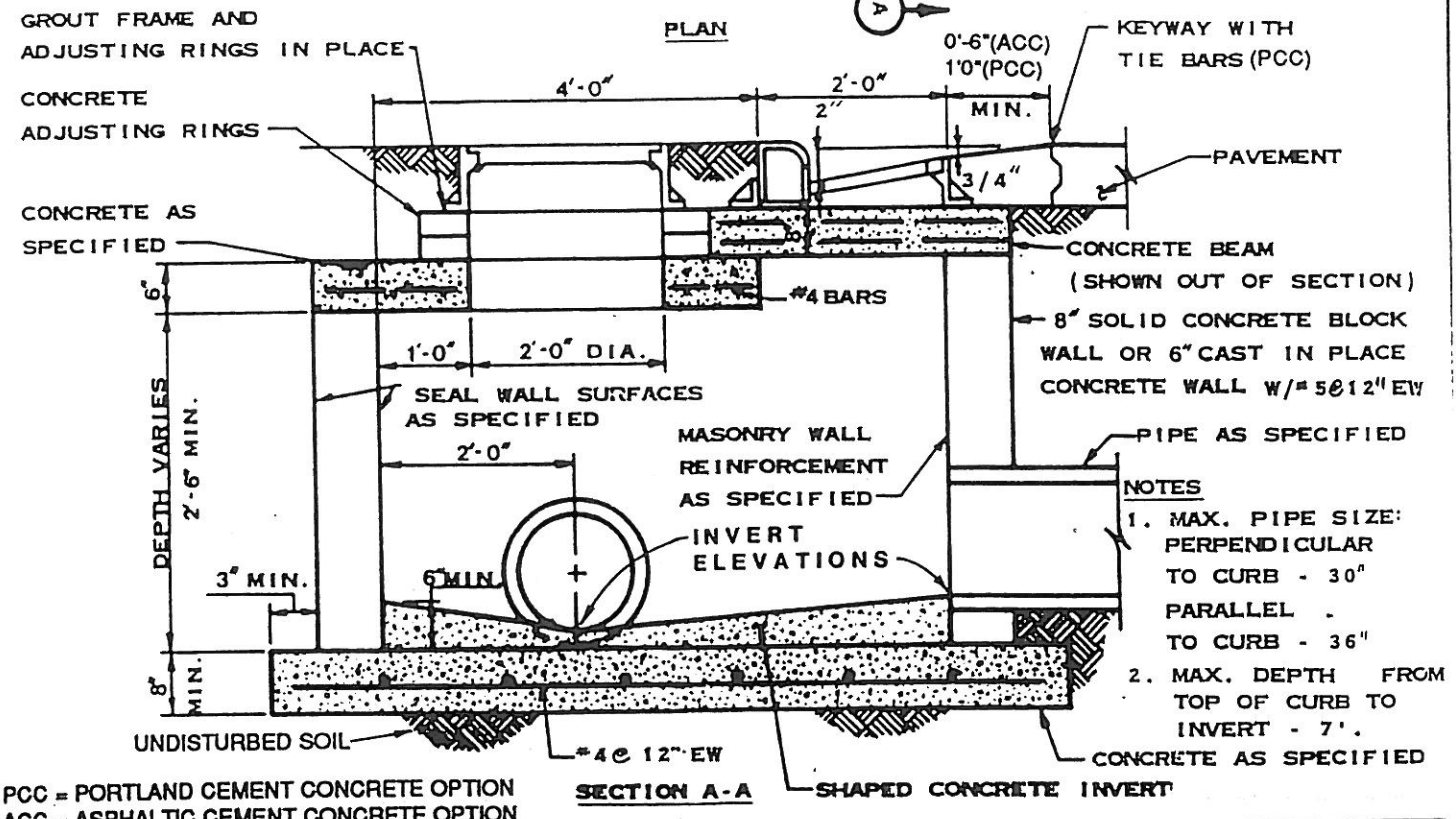
CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE M-D INTAKE

REVISED
3-94

DWG. NO.
5.4




NOTES

1. MAX. PIPE SIZE:
   PERPENDICULAR TO CURB - 30"
   PARALLEL TO CURB - 36"
2. MAX. DEPTH FROM TOP OF CURB TO INVERT - 7'.

PCC = PORTLAND CEMENT CONCRETE OPTION
ACC = ASPHALTIC CEMENT CONCRETE OPTION

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE M-E INTAKE

REVISED : 3-94

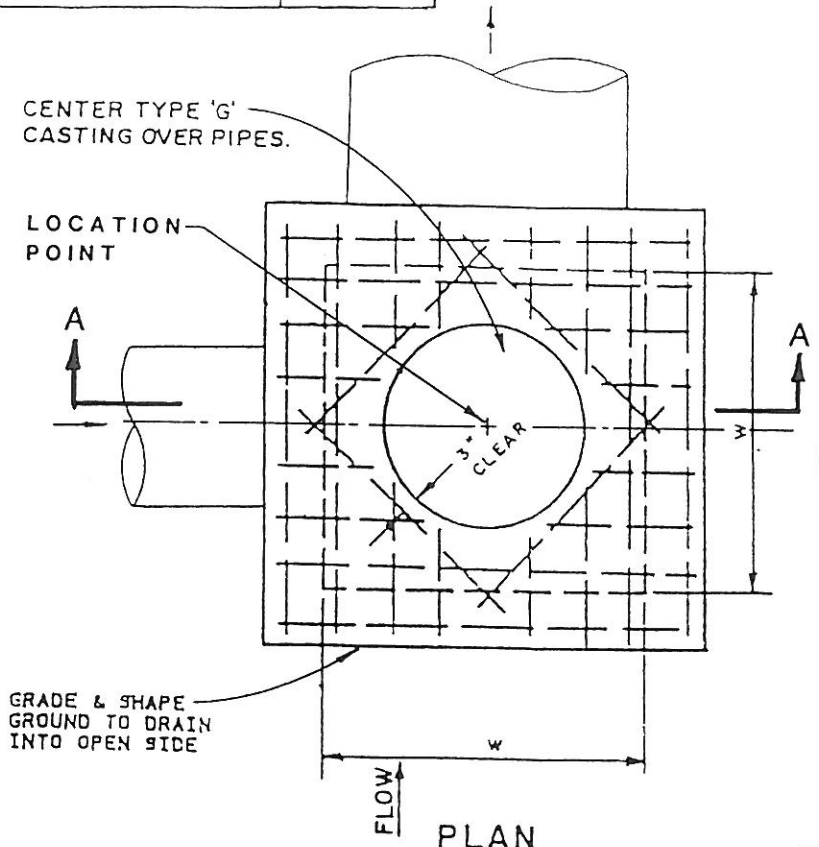
DWG. NO. 5.5

| SIZE STRUCTURE SCHEDULE | |
|---|---|
| PIPE DIAMETER | W-FEET |
| 27" OR LESS | 4' |
| 30-42" | 5' |
| 48-60" | 6' |

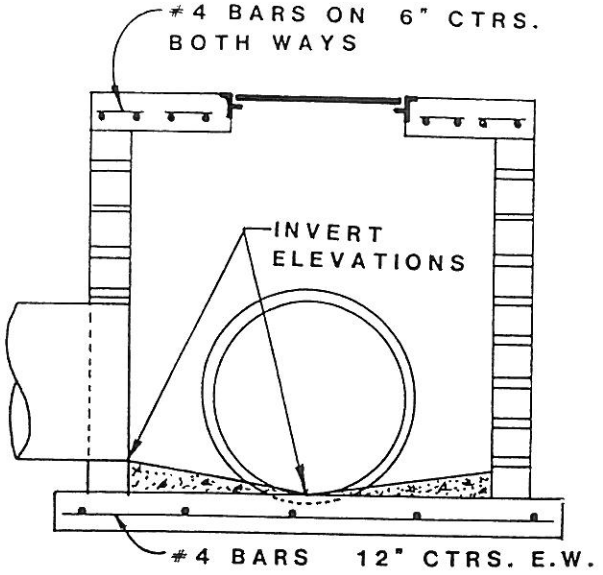
NOTE:
1. INCREASE STRUCTURE SIZE FOR PIPES NOT ENTERING AT RIGHT ANGLES AS DIRECTED BY CITY ENGINEER.

① MATERIALS AND CONSTRUCTION SHALL BE AS A TYPE M-A INTAKE

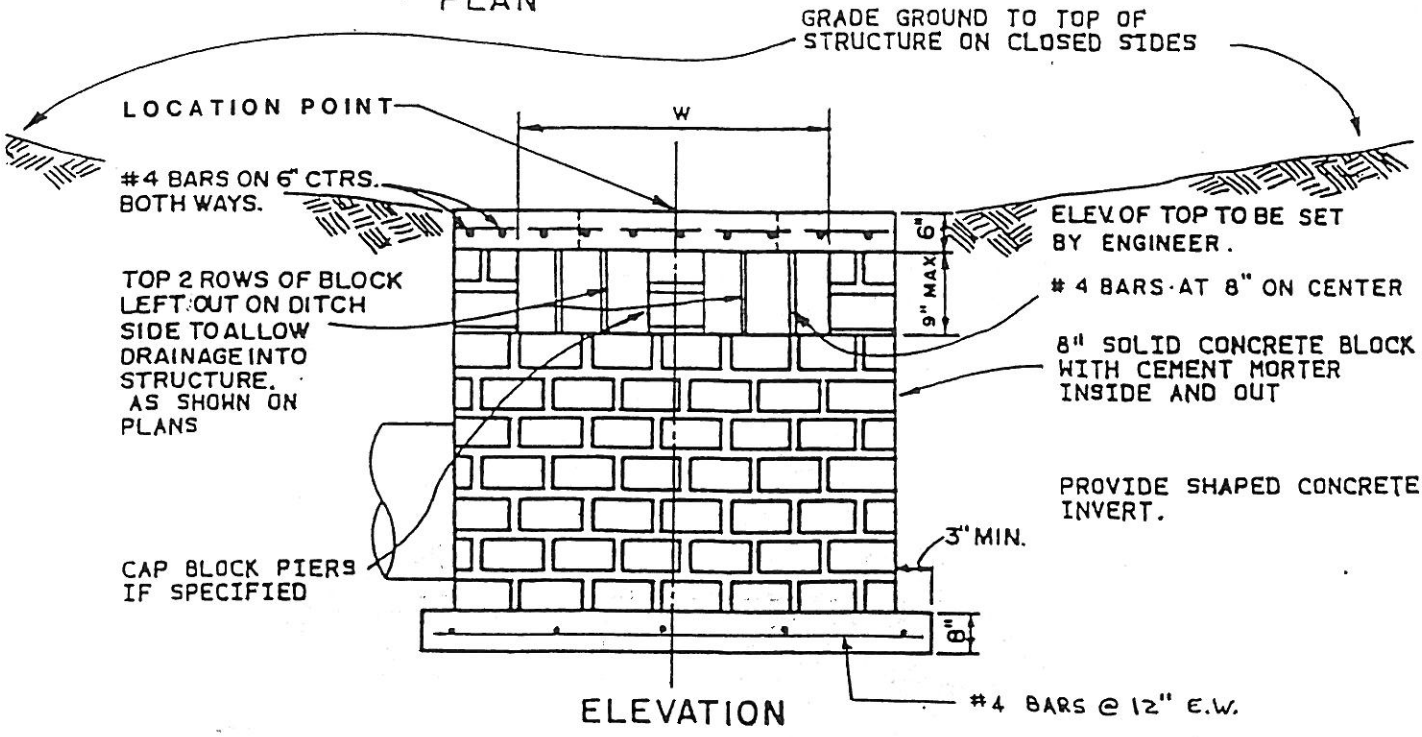
MAX. DEPTH-7' TOP CASTING TO INV.




PLAN




SECTION A-A



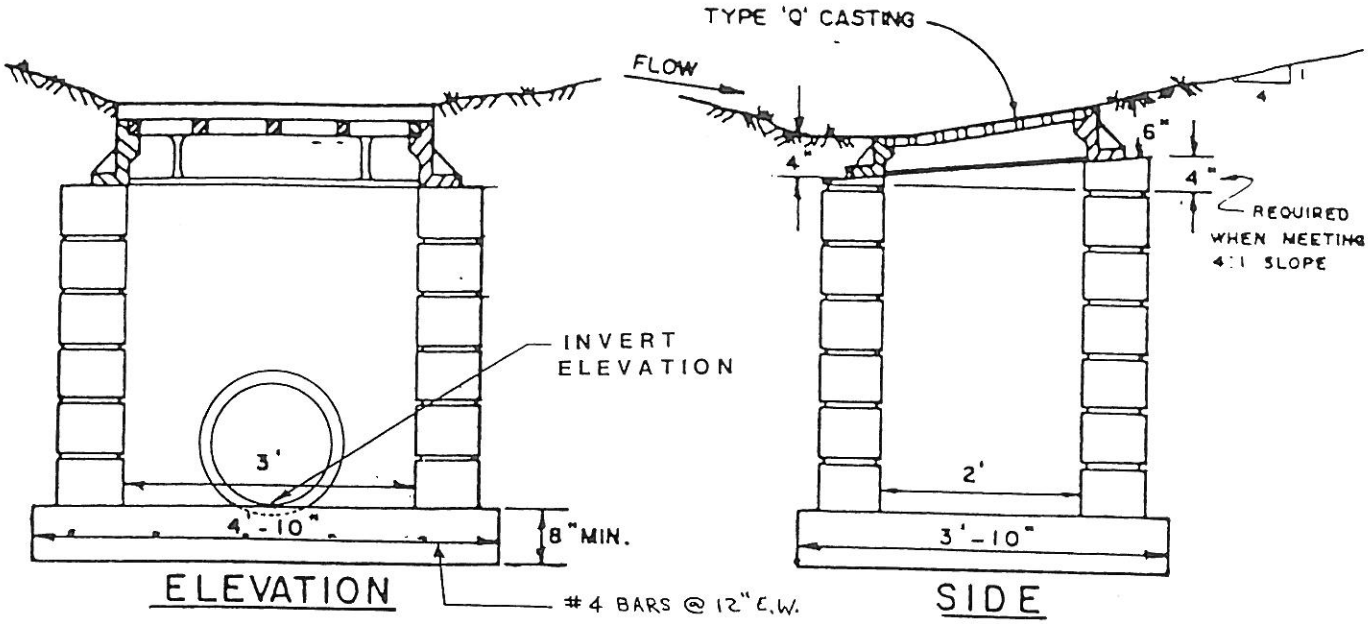

ELEVATION

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE M-G INTAKE

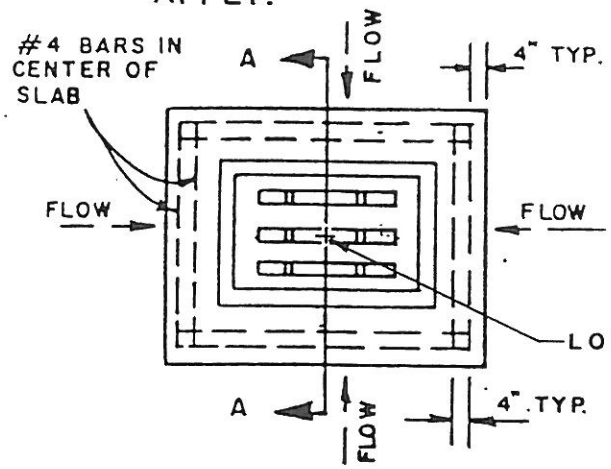
REVISED : 3-94

DWG. NO. 5.6




BUILD STRUCTURE AS STANDARD TYPE 'M-A' INTAKE. RECESS ENTIRE GRATE SURFACE 1" BELOW GRADE MINIMUM TO ENSURE DRAINAGE TOWARD INTAKE. (SEWER PIPES NOT SHOWN)

IF CONCRETE PAD IS SPECIFIED THE DETAIL BELOW SHALL APPLY.

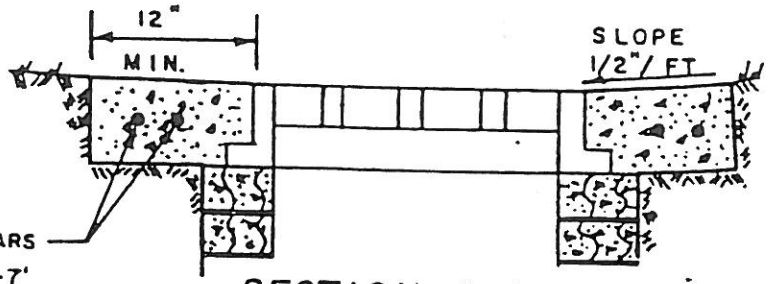



CONTRACTOR TO GRADE AND SHAPE GROUND AROUND INTAKE TO DRAIN TO INTAKE

PLAN

NOTES:

- WALLS AND BASE DIMENSIONS AND CONSTRUCTION SAME AS STD. TYPE "M-A" INTAKE. PLACE 4'X5'-6" THICK P.C. CONC. TOP AROUND CASTING.
- TYPE 'Q' CASTING TO BE SET AT ELEV. SHOWN ON PLANS.
- GRATE TO BE SET LEVEL.




MAX. DEPTH-7'
MAX. PIPE SIZE-30" FOR 3' SIDE
18" FOR 2' SIDE

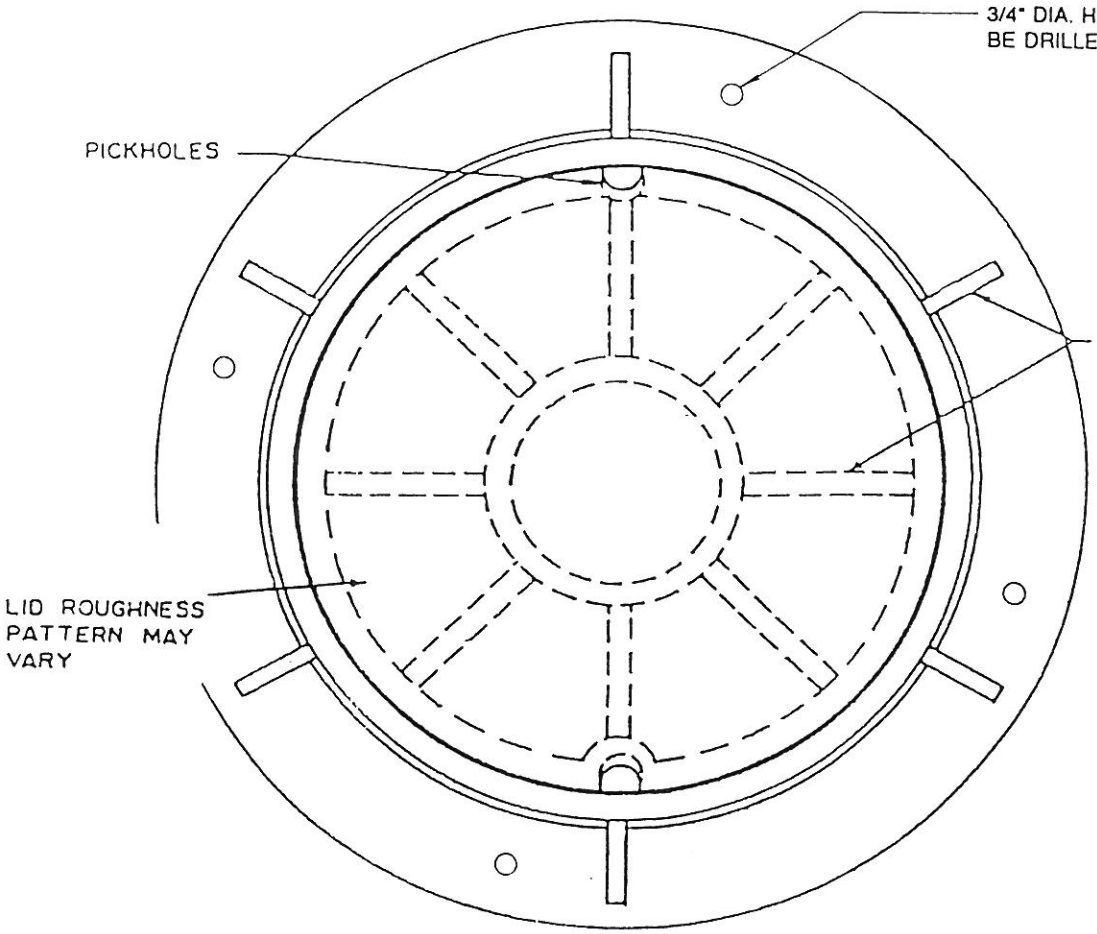
SECTION A-A

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

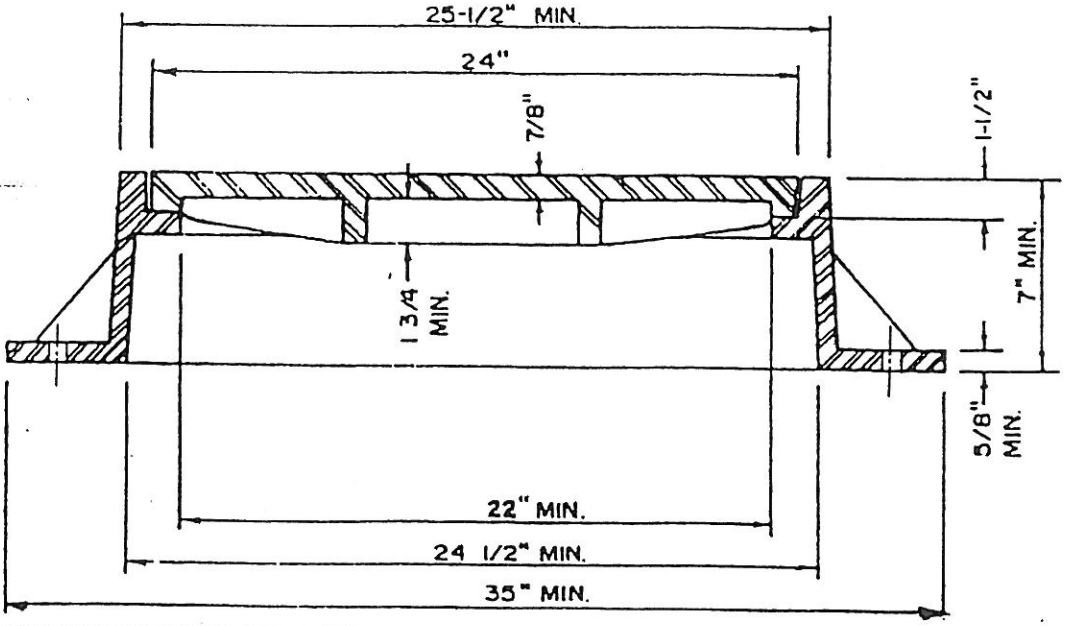
TYPE M-H INTAKE

REVISED: 3-94

DWG. NO. 5.7




MATERIAL: CAST GRAY IRON, CLASS 30
ASTM SPEC. A-48
MIN. WGT. 350 LB.
MACHINED BEARING SURFACES

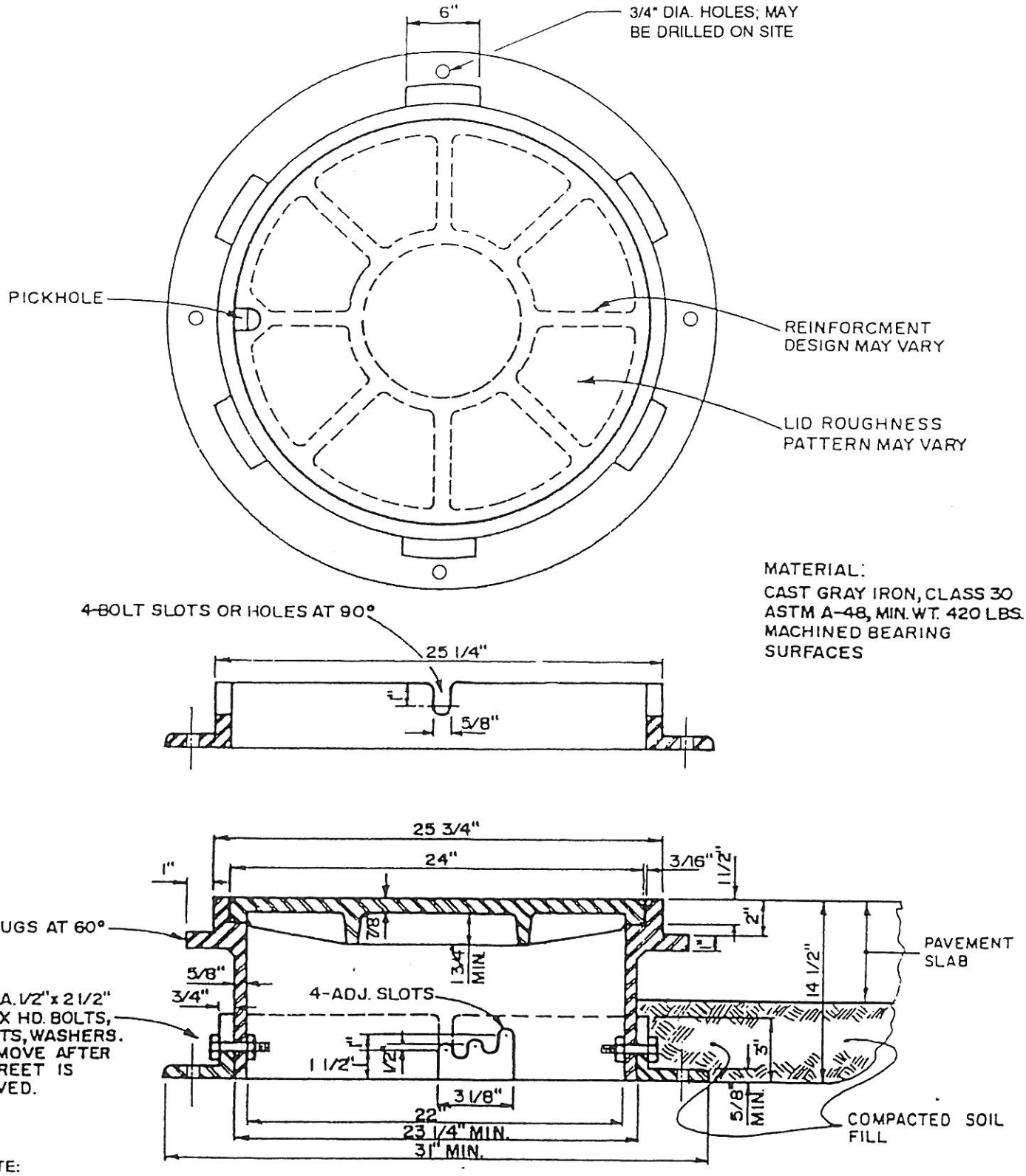



CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE "E" CASTING STORM SEWER

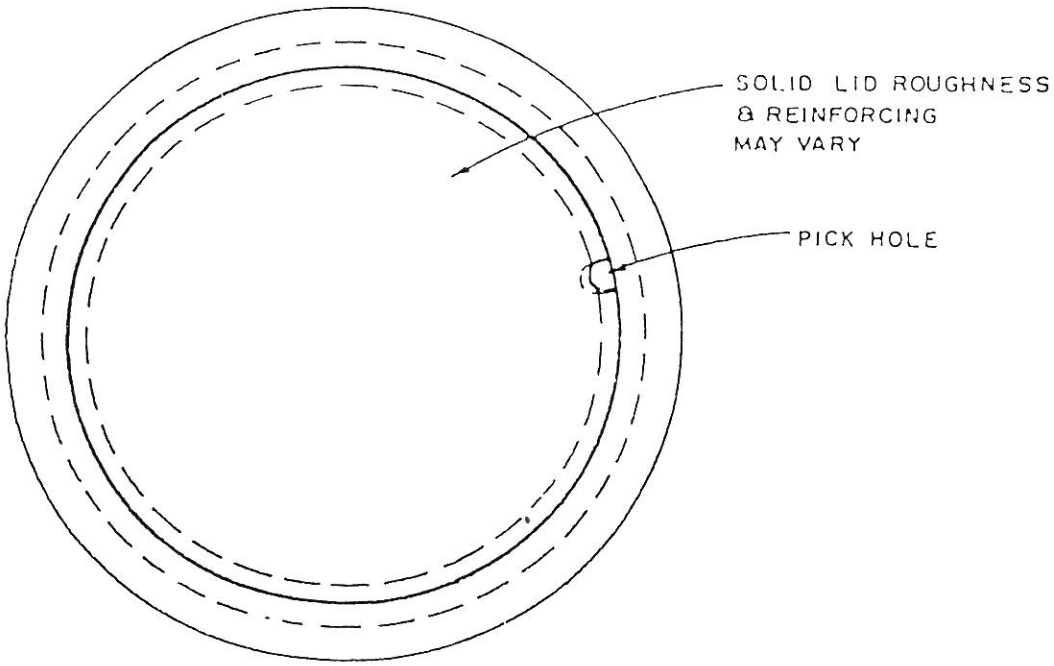
REVISED : 3-94

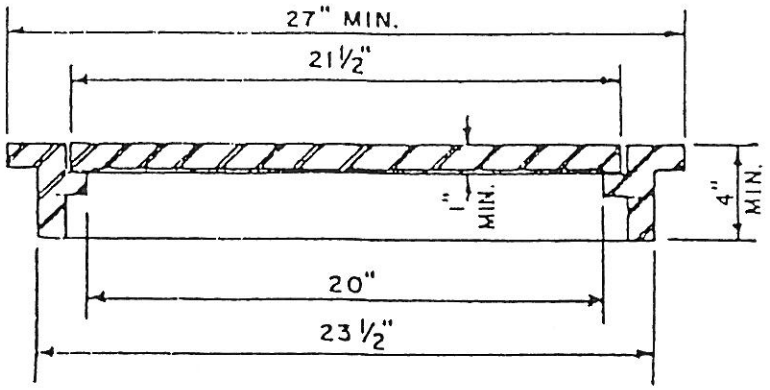
DWG. NO. 5.8




NOTE:
1. USE ONLY TYPE C CHECKERED TOP LID; RAISED DIAMOND PATTERN NOT ACCEPTABLE.

| | | |
|---|---|---|
| CITY OF WEST DES MOINES<br>"CROSSROADS OF THE INTERSTATES" | **TYPE "F" CASTING STORM SEWER** | REVISED :<br>3-94<br>DWG. NO.<br>5.9 |



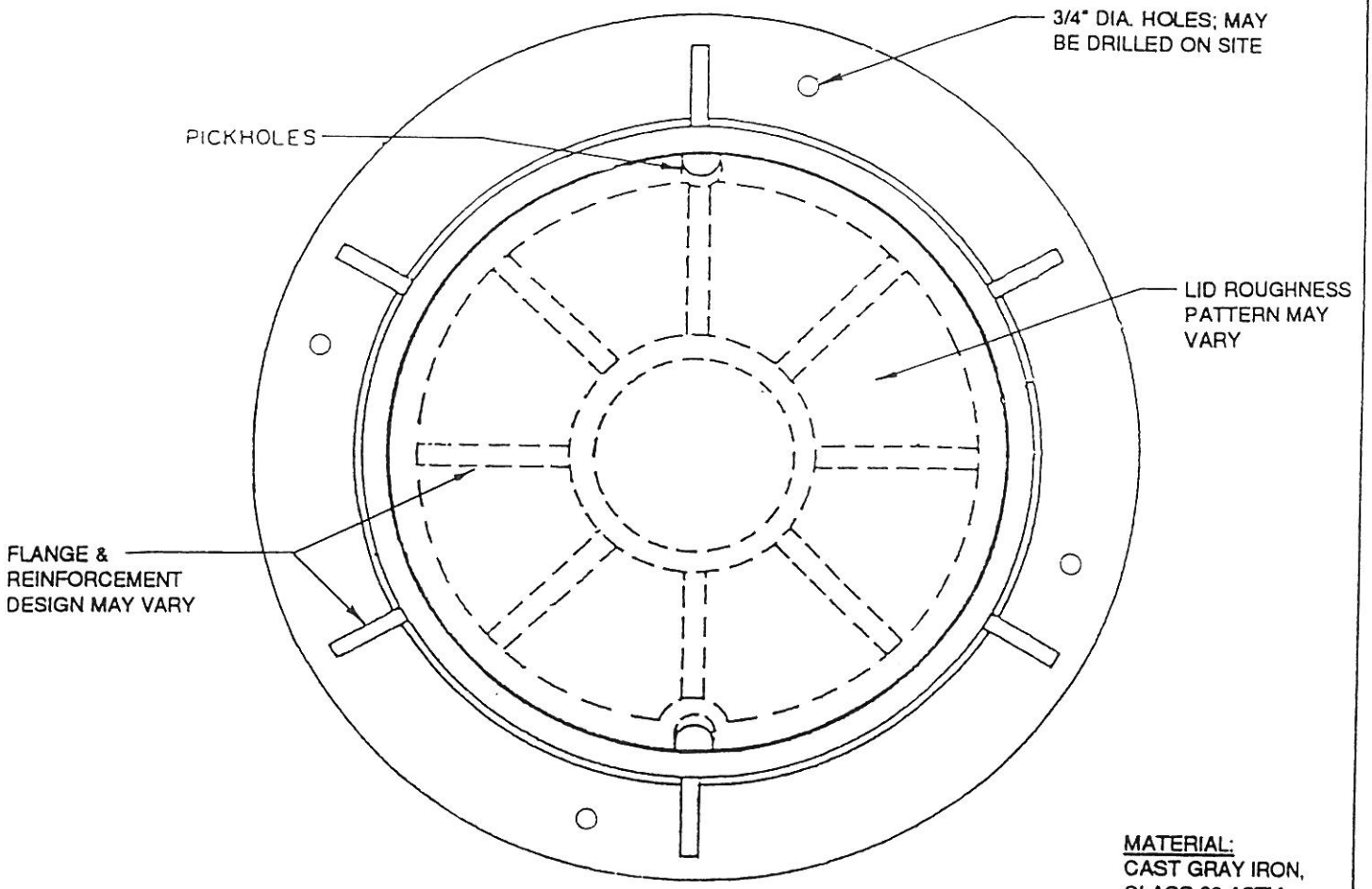

MATERIAL: CAST GRAY IRON
CLASS 30 A.S.T.M. SPEC. 48
MIN. WT. 140 LBS.
MACHINED BEARING SURFACE

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

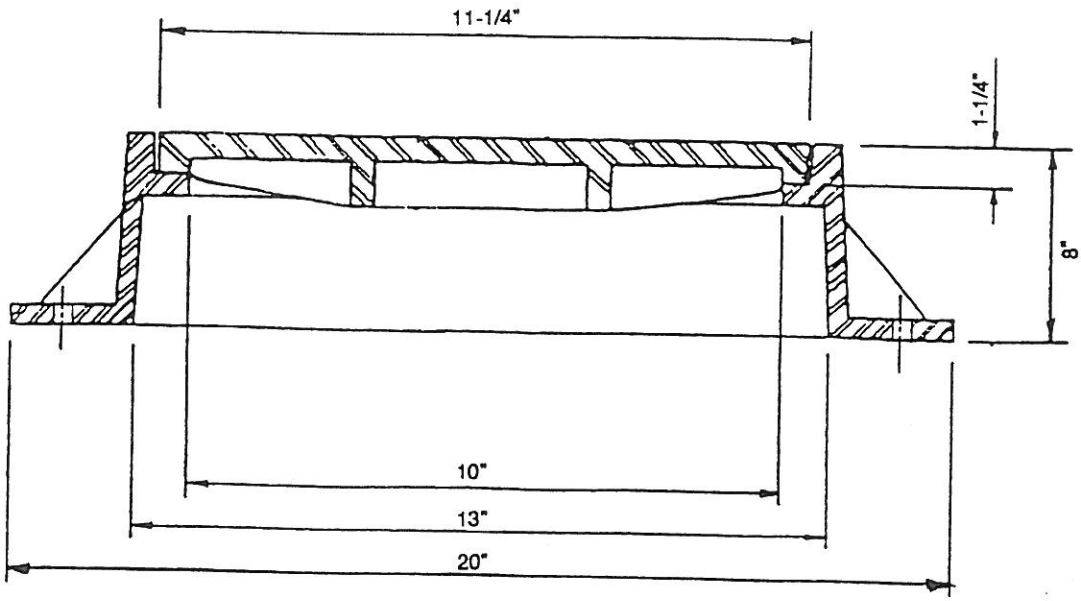
# TYPE "G" CASTING STORM SEWER

REVISED : 3-94

DWG. NO. 5.10




MATERIAL:
CAST GRAY IRON,
CLASS 30 ASTM
SPEC. A-48
MIN. WGT.. 95 LB.

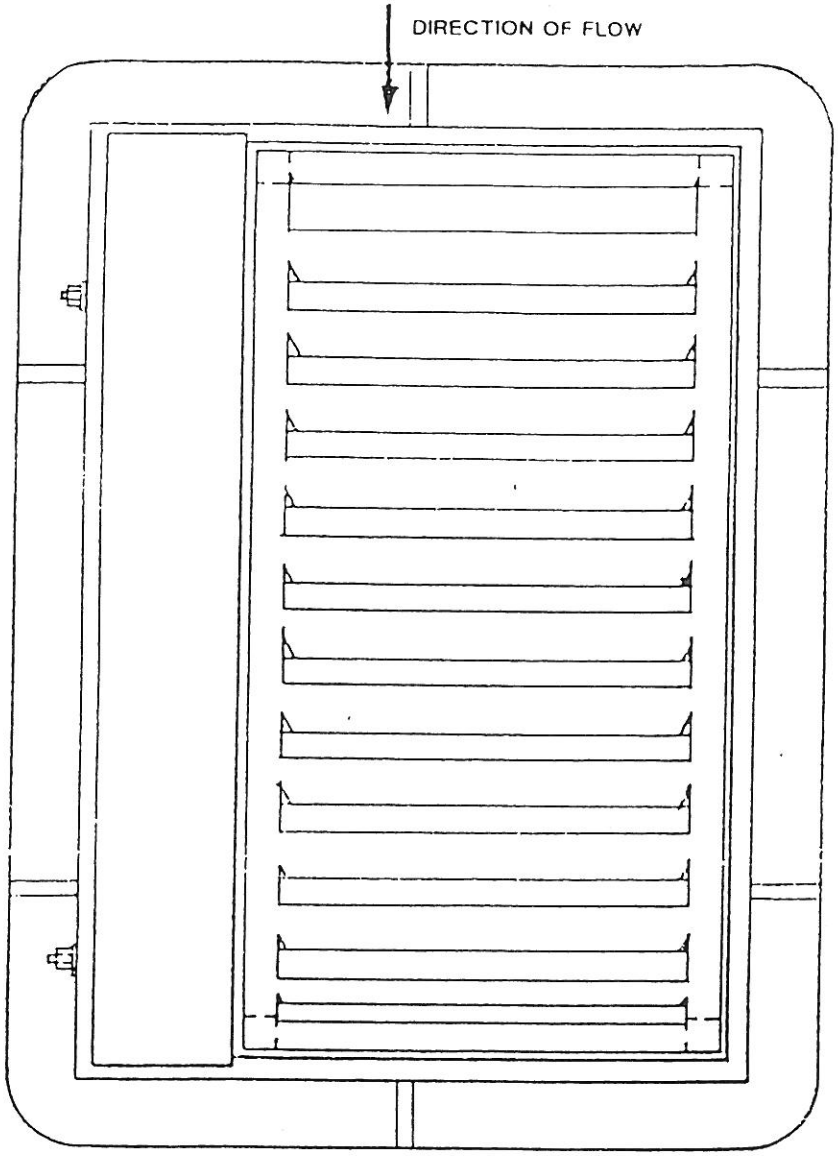


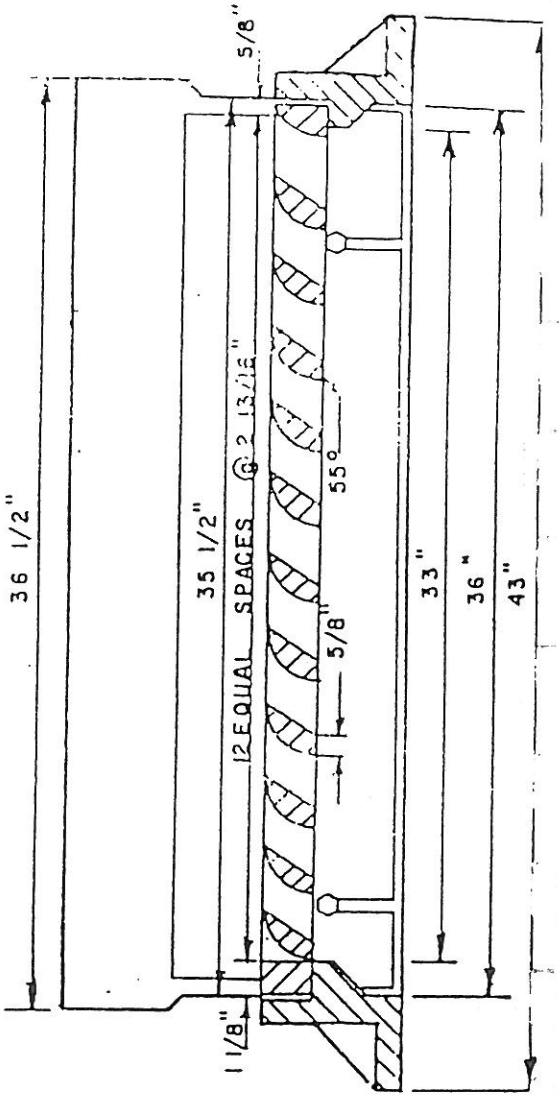

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

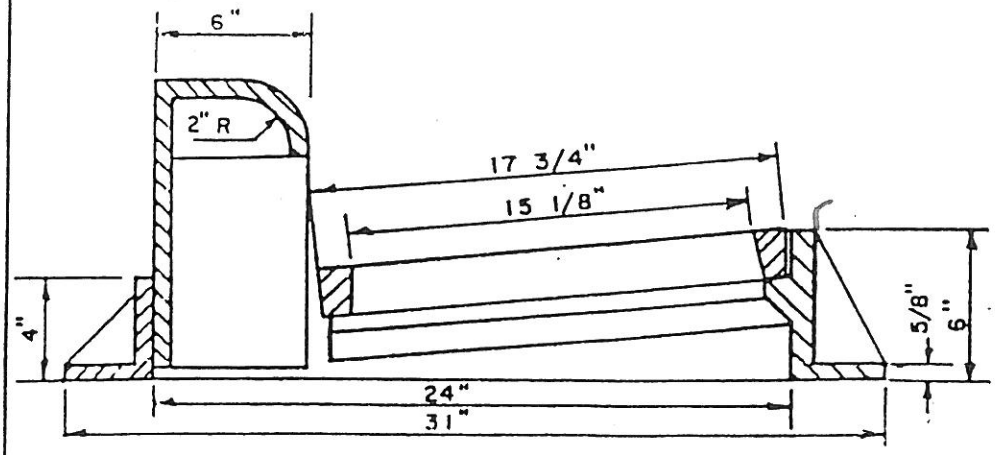
# TYPE "H" CASTING STORM SEWER

REVISED :
3-94

DWG. NO




## MATERIAL:

CAST GRAY IRON CLASS 30
ASTM. SPEC: A 48
MIN. WGT. 500 LBS

## NOTE:

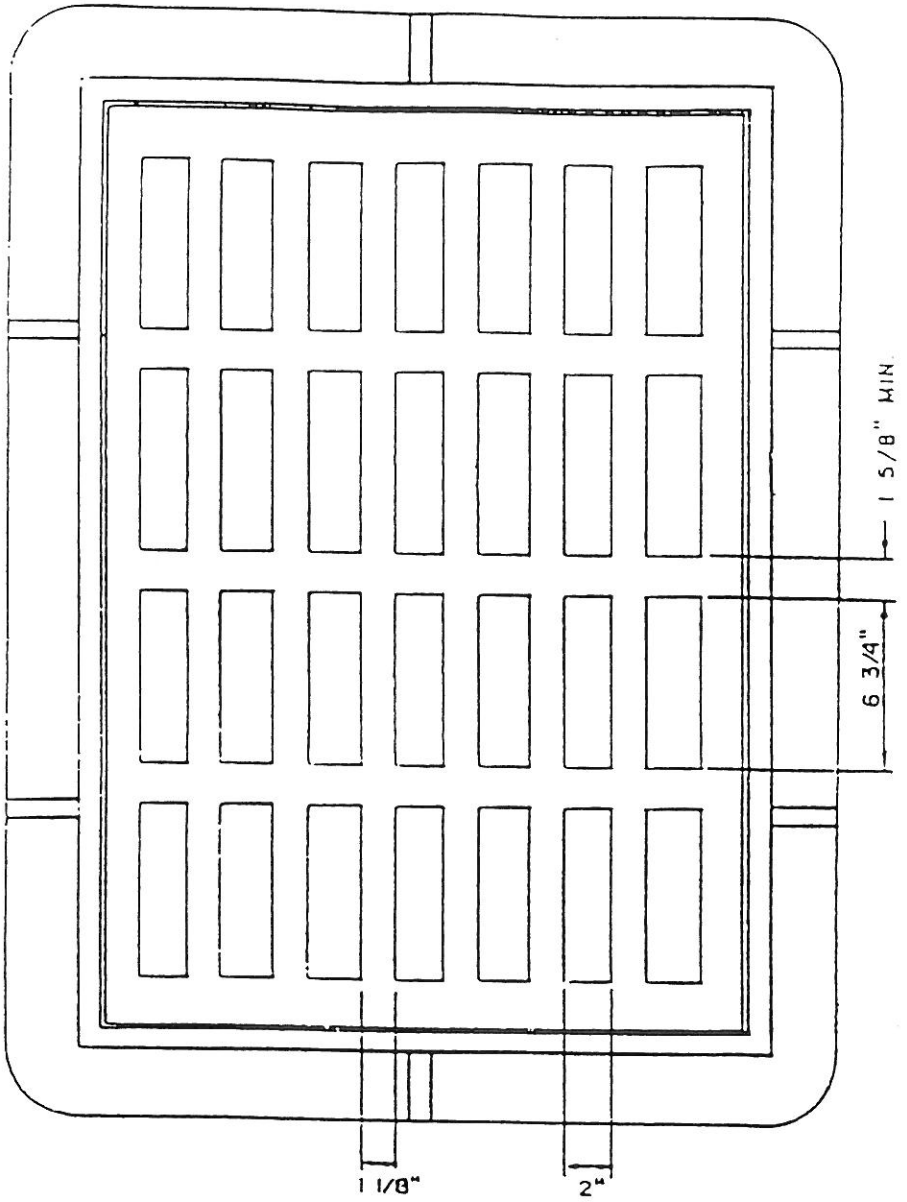
CURB BOX HEIGHT IS ADJUSTABLE TO 9"

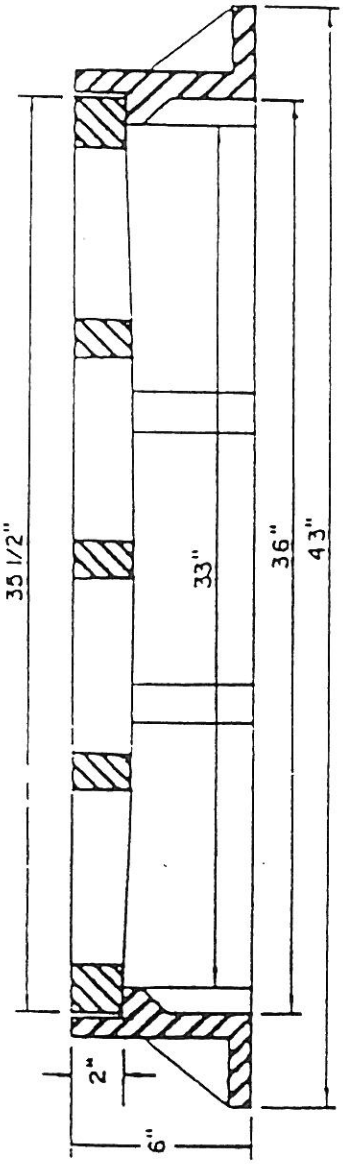
CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

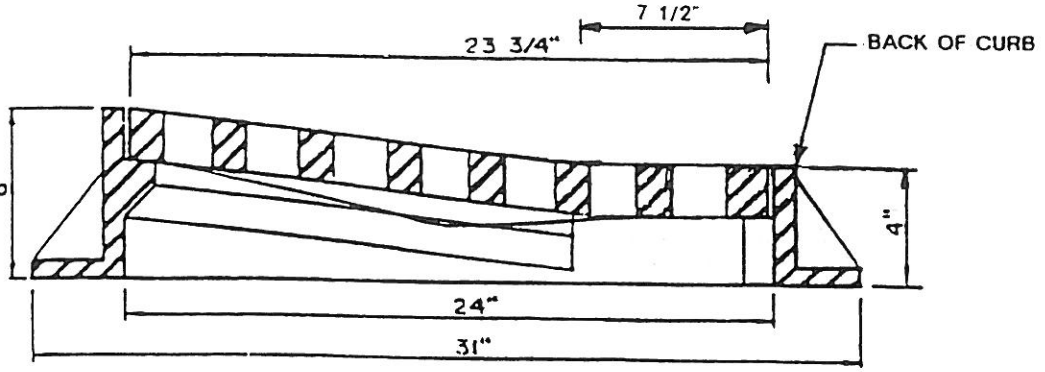
# TYPE R CASTING

REVISED: 3-94

DWG. NO. 5.11



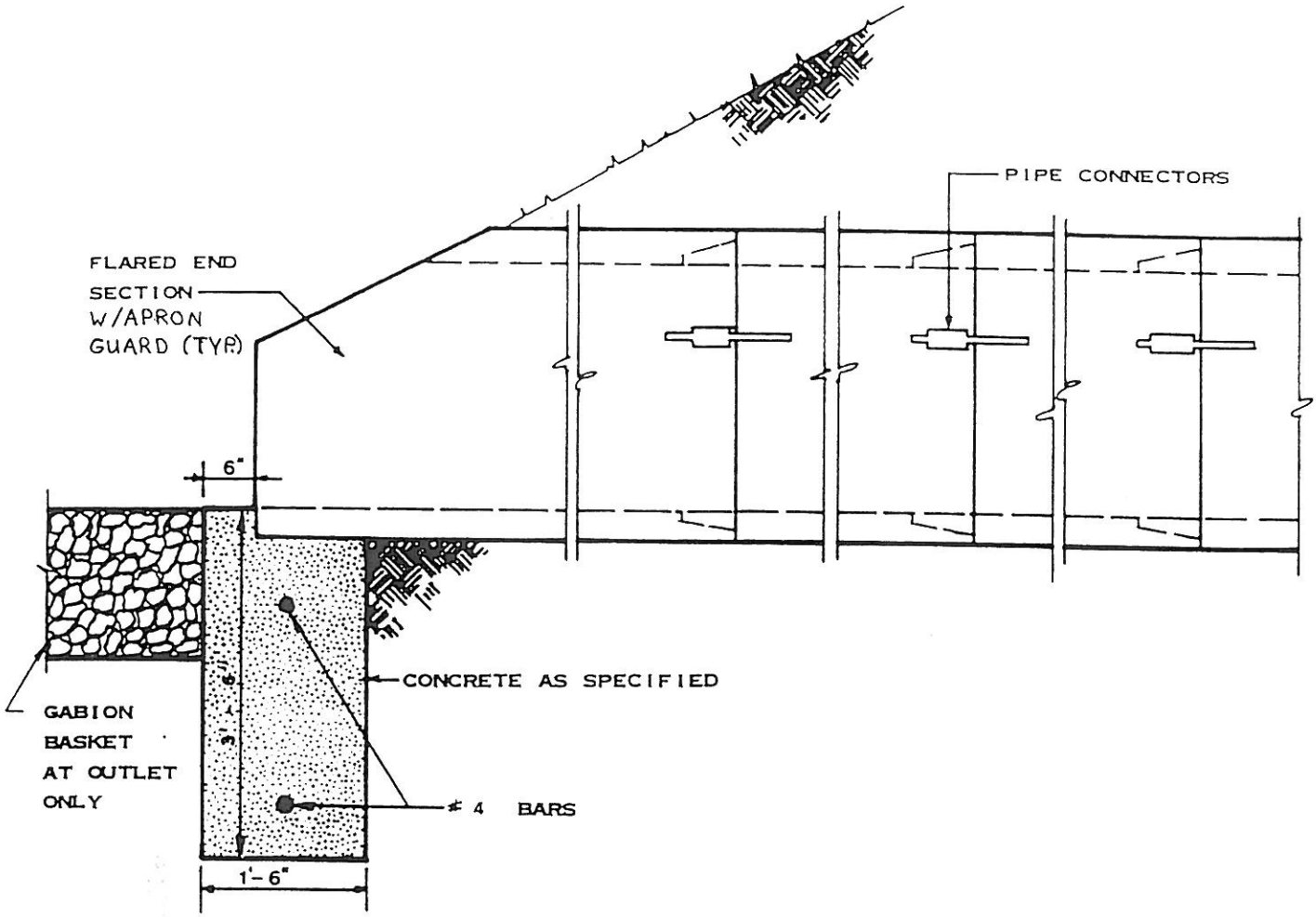

MATERIAL: CAST GRAY IRON CLASS 30.
ASTM SPEC. A-48 MIN. WEIGHT 450 LBS.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# TYPE Q CASTING

REVISED : 3-94

DWG. NO. 5.12




NOTES

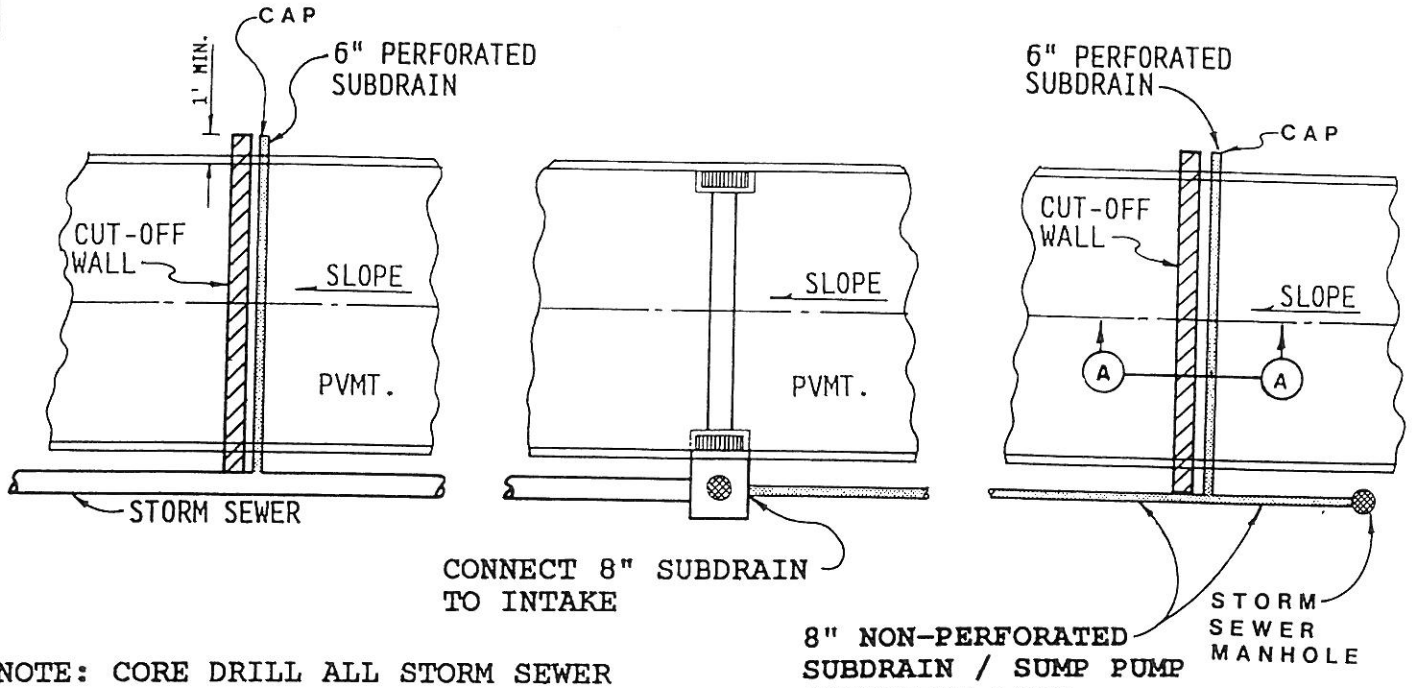
1. INSTALL TWO PIPE CONNECTORS ON LAST THREE PIPE JOINTS AT EACH FLARED END SECTION. PIPE CONNNECTORS AS PER MANUFACTURERS RECOMMENDATIONS.
2. PROVIDE AND INSTALL GALVANIZED DIPPED APRON GUARD IN ACCORDANCE WITH IOWA DOT STANDARD ROAD PLAN RF-26 FOR ALL 36" AND SMALLER PIPE.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

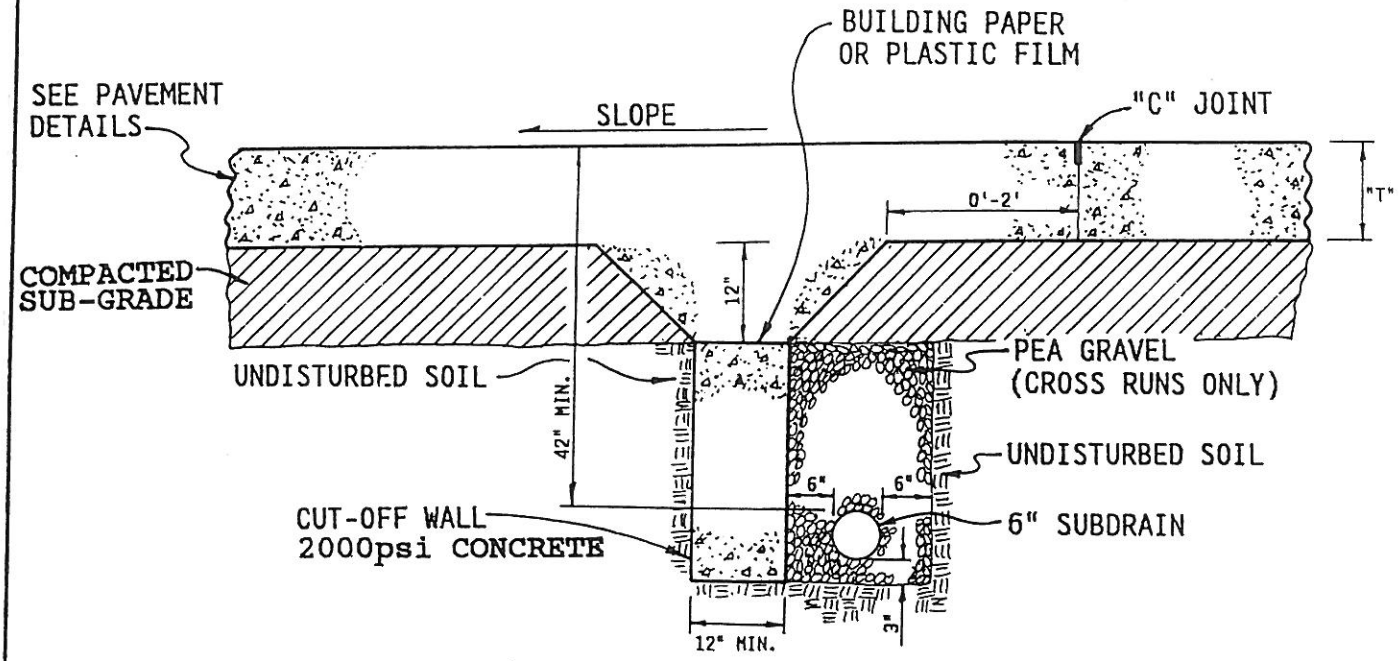
# FLARED END DETAIL

REVISED : 3-94

DWG. NO. 5.13




NOTE: CORE DRILL ALL STORM SEWER AND PLACE NON-SHRINK GROUT COLLAR AT CONNECTION.




**SECTION A-A**

NOTES:

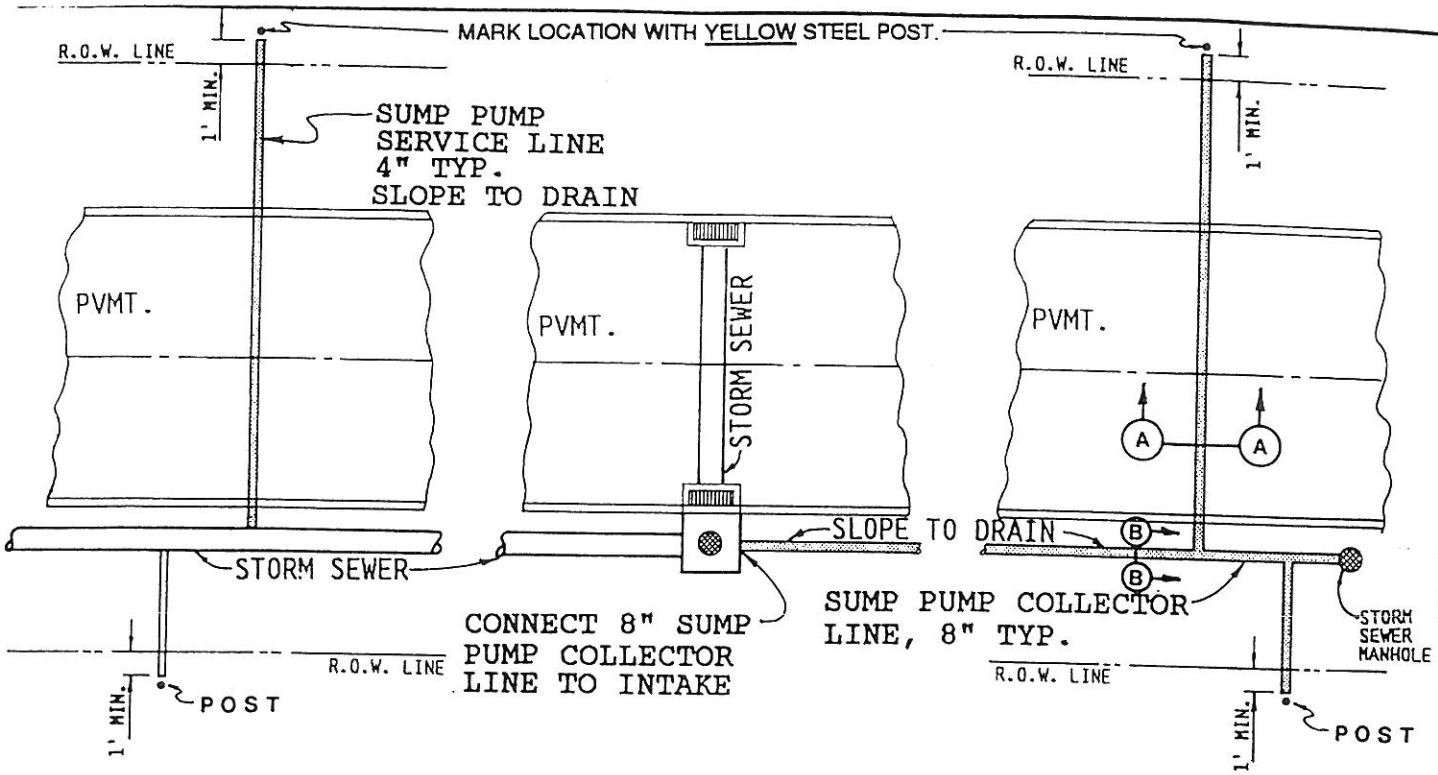
1. INSTALL CUT-OFF WALLS ON ALL STREETS WITH GRADES GREATER THAN 6%
2. INSTALL CUT-OFF WALLS AT A MAXIMUM OF 150' INTERVALS OR AS SHOWN ON PLANS
3. SLOPE SUBDRAIN TO DRAIN.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# CUT-OFF WALL

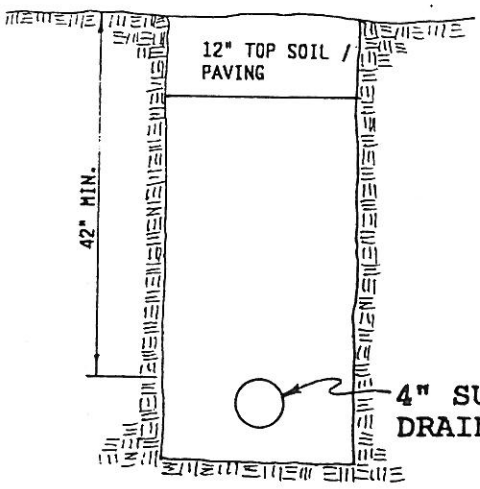
REVISED : 3-94

DWG. NO. 5.14

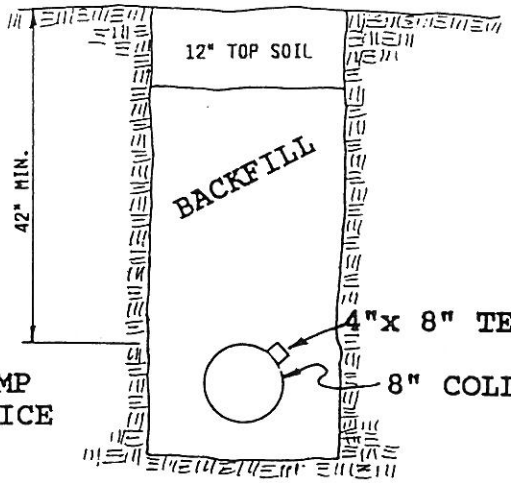



NOTE:

CORE DRILL ALL STORM SEWER AND PLACE NON-SHRINK GROUT COLLAR AT CONNECTION.




SECTION A-A




SECTION B-B

NOTE:

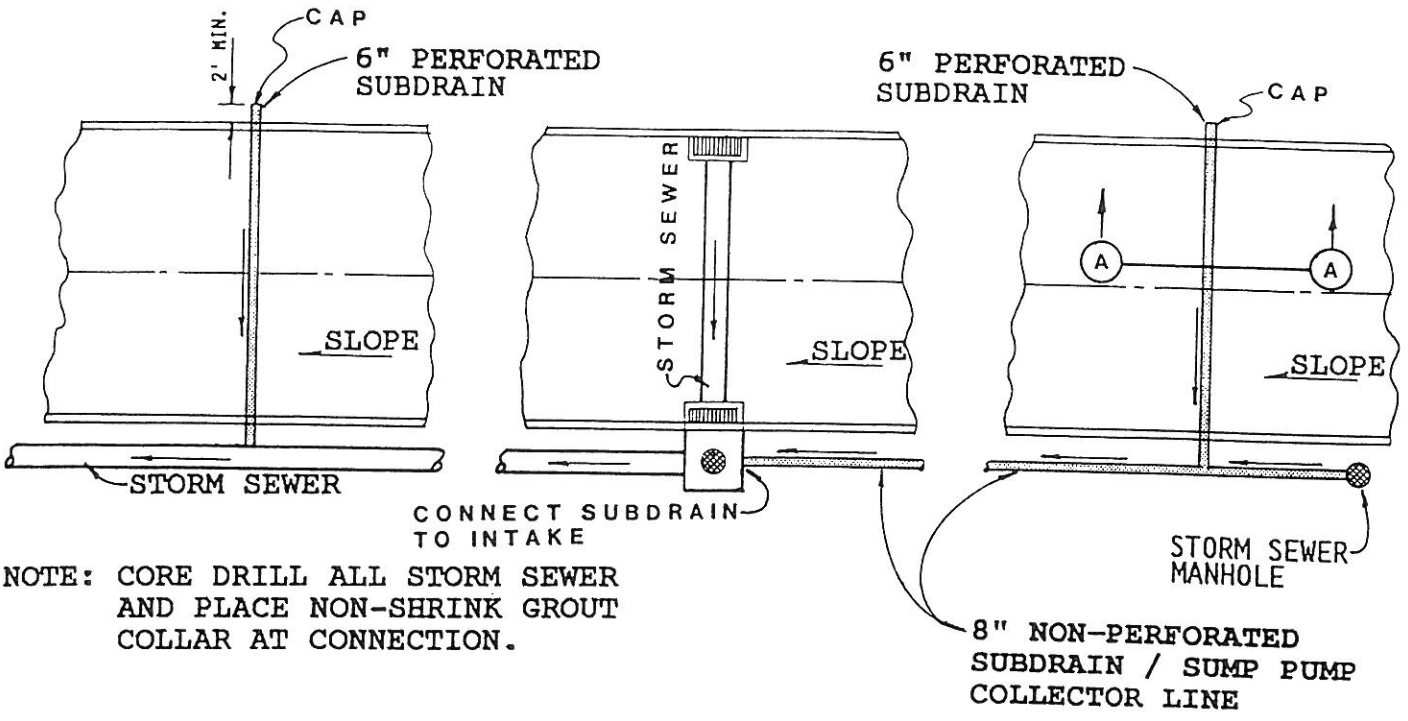
1. ALL CONNECTIONS MADE OF DISIMILAR PIPE- USE APPROVED RUBBER GASKETED FITTINGS.
2. CAP ALL SERVICE LINES.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

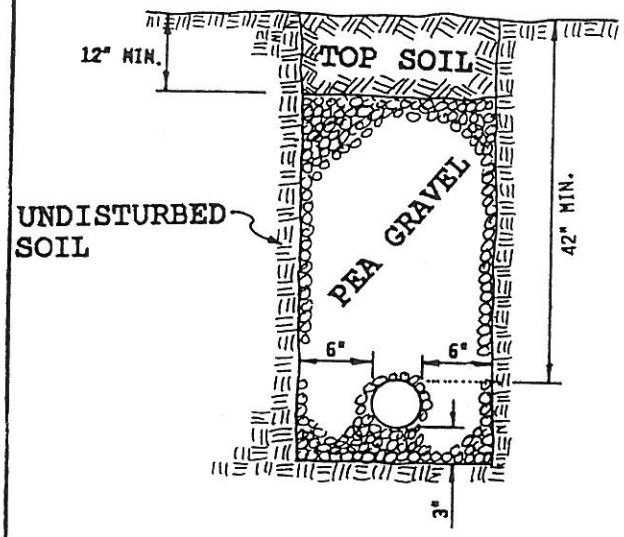
# SUMP PUMP DRAIN LINES

REVISED : 3-94

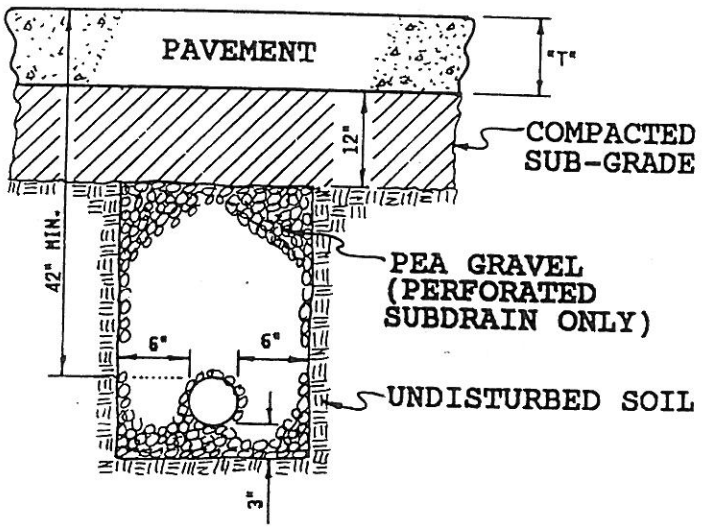
DWG. NO. 5.15




NOTE: CORE DRILL ALL STORM SEWER AND PLACE NON-SHRINK GROUT COLLAR AT CONNECTION.




USE AS SHOWN ON PLANS




SECTION A-A

NOTES:

1. SLOPE SUBDRAINS TO DRAIN

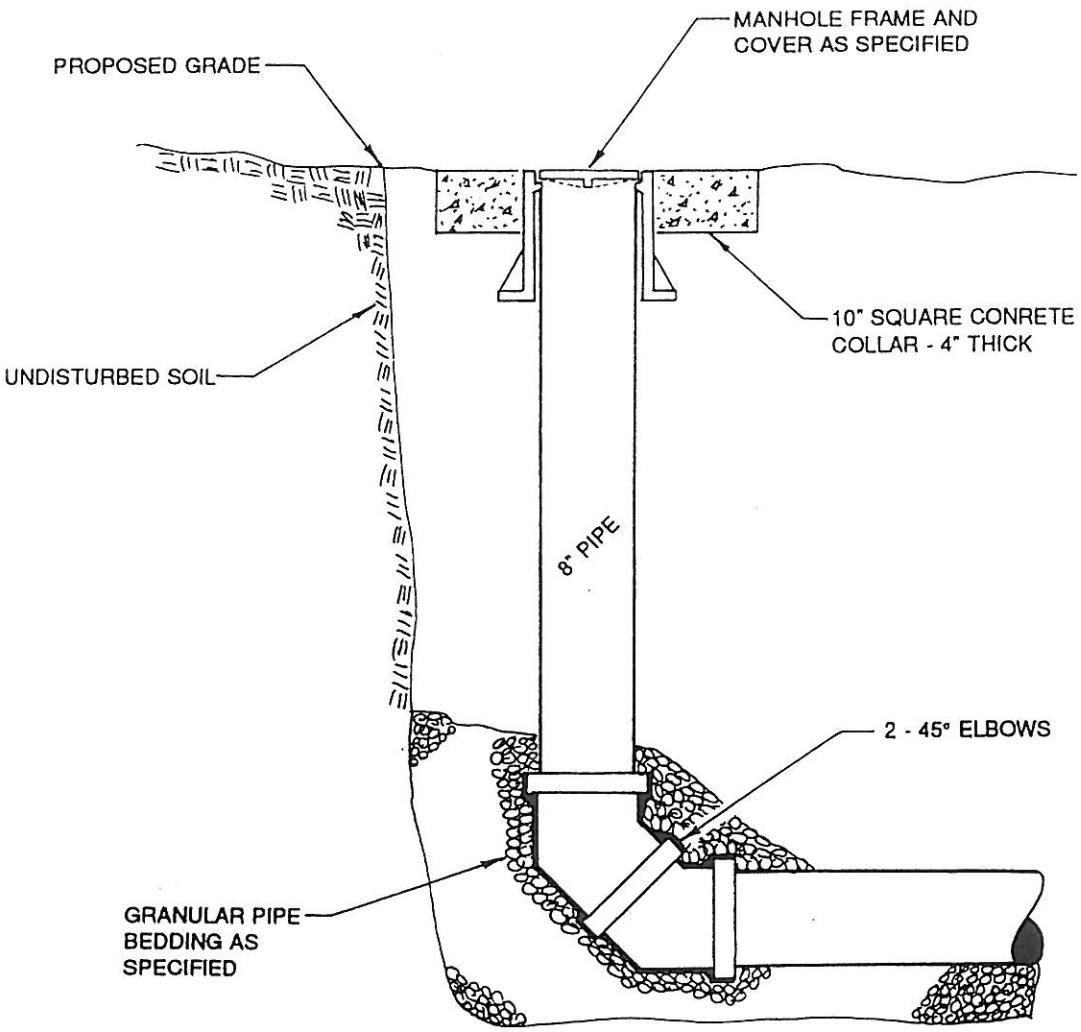
CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# SUBDRAINS

REVISED : 3-94

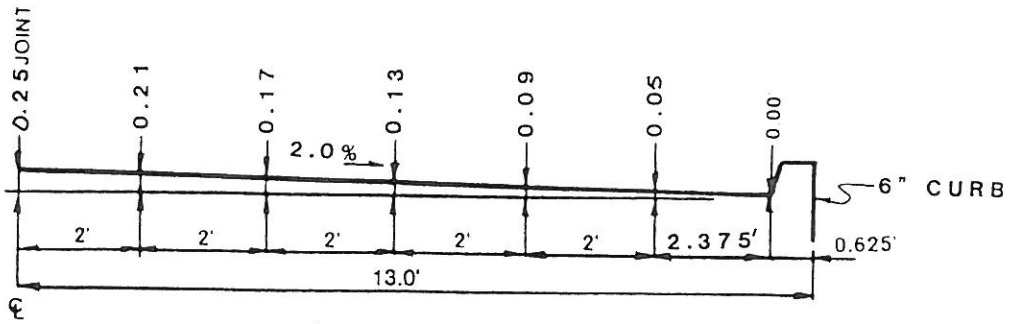
DWG. NO. 5.16

Type H Casting

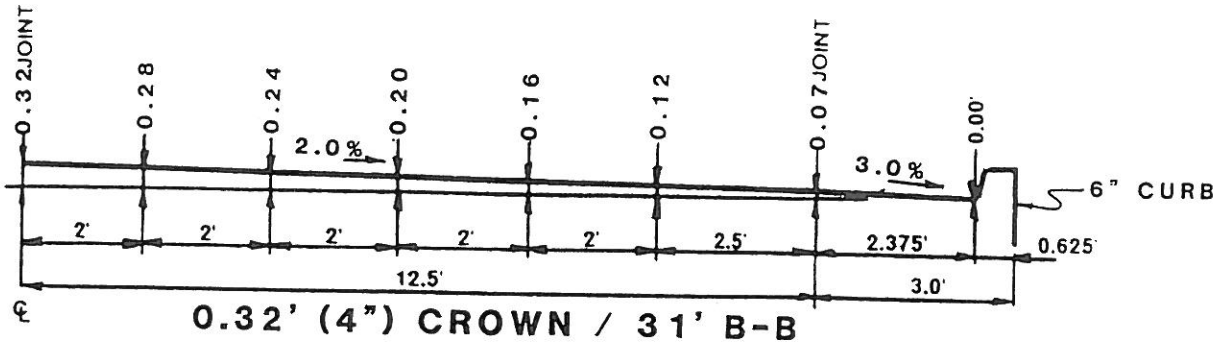



NOTES:
1. FOR USE IN LIEU OF MANHOLE FOR END OF LINE FOR SUMP PUMP DRAINLINES AND SUBDRAINS ONLY

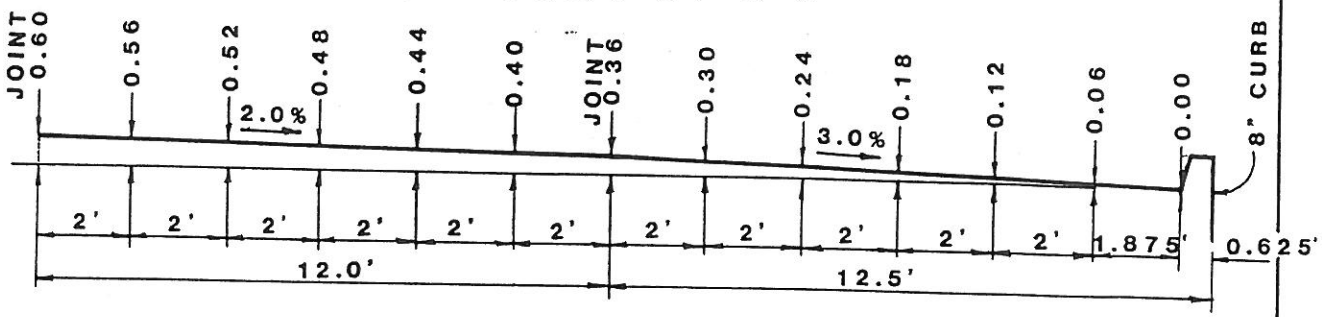
| | | |
|---|---|---|
| CITY OF WEST DES MOINES<br>"CROSSROADS OF THE INTERSTATES" | **CLEAN OUT** | REVISED :<br>3-94<br>DWG. NO.<br>5.17 |




0.25 (3⅛") CROWN / 26' B-B




0.32' (4") CROWN / 31' B-B




0.60' (7½") CROWN 49' B-B

NOTE:

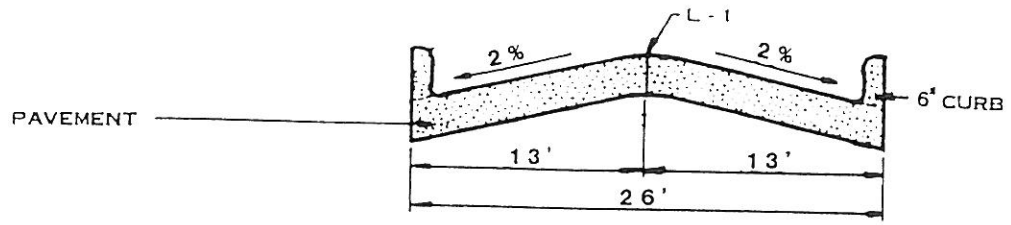
1. CROWN ORDINATES ARE GIVEN IN DECIMALS OF A FOOT.
2. SLIGHTLY ROUND ALL GRADE BREAKS.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

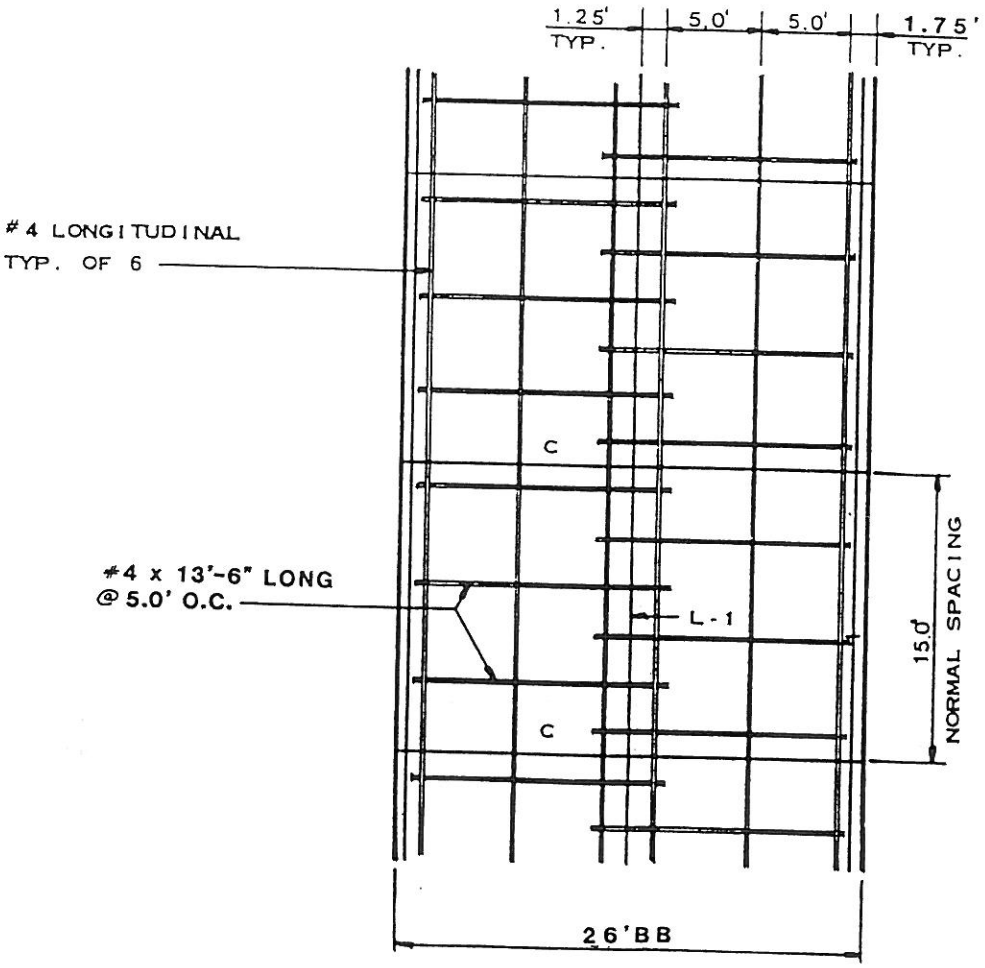
# STREET CROWN TEMPLATES

REVISED : 3-94

DWG. NO. 7.1




SECTION



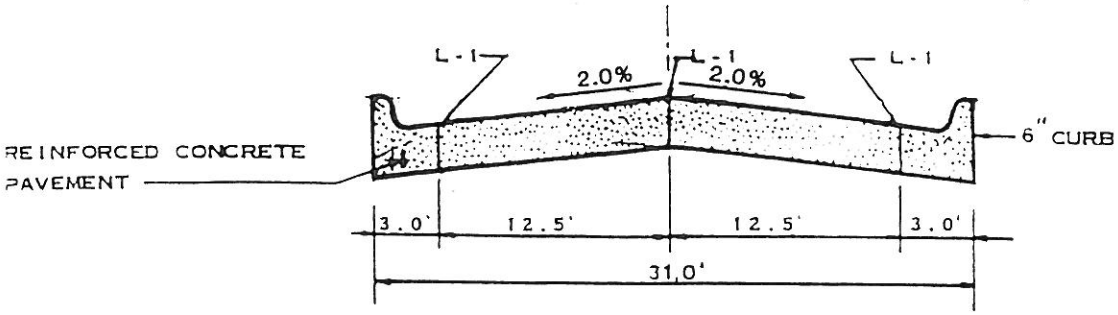

PLAN

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

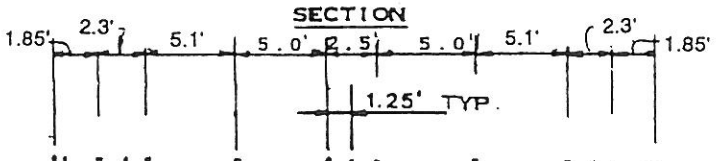
# PORTLAND CEMENT CONCRETE PAVEMENT DETAILS - 26' STREET

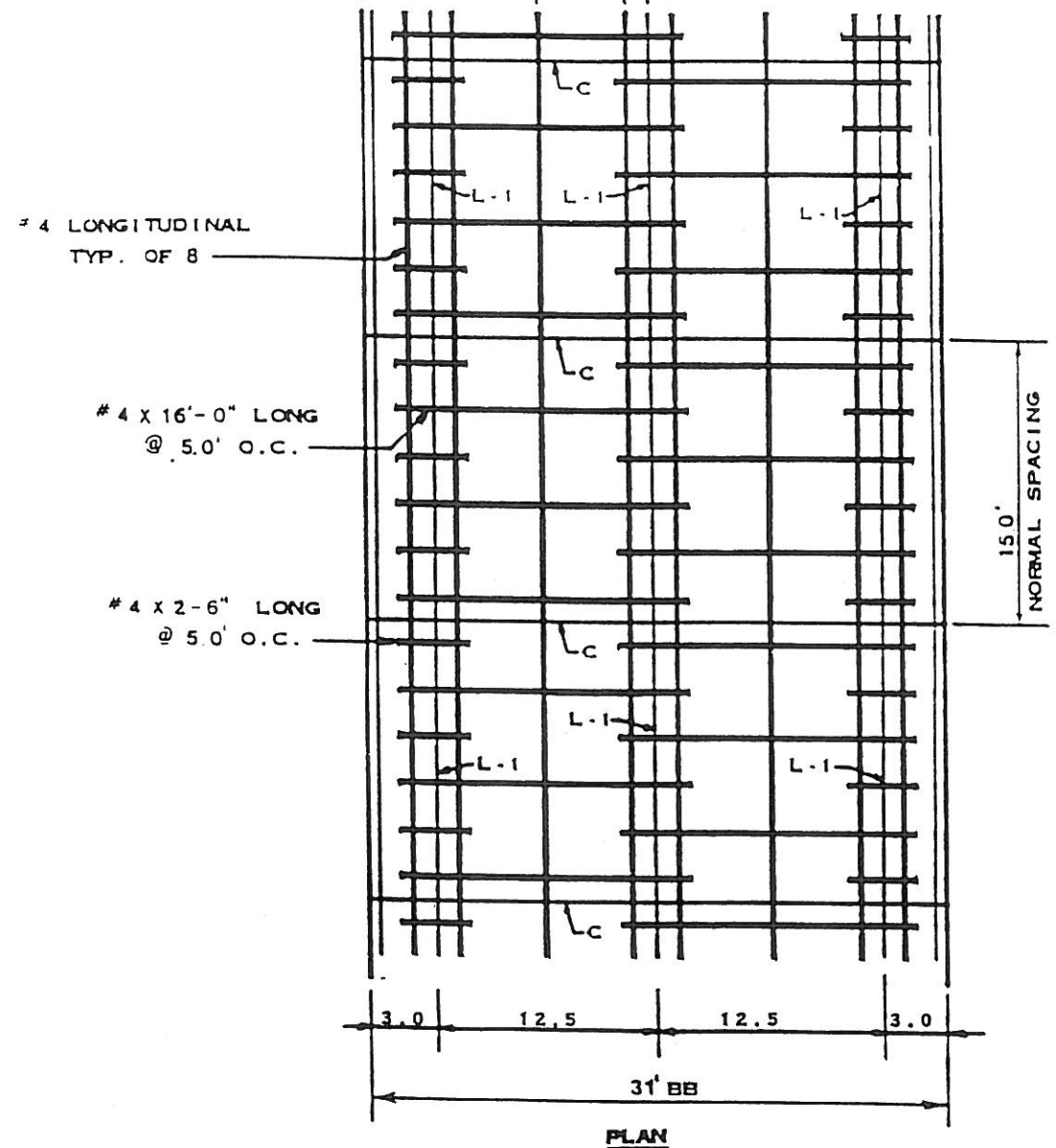
REVISED 3-94

DWG. NO. 7.2




SECTION



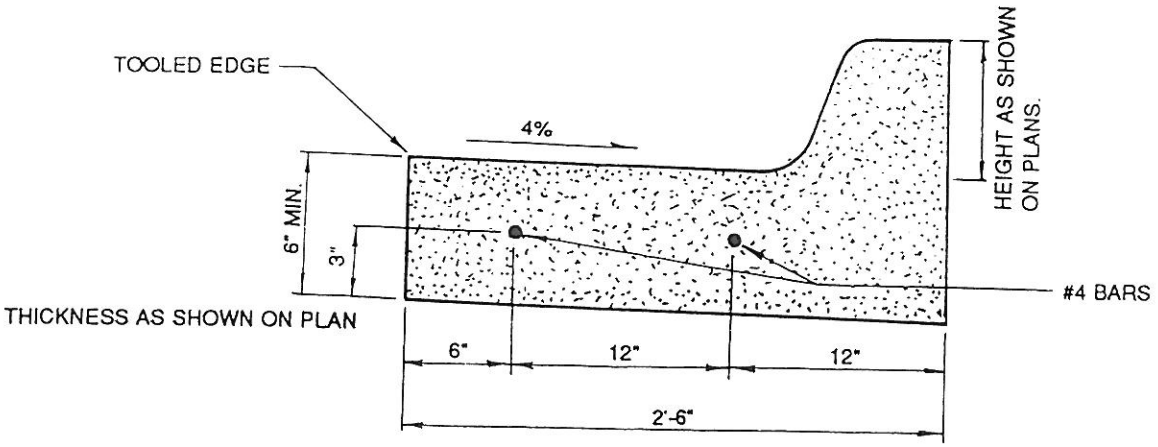

PLAN

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

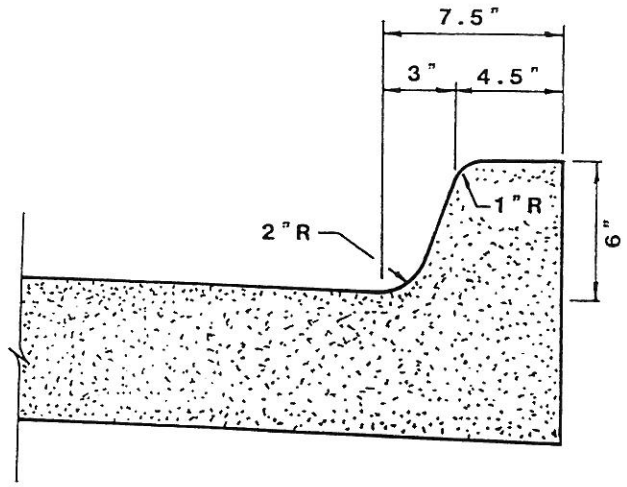
# PORTLAND CEMENT CONCRETE PAVEMENT DETAILS - 31' STREET

REVISED : 3-94

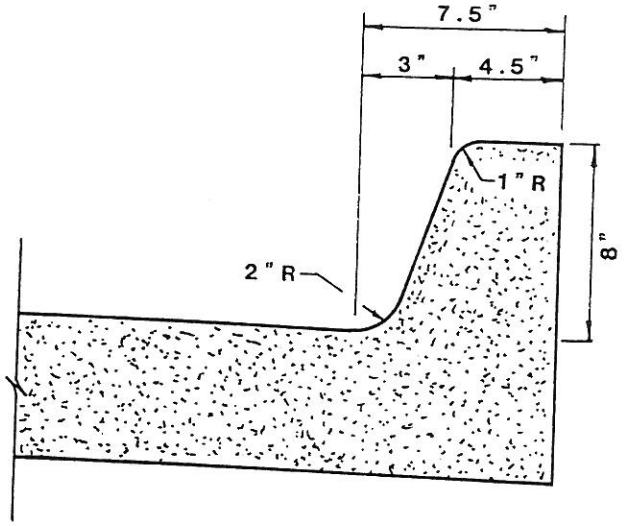
DWG. NO. 7.4



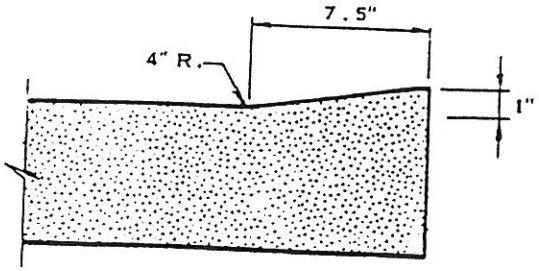

CURB AND GUTTER



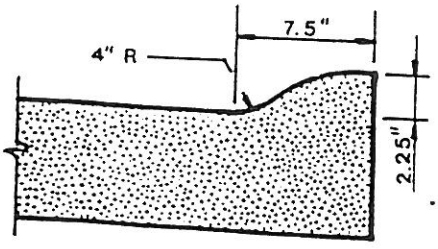

6" CURB




8" CURB




HANDICAP RAMP



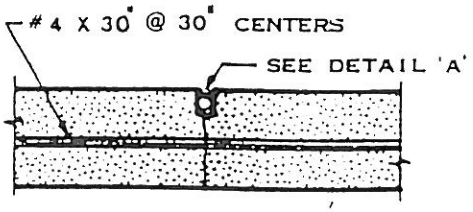

DEPRESSED CURB DRIVEWAYS

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

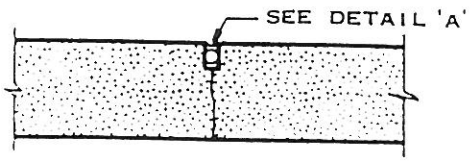
# CURB DETAILS

REVISED : 3-94

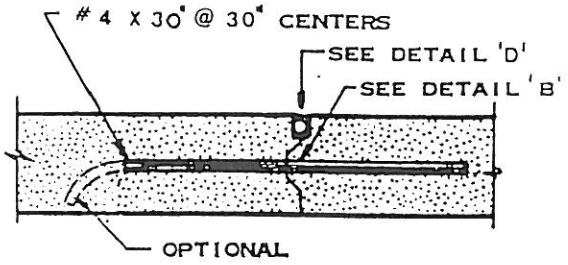
DWG. NO. 7.5



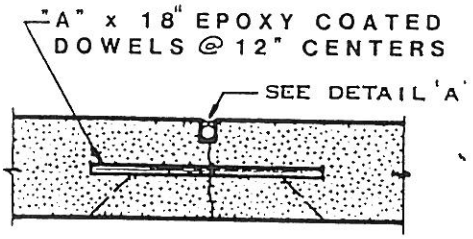

L-1



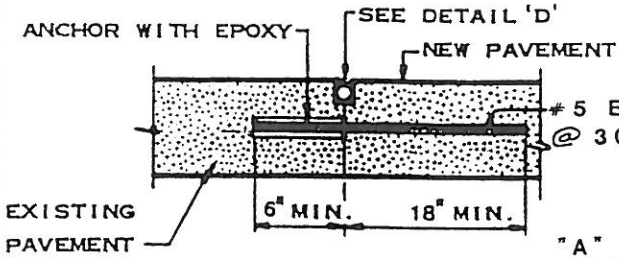

C



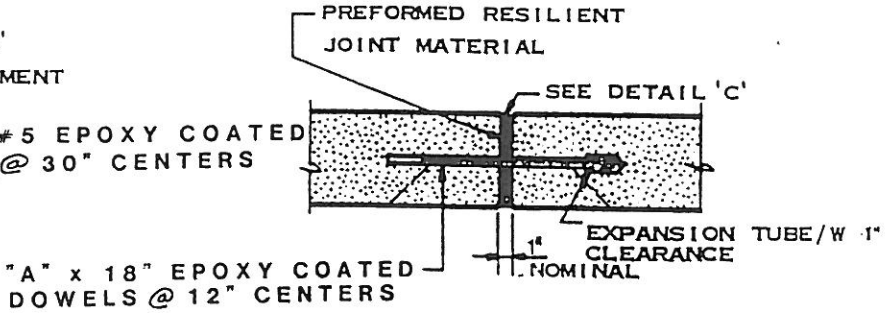

KD-1



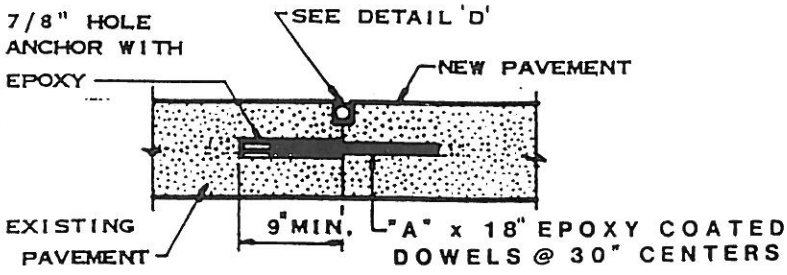

CD



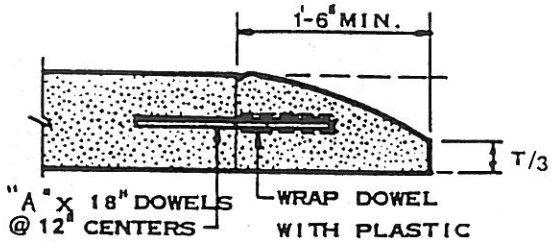

BD




ED




BD-2




HD-1

NOTES:
1. ALTERNATE EXPANSION TUBES ON "ED" JOINT.
2. "A" = 1/8" x PAVEMENT THICKNESS IN INCHES.
3. CENTER ALL REINFORCING STEEL UNLESS OTHERWISE NOTED.

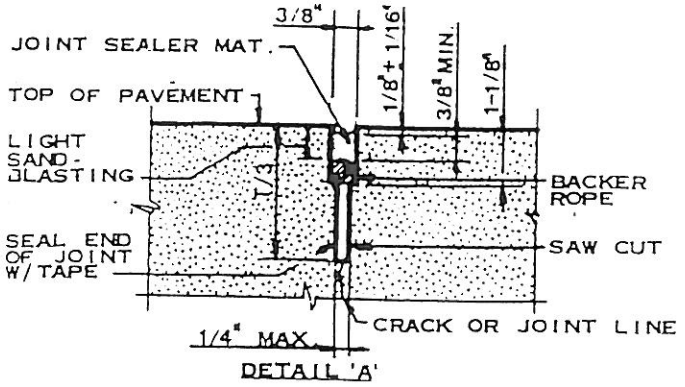
CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# PORTLAND CEMENT CONCRETE PAVEMENT JOINT DETAILS

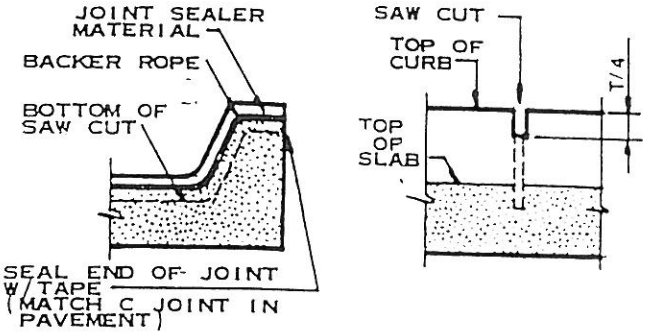
1 OF 2

REVISED : 3-94

DWG. NO.

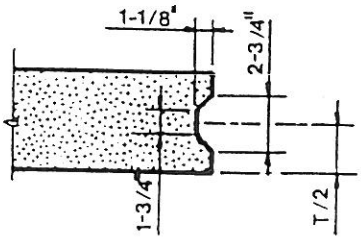


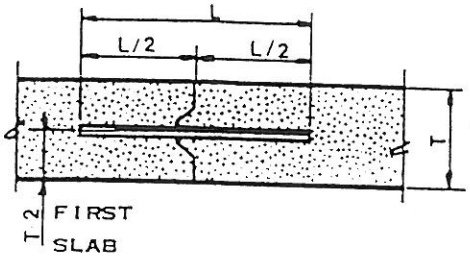

DETAIL 'A'



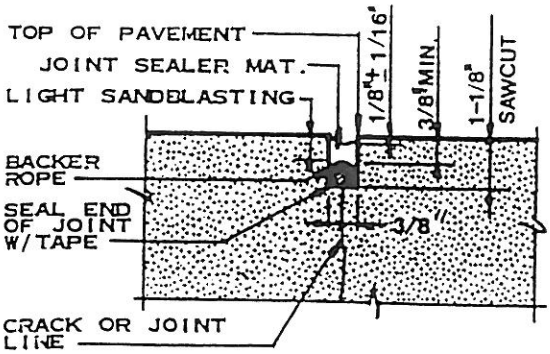

C JOINT IN CURB

*Full Depth 3/8" Saw Cut Allowed

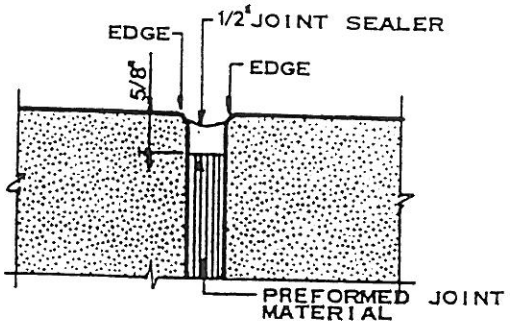


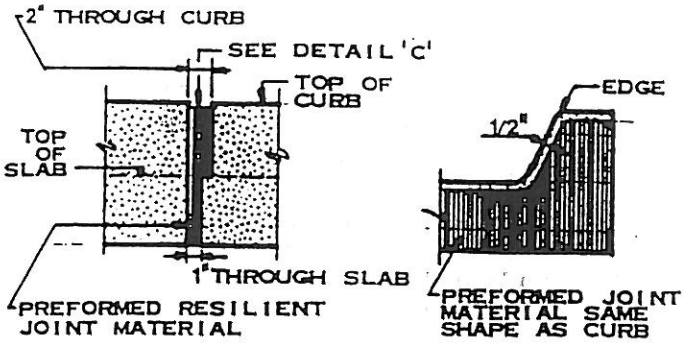

DETAIL 'B'



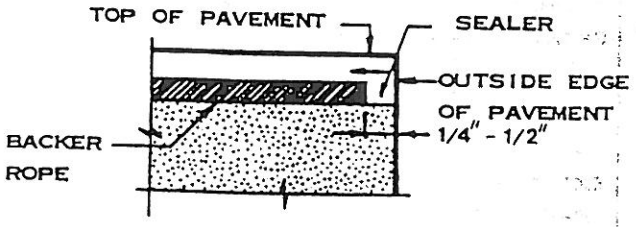

DETAIL 'D'




DETAIL 'C'




E JOINTS IN CURB




SECTION THRU JOINT AT PAVEMENT EDGE

NOTES

1. EDGE WITH 1/4" RADIUS TOOL FOR LENGTH OF JOINT WHERE NOTED.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

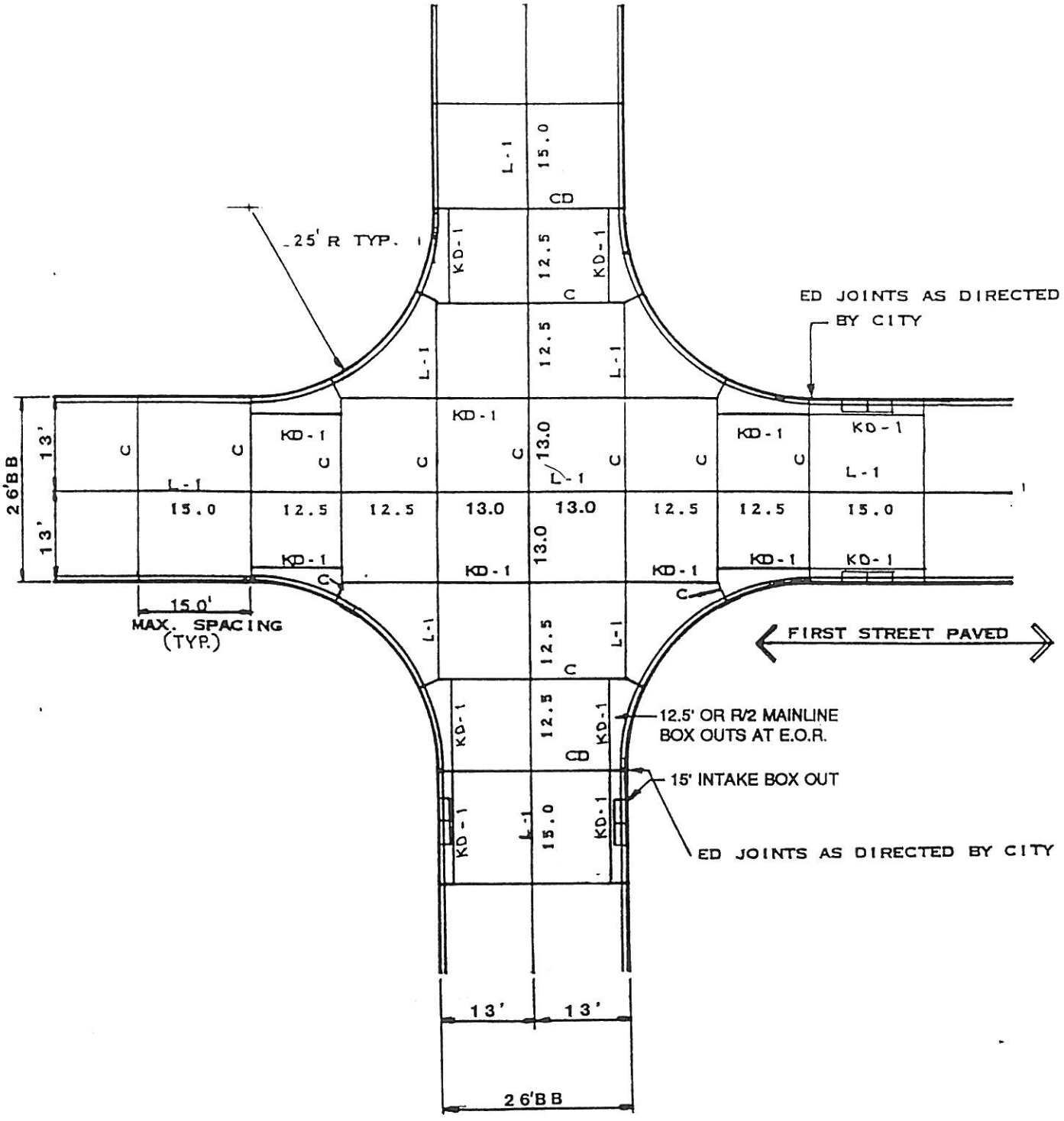
# PORTLAND CEMENT CONCRETE PAVEMENT JOINT DETAILS 2 OF 2

REVISED: 3-94

DWG. NO. 7.7

NOTES

1. DUE TO THE ORDER OF CONSTRUCTION THE FOLLOWING JOINTS MAYBE INTERCHANGEABLE; CD WITH C AND L-1 WITH KD-1




CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

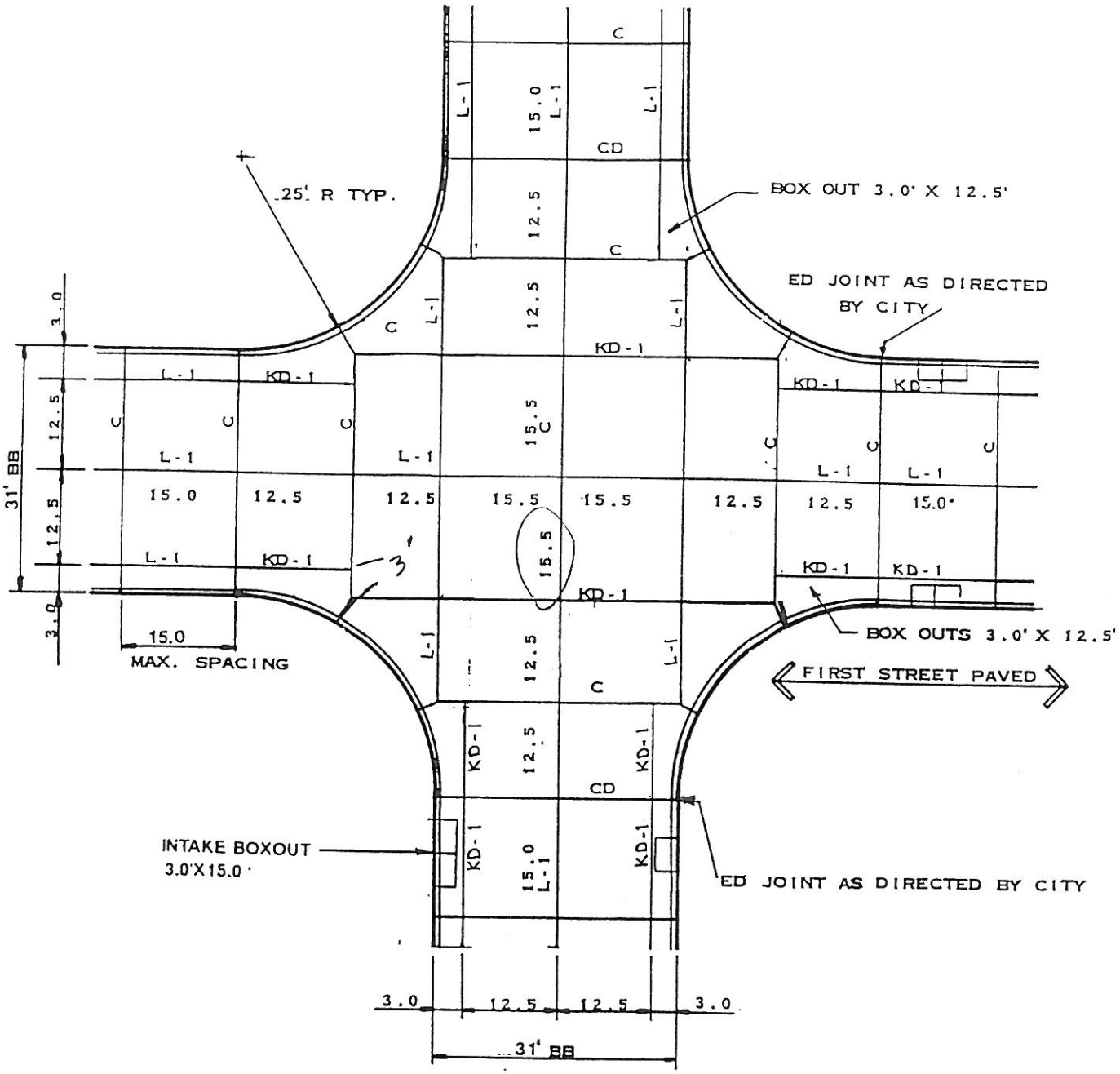
**PORTLAND CEMENT CONCRETE PAVEMENT**
**INTERSECTION DETAILS**
**26' STREET**

REVISED : 3-94

DWG. NO. 7.0

NOTES

1. DUE TO THE ORDER OF CONSTRUCTION THE FOLLOWING JOINTS MAYBE INTERCHANGEABLE; CD WITH C AND L-1 WITH KD-1

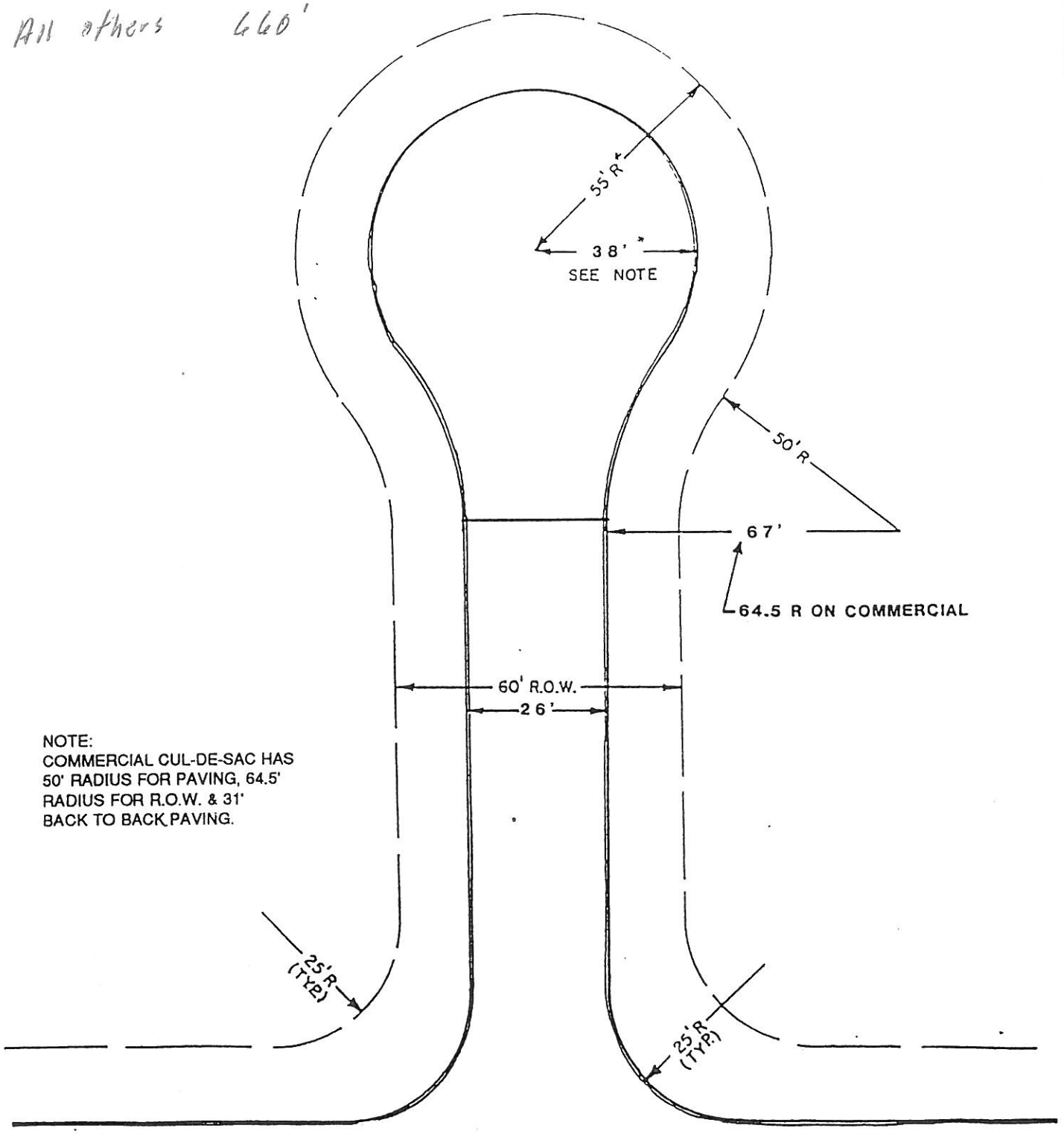



| | | |
|---|---|---|
| CITY OF WEST DES MOINES<br>"CROSSROADS OF THE INTERSTATES" | PORTLAND CEMENT CONCRETE PAVEMENT<br>INTERSECTION DETAILS<br>31' STREET | REVISED :<br>3-94<br>DWG. NO.<br>7.10 |

Estate lots - 1000'

K-1 - 800'

All others 660'



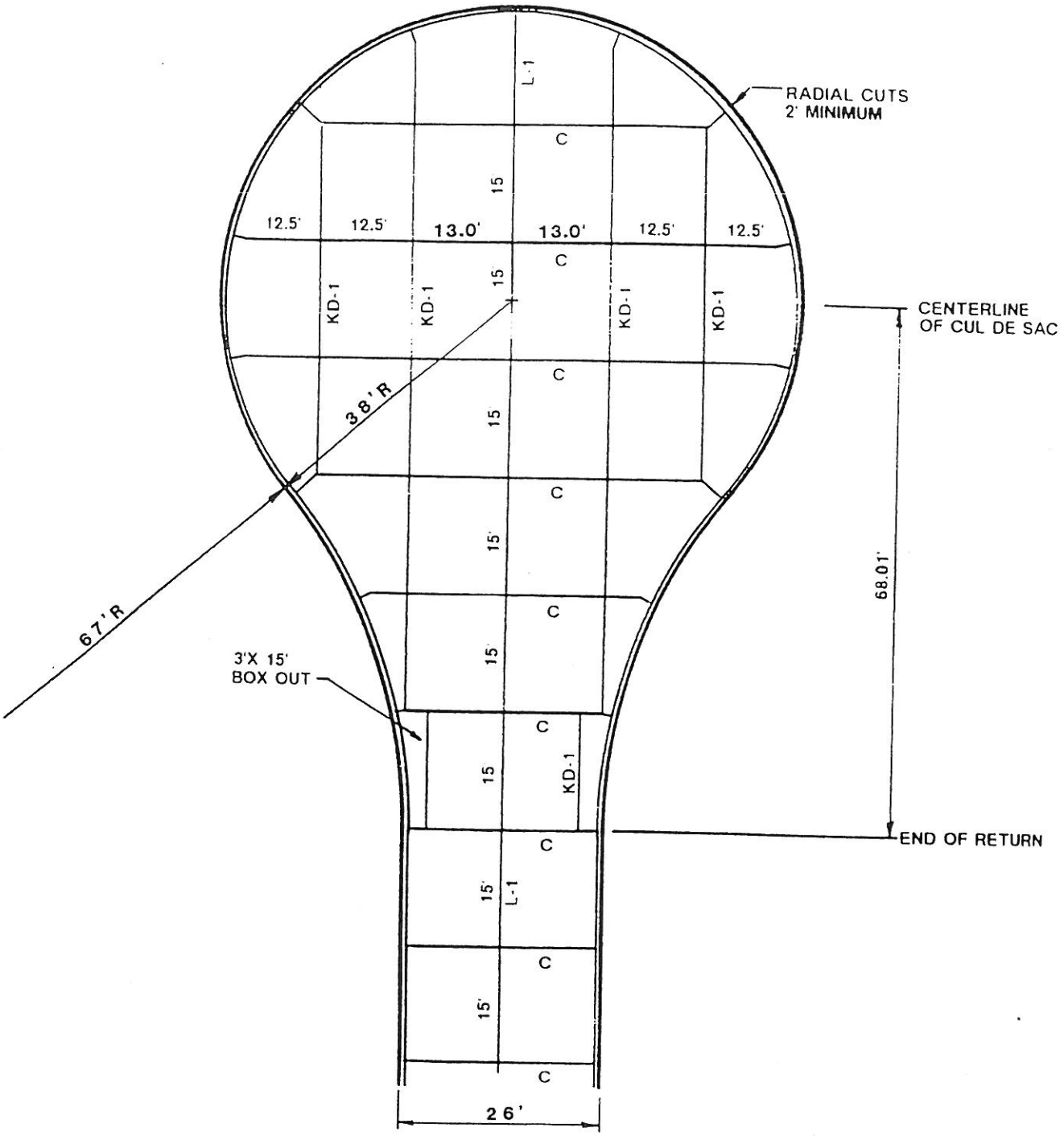

NOTE:
COMMERCIAL CUL-DE-SAC HAS 50' RADIUS FOR PAVING, 64.5' RADIUS FOR R.O.W. & 31' BACK TO BACK PAVING.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

CUL-DE-SAC R.O.W. AND PAVING
26' STREET

REVISED : 3-94

DWG. NO.

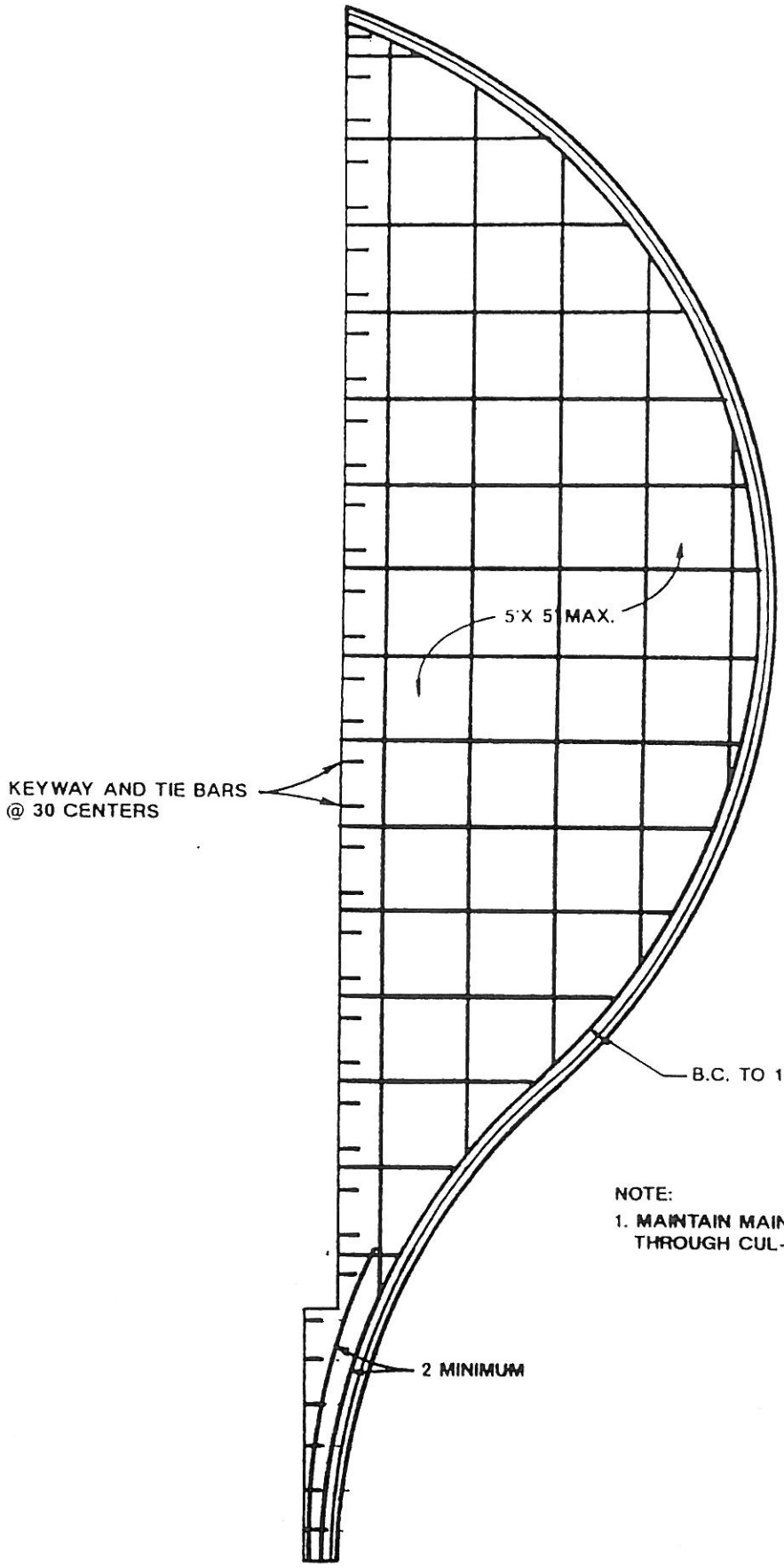



CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# PORTLAND CEMENT CONCRETE PAVEMENT
## RESIDENTIAL
## CUL-DE-SAC JOINT DETAIL
## 26' STREET

REVISED
3-94

DWG. NO.:
7.12




NOTE:

1. MAINTAIN MAINLINE STEEL PATTERN THROUGH CUL-DE SAC.

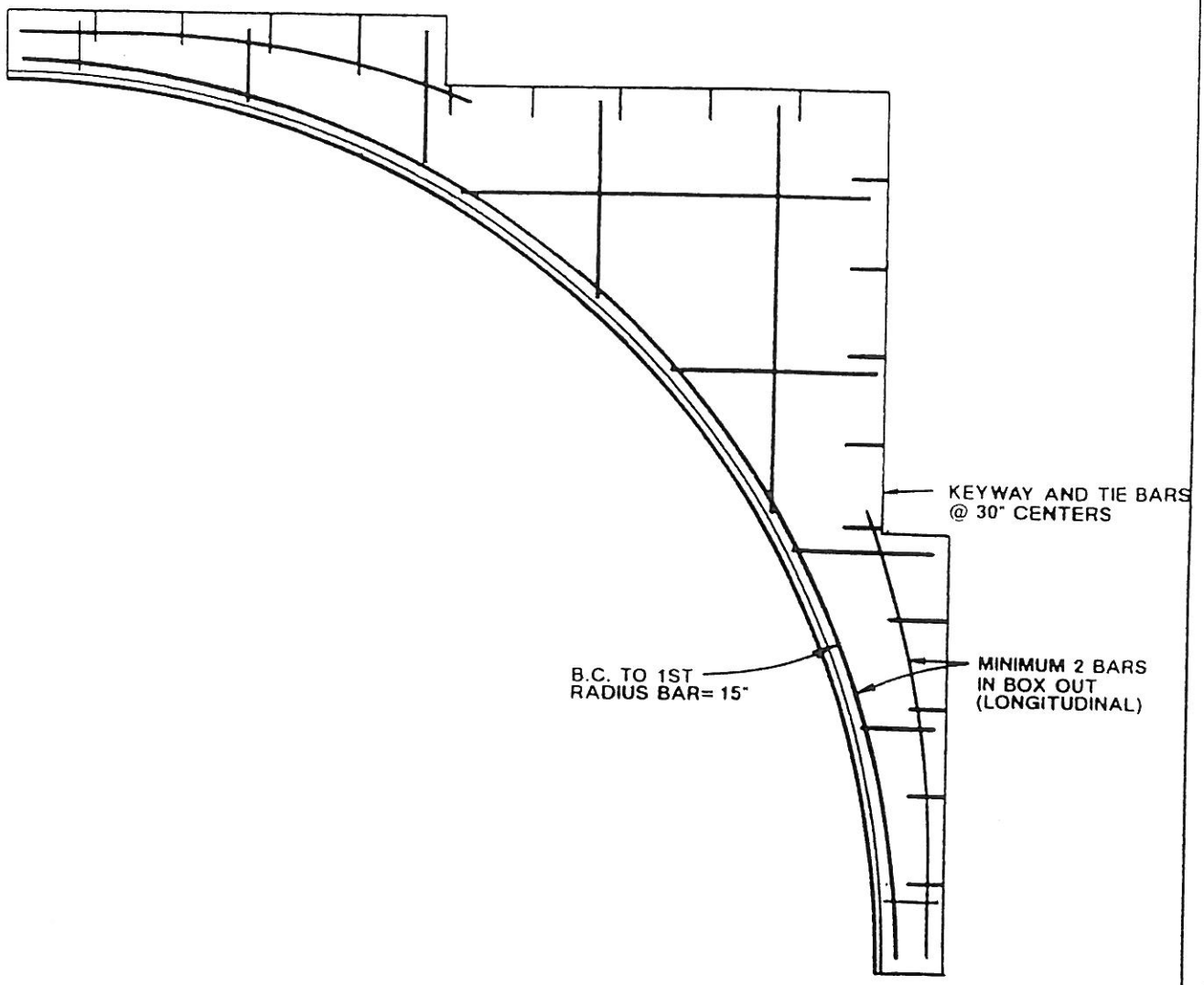
CITY OF WEST DES MOINES

"CROSSROADS OF THE INTERSTATES"

# PORTLAND CEMENT CONCRETE PAVEMENT RESIDENTIAL CUL-DE-SAC REINFORCING

REVISED : 3-94

DWG. NO. 7.13

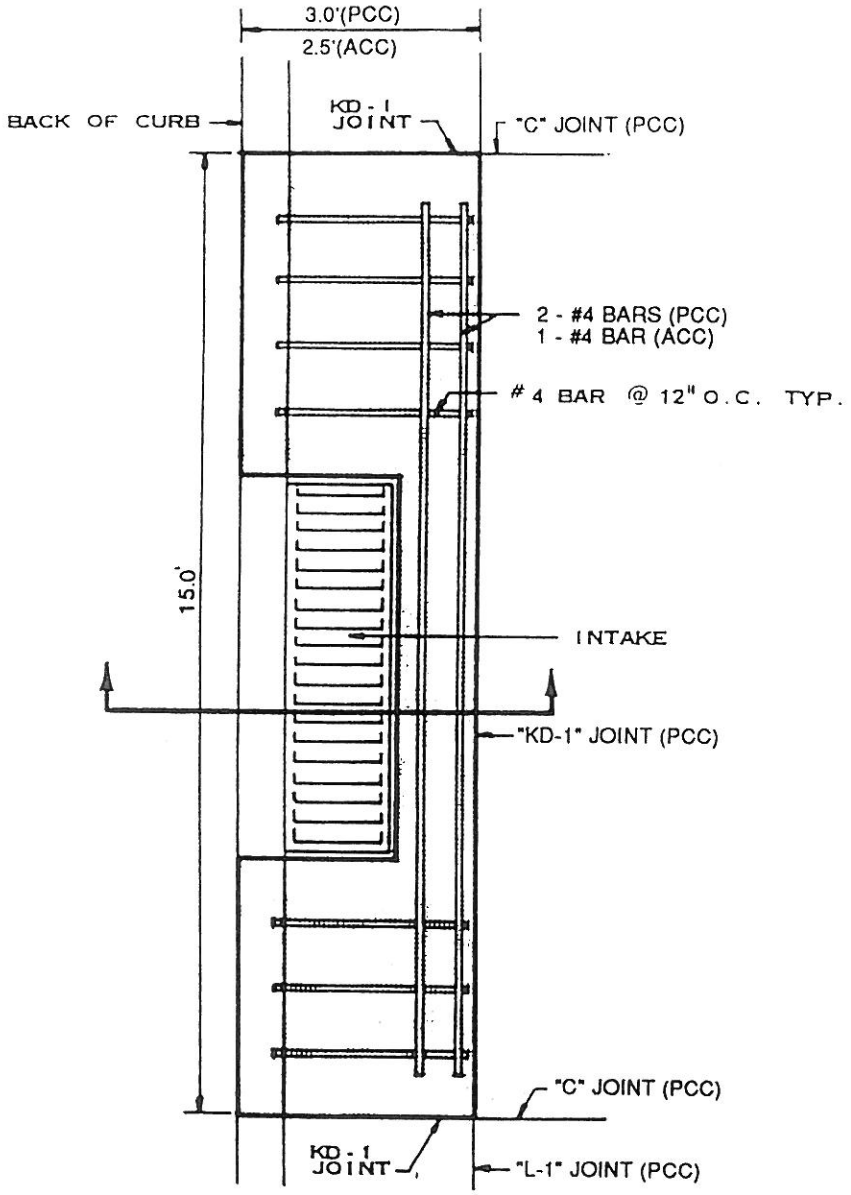



CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

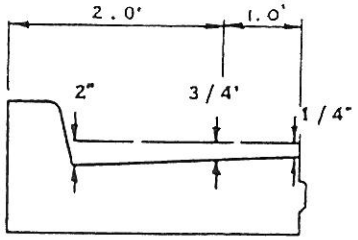
# PORTLAND CEMENT CONCRETE PAVEMENT RETURN REINFORCING

REVISED : 3-94

DWG. NO. 7.14




PLAN




GRATE ADJUSTMENTS

PCC = PORTLAND CEMENT CONCRETE OPTION
ACC = ASPHALTIC CEMENT CONCRETE OPTION

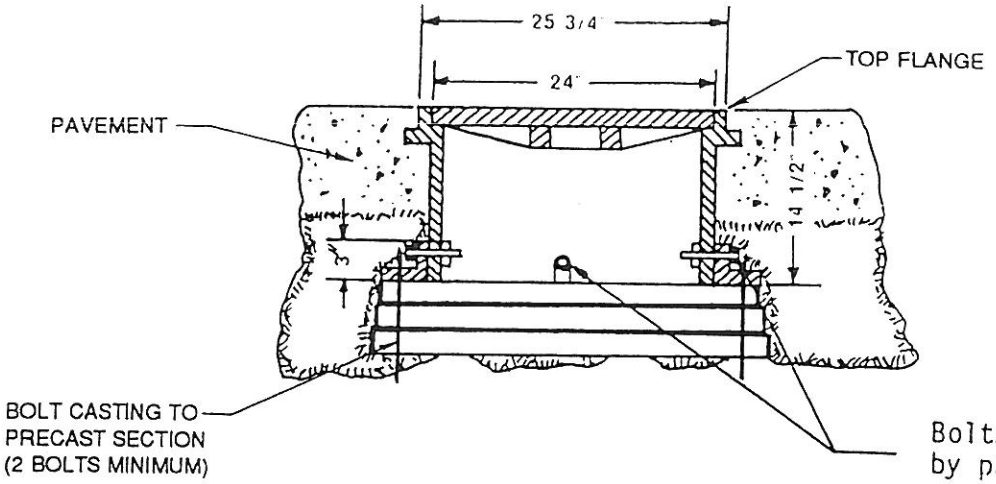
CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# INTAKE BOXOUT DETAIL

REVISED : 3-94

DWG. NO. 715

CASTING TYPE AS SPECIFIED IN PLANS OR SPECIFICATIONS



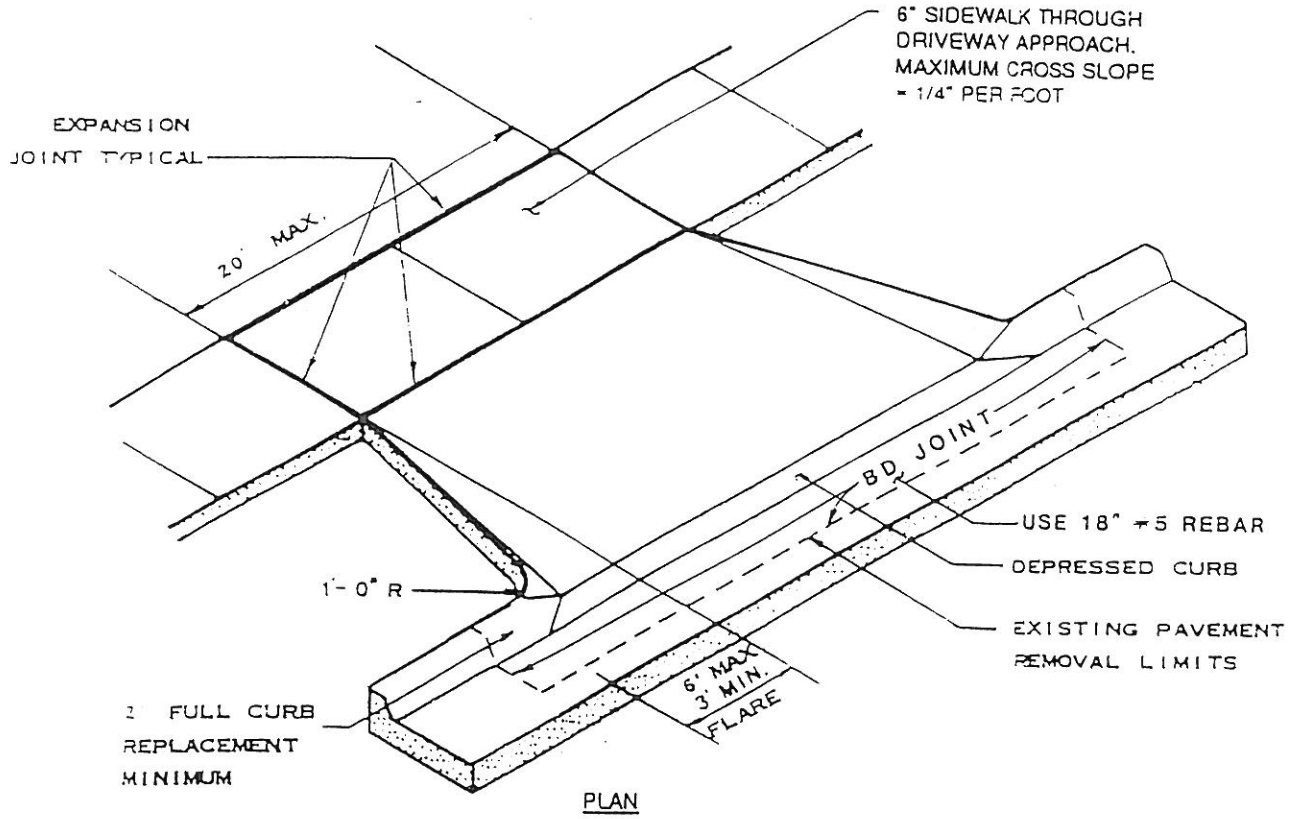

NOTES:
1. INSTALL TOP FLANGE FLUSH WITH GRADE.
2. DO NOT ALLOW TOP FLANGE AND PAVEMENT TO BE SUPPORTED BY MANHOLE WALL.
3. BOLT CASTINGS TO PRECAST SECTION, 2 BOLTS MINIMUM.
4. COMPACT COHESIVE SOIL AROUND MANHOLE FLANGE SECTION.
   DO NOT USE GRANULAR BACKFILL MATERIAL.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

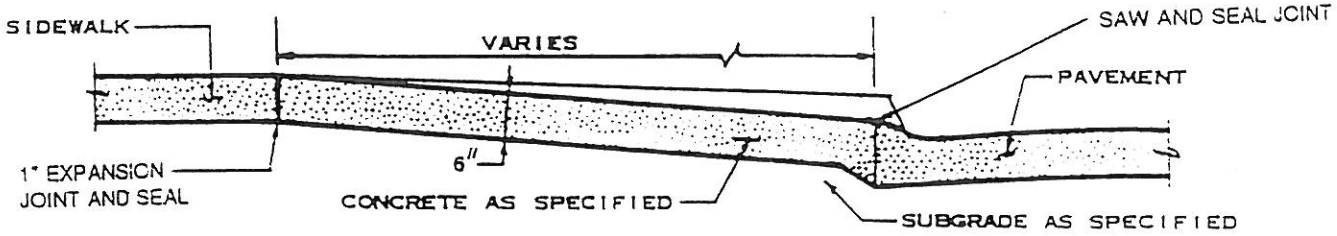
**TYPICAL MANHOLE ASSEMBLY IN PAVEMENT**

REVISED 3-94

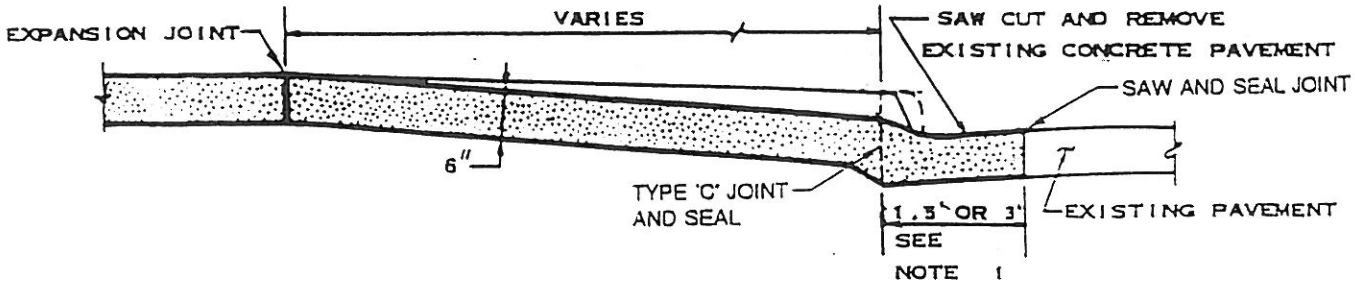
DWG. NO. 7.16




PLAN




SECTION - (NEW PAVEMENT AND NEW DRIVEWAY)




SECTION - (EXISTING PAVEMENT AND NEW DRIVEWAY)

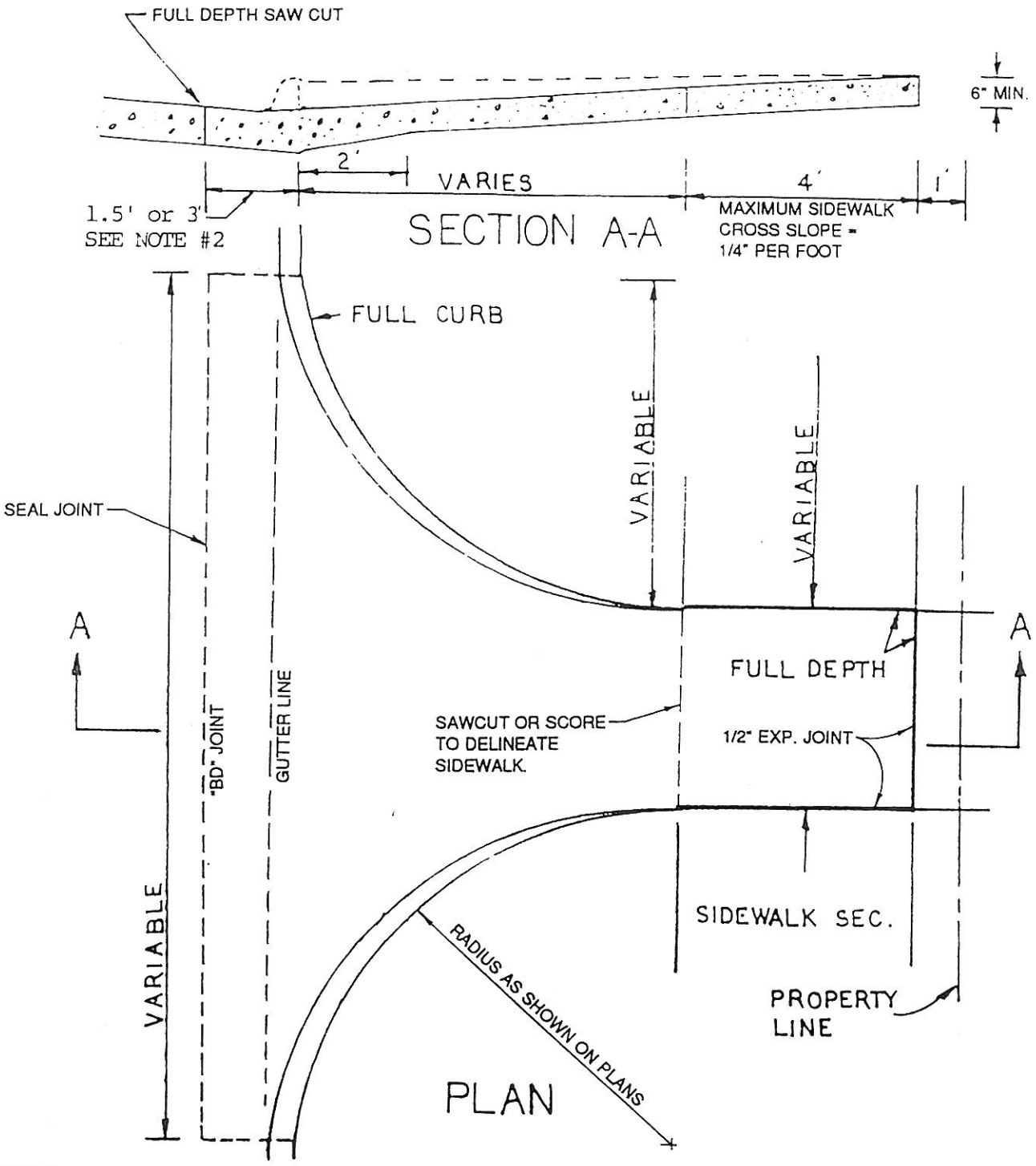
NOTES:
1. SAW CUT AND REMOVE EXISTING CONCRETE A WIDTH OF 3' WHEN EXISTING JOINT IS 3' FROM BACK OF CURB
2. IN LIEU OF PAVEMENT REMOVAL THE CONCRETE CURBS MAY BE SAWED OR GROUND OFF TO CONFORM TO THE SPECIFIED SHAPE FOR DEPRESSED CURB DRIVEWAYS.
3. SAW CUT PAVEMENT JOINTS IN GENERAL CONFORMANCE WITH PORTLAND CEMENT CONCRETE INTERSECTION DETAILS.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# RESIDENTIAL DRIVEWAY DETAILS

REVISED : 3-94

DWG. NO 7.17




NOTES:

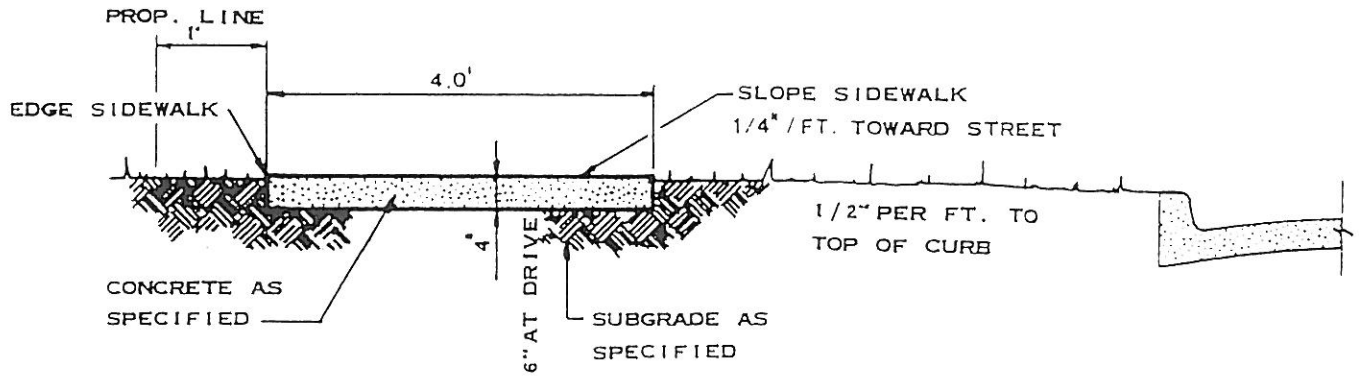
1. BEFORE THE CONCRETE IS PLACED, THE SAW CUT JOINTS SHALL BE COMPLETELY CLEANED OF ALL LOOSE CONCRETE OR FOREIGN MATERIAL.
2. SAW CUT AND REMOVE EXISTING CONCRETE PAVEMENT A WIDTH OF 3' WHEN EXISTING JOINT IS 3' FROM BACK OF CURB.
3. SAW CUT PAVEMENT JOINTS IN GENERAL CONFORMANCE WITH PORTLAND CEMENT CONCRETE INTERSECTION DETAILS.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

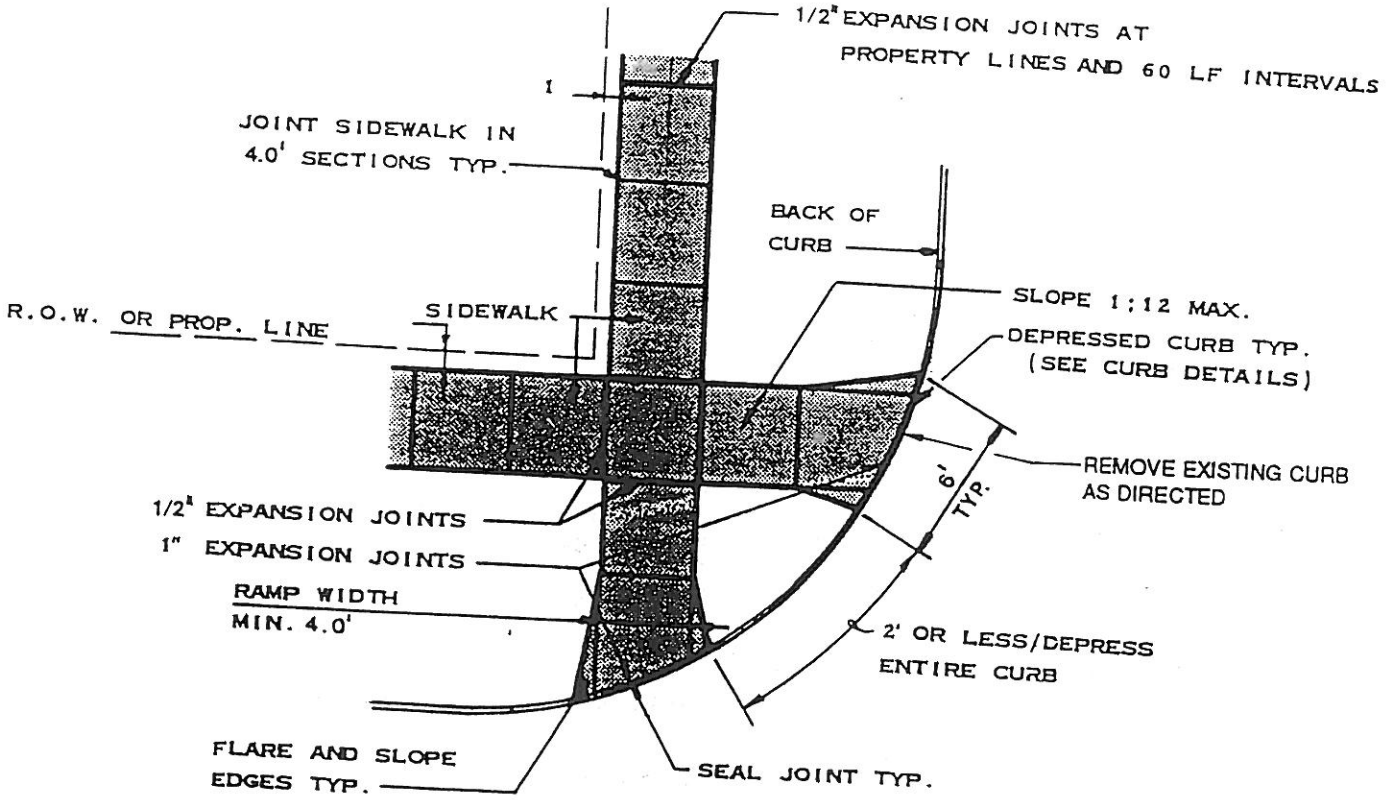
# COMMERCIAL DRIVEWAY DETAIL

REVISED : 3-94

DWG. NO. 7.18




SECTION




PLAN

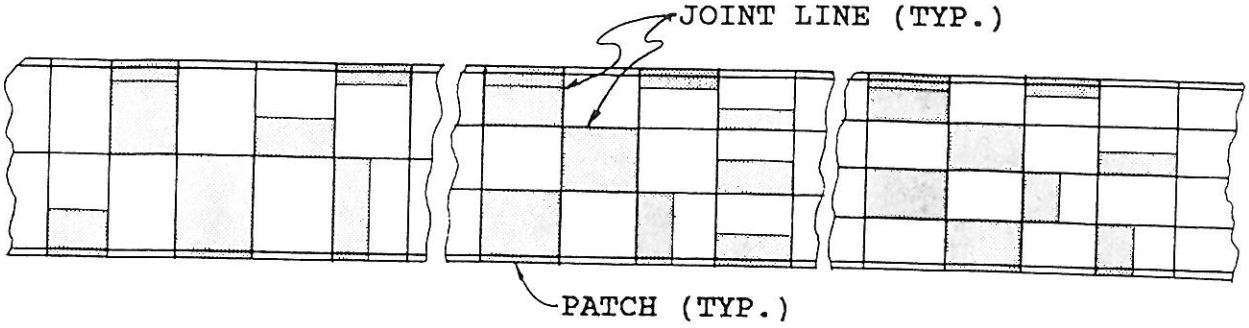
NOTES:
1. CONSTRUCT PEDESTRIAN RAMPS 6" THICK BETWEEN EXPANSION JOINTS.
2. VARIATION IN THE CROSS SLOPE OF THE PARKING AREA MUST BE APPROVED BY THE CITY.
3. IN LIEU OF PAVEMENT REMOVAL THE CONCRETE CURBS MAY BE SAWED OR GROUND OFF TO CONFORM TO THE SPECIFIED SHAPE FOR DEPRESSED CURB DRIVEWAYS.

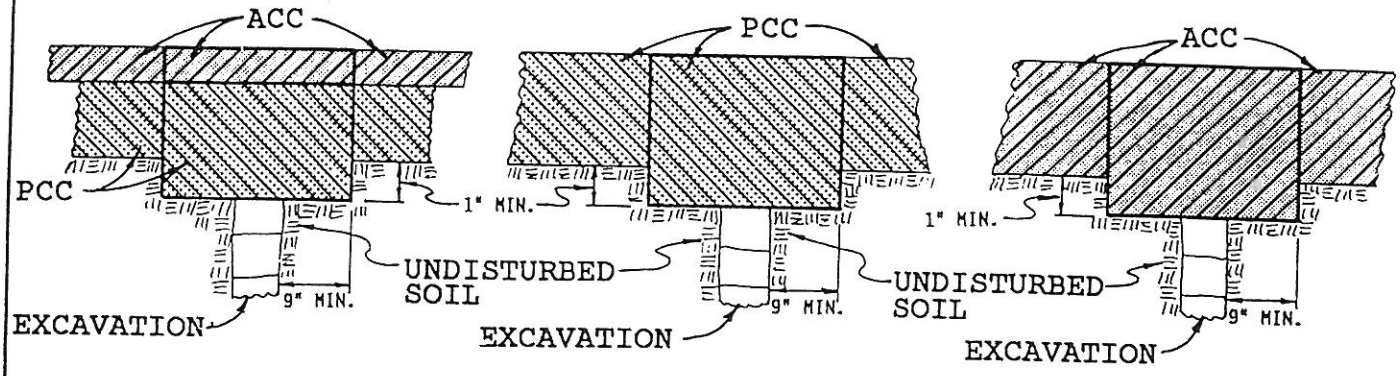
CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

# SIDEWALK DETAILS

REVISED : 3-94

DWG. NO. 7.19




ACC RESURFACED PCC PAVEMENT

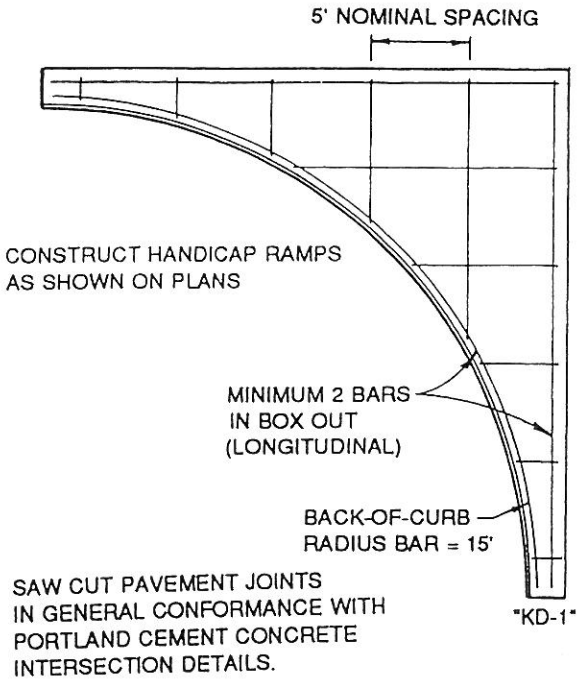
PCC PAVEMENT

ACC PAVEMENT

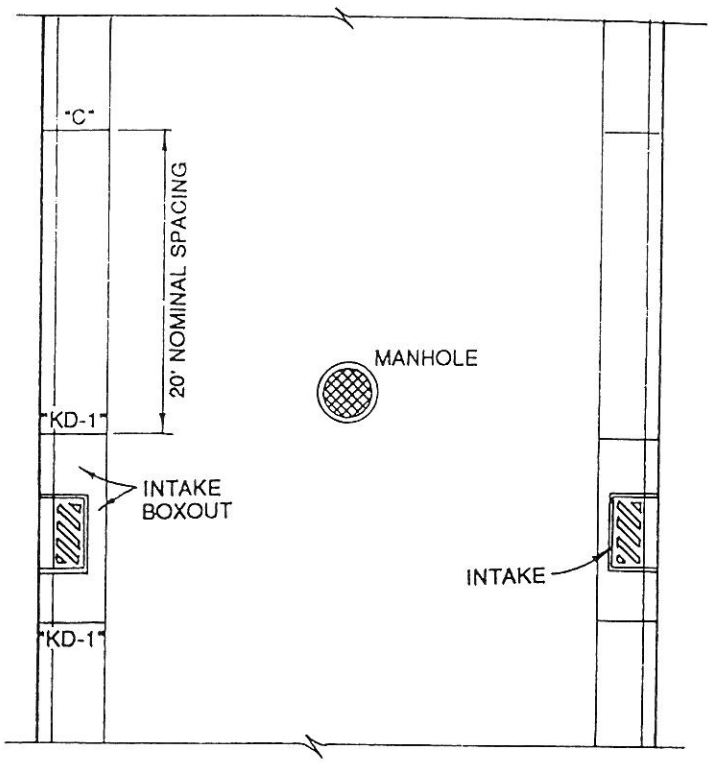
NOTES:

1. SAWCUT ALL PATCHES FULL DEPTH PRIOR TO REMOVAL.
2. PLACE BACKFILL IN MAXIMUM 8" LIFTS.
   I.D.O.T. CLASS "A" CRUSHED STONE MAY BE USED AS ALTERNATE BACKFILL MATERIAL - COMPACT BACKFILL TO 95% MAXIMUM DENSITY.
3. CONSTRUCT TYPE "BD" LONGITUDINAL JOINTS AND TYPE "BD-2" TRANSVERSE JOINTS ON ALL PCC PATCHES.
4. USE I.D.O.T. M-4 PCC CONCRETE MIX AND I.D.O.T. TYPE "A" ACC CONCRETE MIX AS SHOWN.
5. SAW AND SEAL ALL PCC PATCHES.
6. HALF PANEL PCC PATCHES MAY BE ALLOWED UNDER THE FOLLOWING CONDITIONS:
   A. PAVEMENT IS MORE THAN TEN (10) YEARS OLD.
   B. THE LENGTH OF THE PATCH AN / OR THE REMAINING PANEL DO NOT EXCEED TWICE THE WIDTH.
   C. PRIOR APPROVAL IS RECEIVED FROM THE CITY.
7. SMALLER PATCHES MAY BE ALLOWED ON STREETS MORE THAN TWENTY (20) YEARS OLD WITH APPROVAL FROM CITY ENGINEER.
8. UNDERMINING OF PAVEMENT IS NOT PERMITTED.
9. PCC PATCHES TO BE REINFORCED IN A SIMILAR FASHION AS SHOWN ON PAVEMENT DETAIL DRAWINGS.
10. THE CONTRACTOR MUST RECEIVE PERMISSION TO CONSTRUCT PATCHES WHICH MUST BE TEMPORARILY INSTALLED DUE TO WEATHER OR TRAFFIC CONSTRAINTS. PERMANENT REPAIRS MUST BE MADE AS SOON AS WEATHER OR TRAFFIC PERMITS.

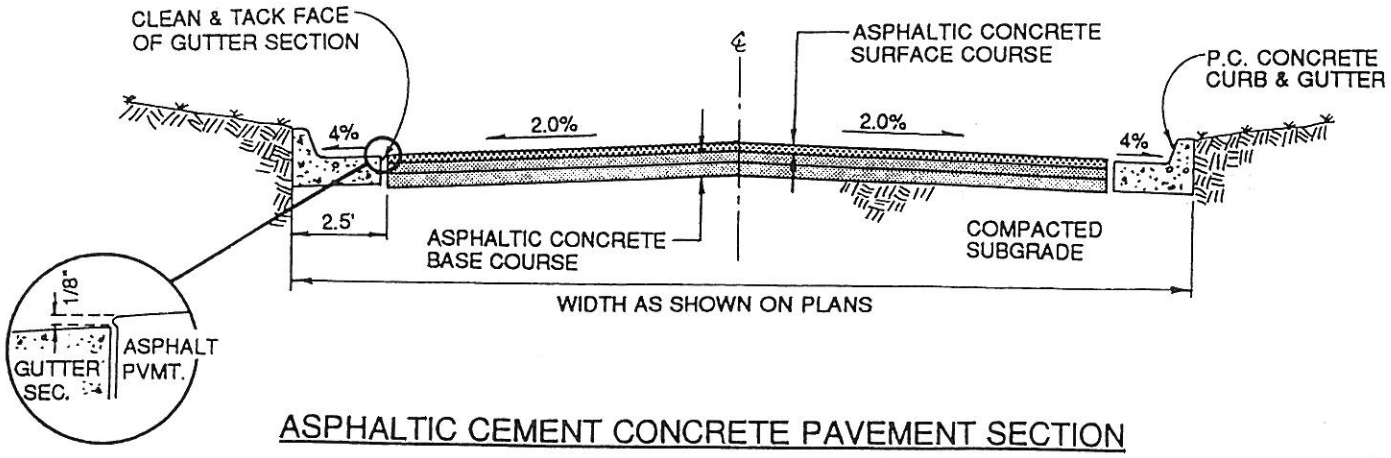
| | | |
|---|---|---|
| CITY OF WEST DES MOINES<br>"CROSSROADS OF THE INTERSTATES" | **STREET EXCAVATION AND PAVEMENT REPLACEMENT DETAILS** | REVISED 3-94<br>DWG. NO. 7.20 |




RADIUS DETAIL




PLAN




ASPHALTIC CEMENT CONCRETE PAVEMENT SECTION

NOTE:
1. INSTALL TYPE "E" EXPANSION JOINTS AT NOT LESS THAN 100' INTERVALS.

CITY OF WEST DES MOINES
"CROSSROADS OF THE INTERSTATES"

**ASPHALTIC CEMENT CONCRETE PAVEMENT**

REVISED
3-94

DWG. NO
81

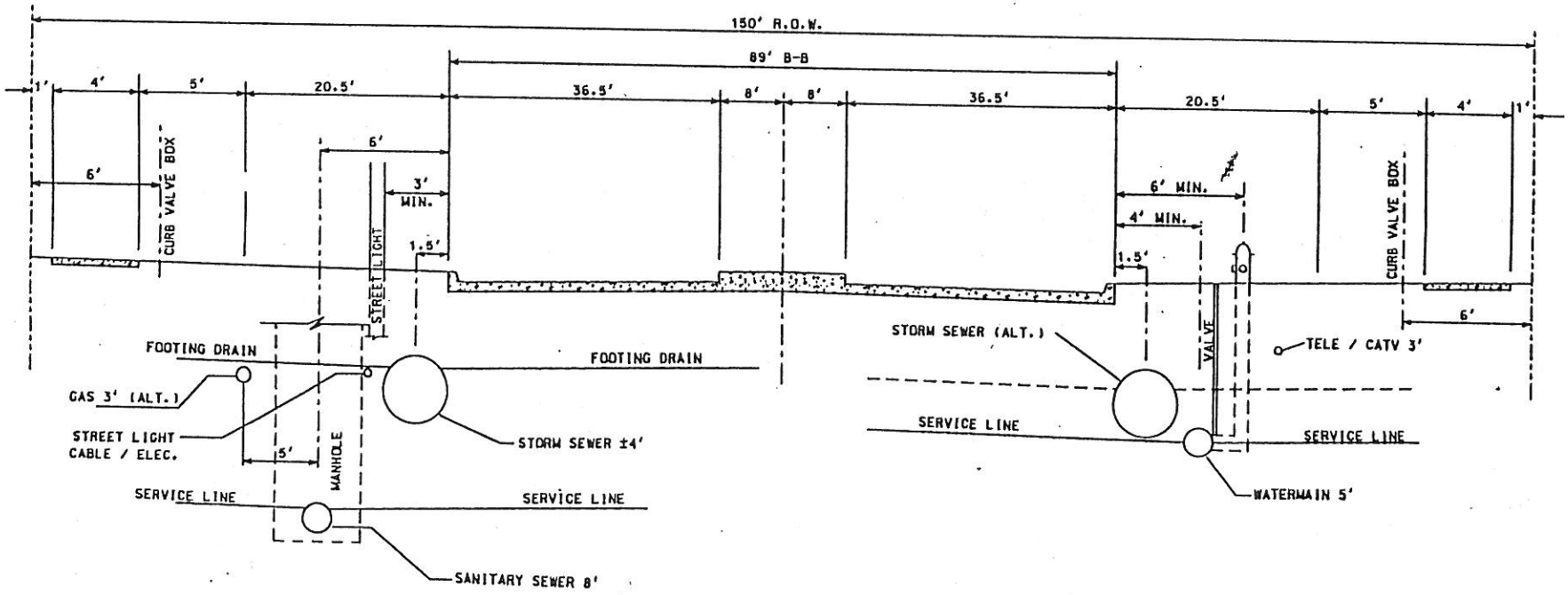



FIGURE 8.1

CITY OF WEST DES MOINES
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
CADD PRODUCED

DATE: 06-16-92

PROJECT:

STANDARD 89' MAJOR ARTERIAL STREET

DRAWN BY:

DESIGNED BY:

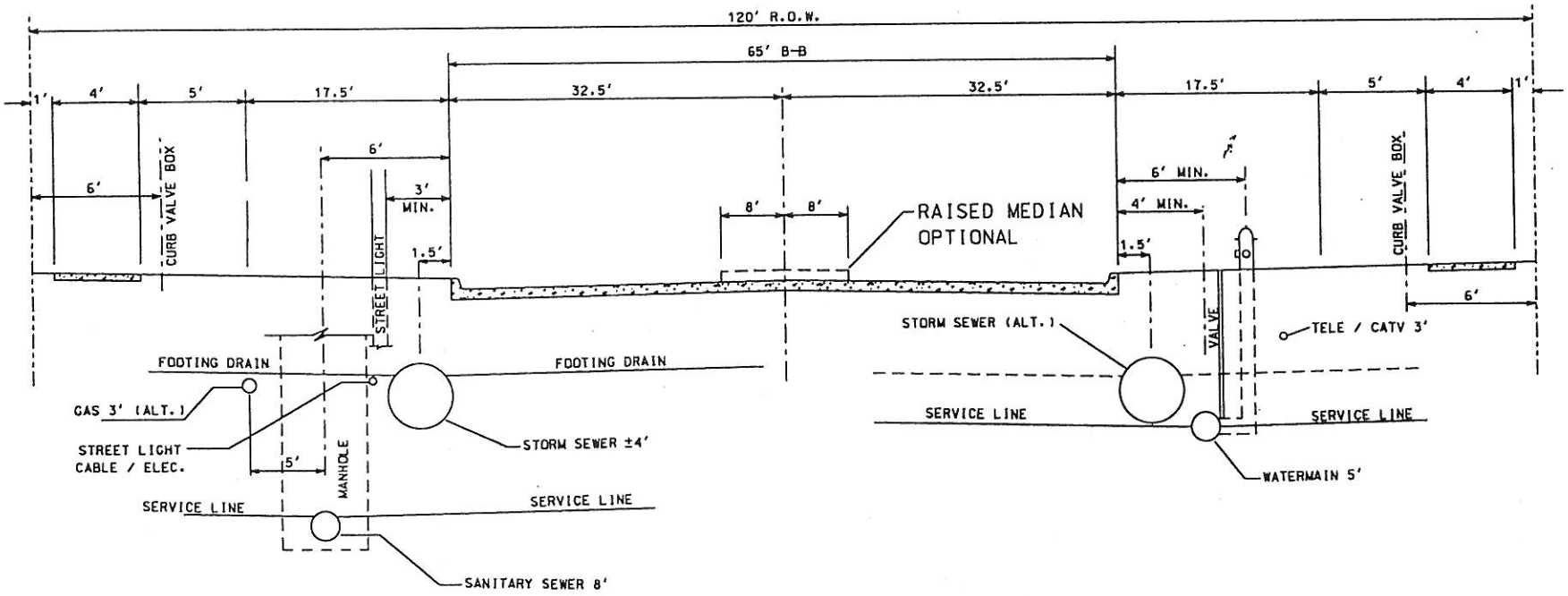



FIGURE 8.2

CITY OF WEST DES MOINES
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
DATE: 06-16-92
REVISED:
CADD PRODUCED

PROJECT:

# STANDARD 65' MAJOR ARTERIAL STREET

| DRAWN BY: | DESIGNED BY: | SCALE: |
|---|---|---|
| JDH | | N/A |

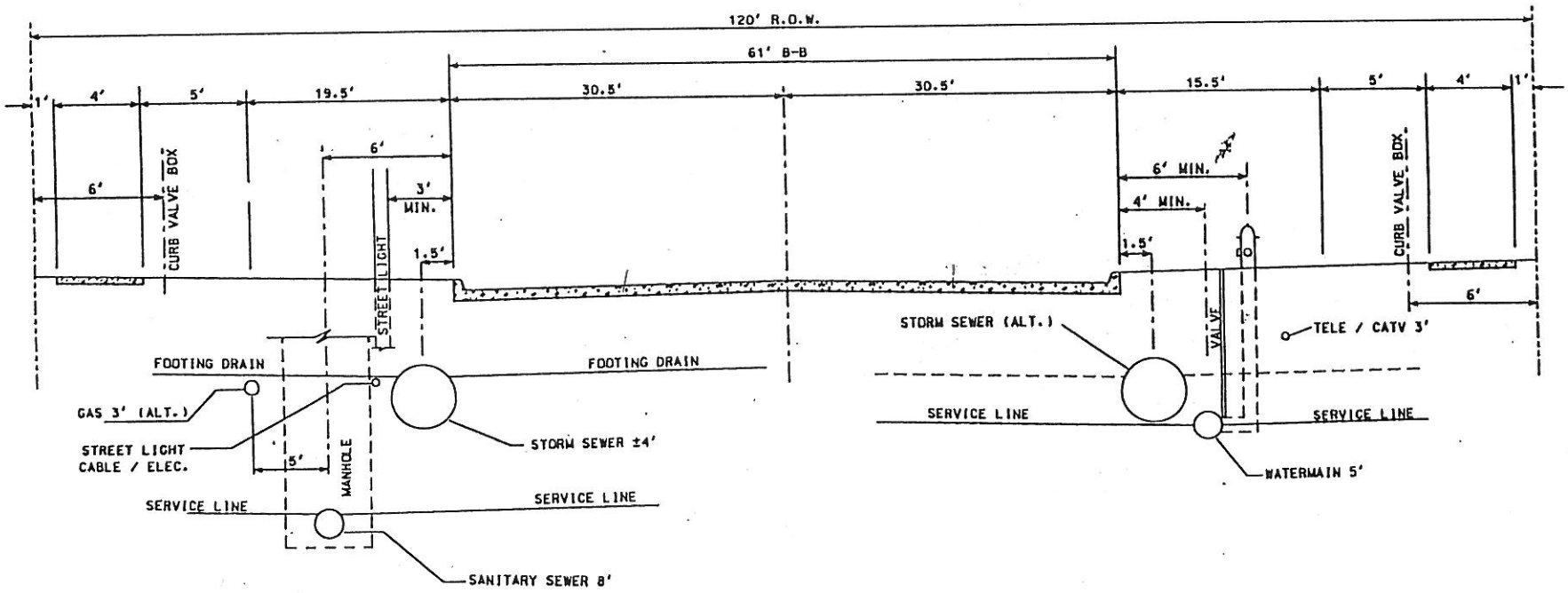



FIGURE 8.3

CITY OF WEST DES MOINES — DEPARTMENT OF PUBLIC WORKS, ENGINEERING DIVISION
660 S. 18TH STREET (515)223-3261
WEST DES MOINES, IOWA 50265
FAX NO. (515)223-3267
CADD PRODUCED

DATE: 06-16-92
REVISED:

PROJECT:

# STANDARD 61' MINOR ARTERIAL STREET

DRAWN BY: JDH
DESIGNED BY:
N/A

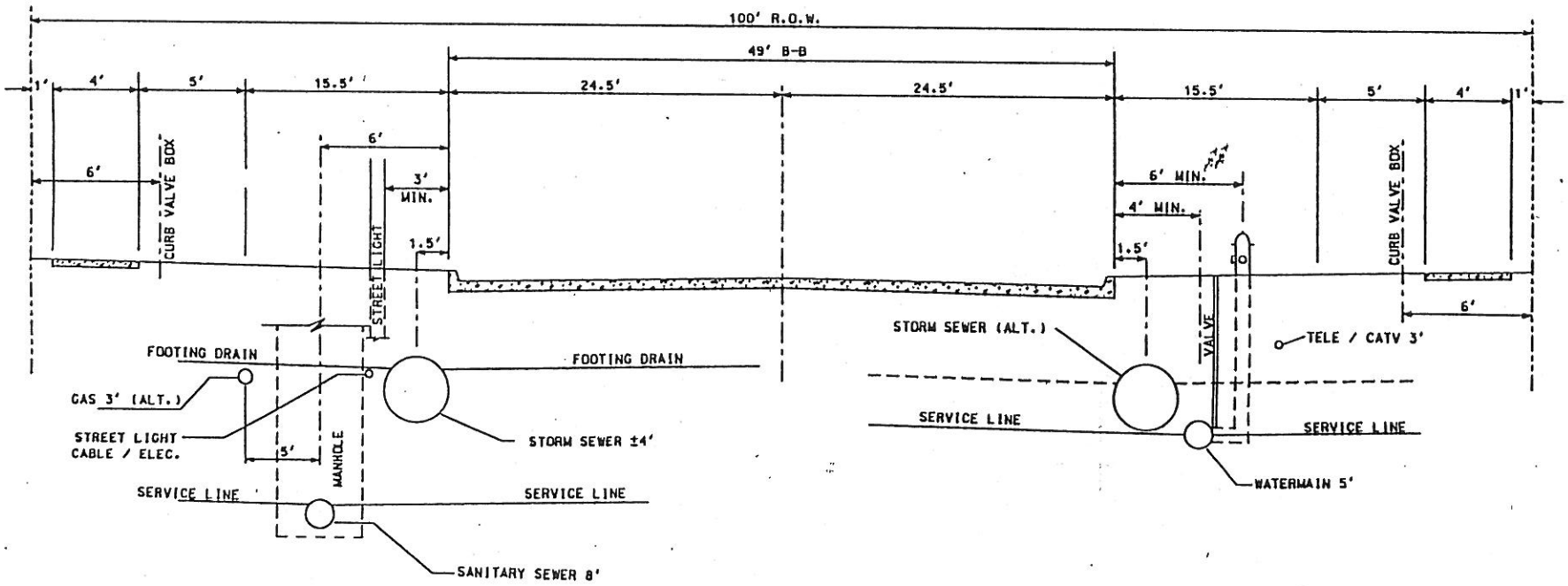



FIGURE 8.4

CITY OF WEST DES MOINES
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
660 S. 35TH STREET (515)223-3261
WEST DES MOINES, IOWA 50265
FAX NO. (515)223-3267
CADD PRODUCED

DATE: 06-16-92
REVISED:

PROJECT:

# STANDARD 49' MAJOR COLLECTOR STREET

DRAWN BY: JDH
DESIGNED BY:
SCALE: N/A

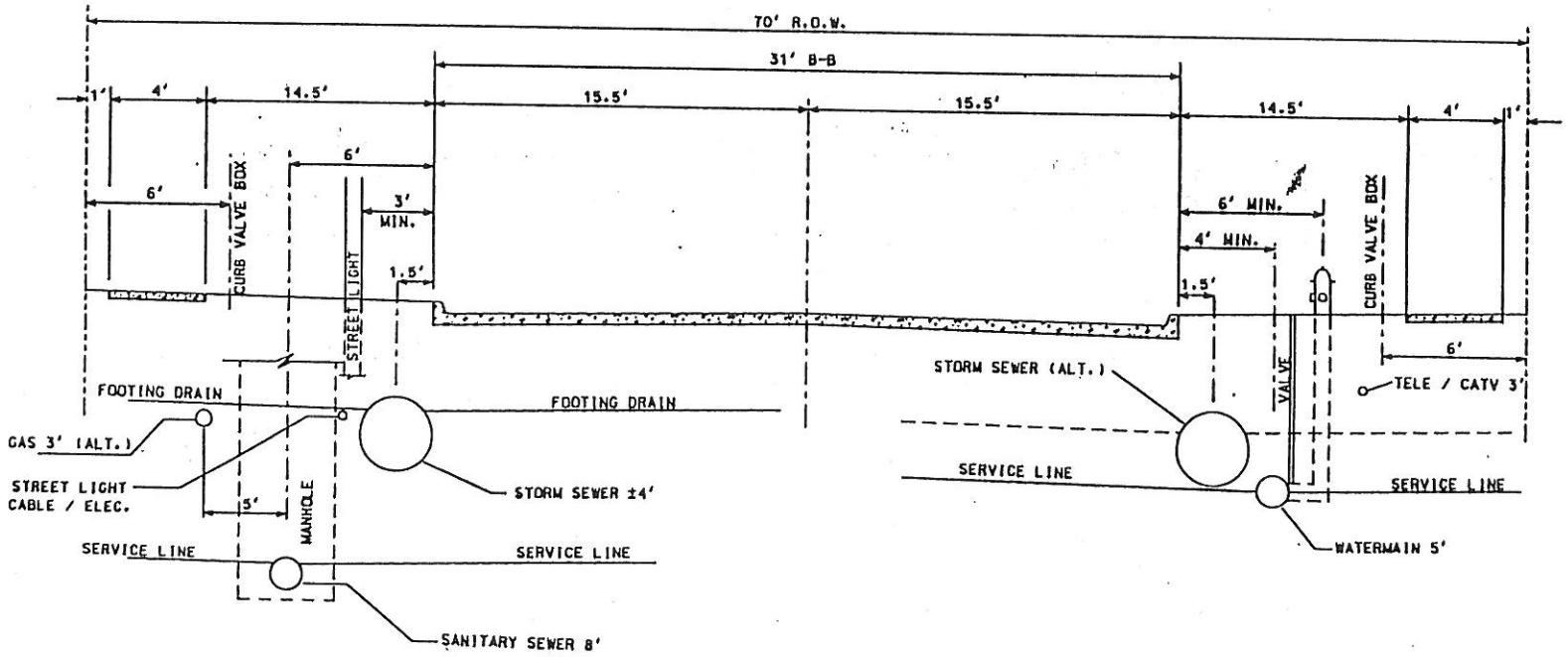



FIGURE 8.5

CITY OF WEST DES MOINES — DEPARTMENT OF PUBLIC WORKS, ENGINEERING DIVISION
CADD PRODUCED

DATE: 06-16-92

PROJECT:

# STANDARD 31' MINOR COLLECTOR STREET

DRAWN BY: IDH
DESIGNED BY:

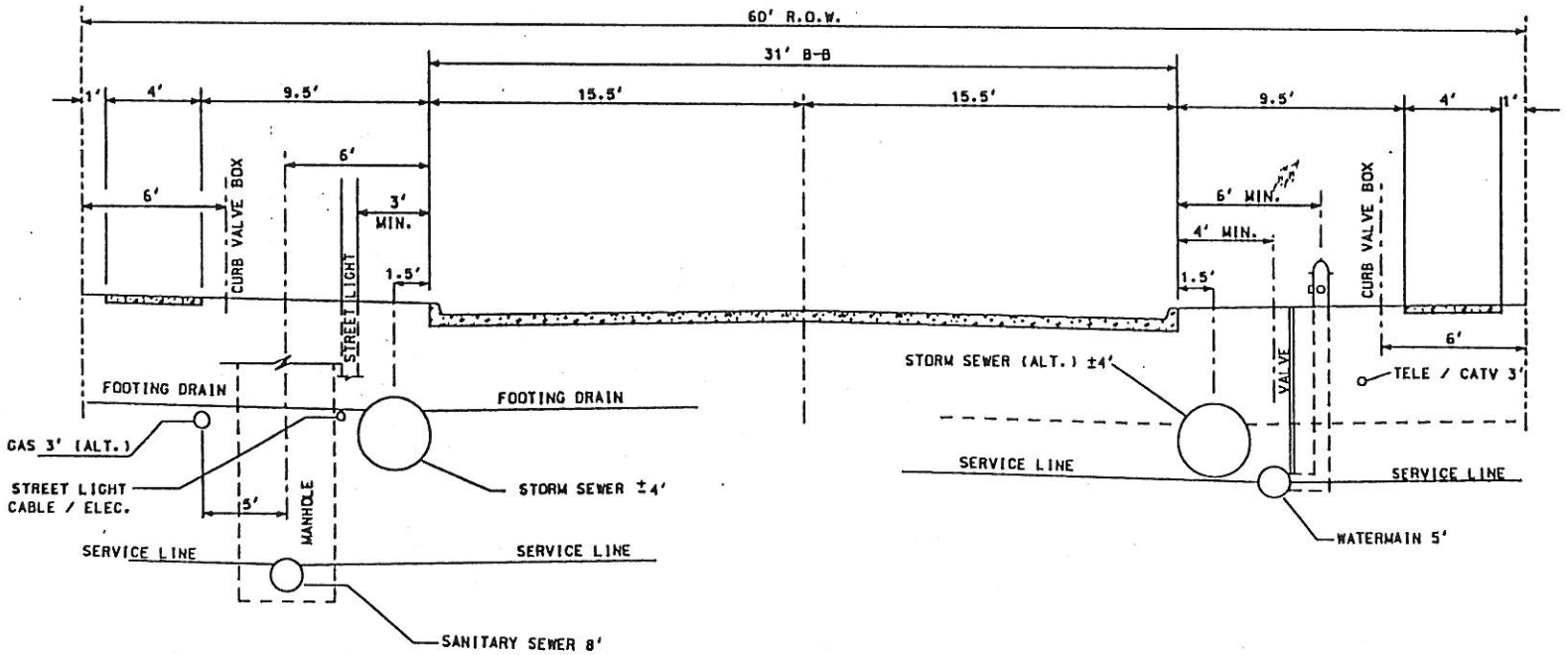



FIGURE 8.6

Minor Collector - ~~35~~ 30
Major Collector - 35
Minor Arterial - 45
Major Arterial - 45
} Design speeds

g1 + g2 = A
A x K value = Length t

| | | | |
|---|---|---|---|
| CITY OF WEST DES MOINES, DEPARTMENT OF PUBLIC WORKS, ENGINEERING DIVISION<br>CADD PRODUCED | | | DATE: 06-16-92 |
| PROJECT: STANDARD 31' LOCAL STREET | | | |
| DRAWN BY: JDH | DESIGNED BY: | SCALE: N/A | |

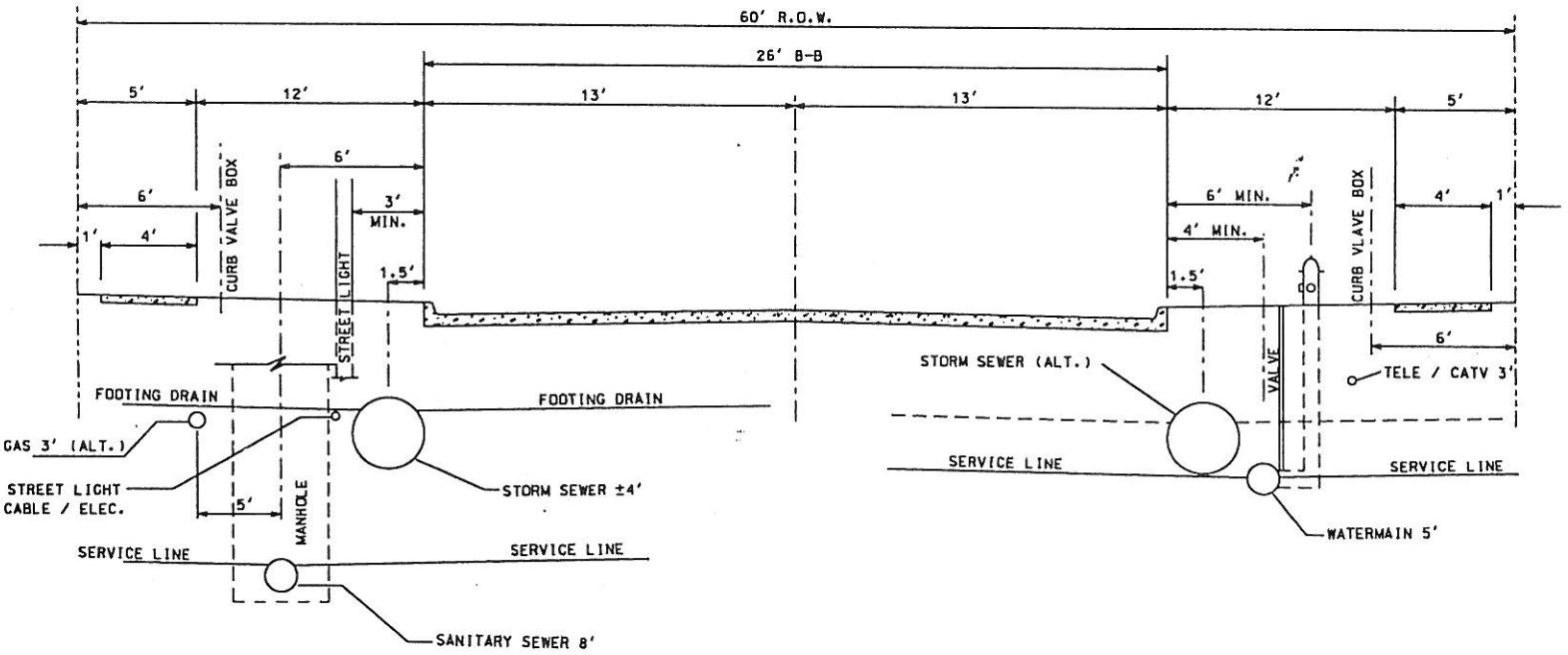


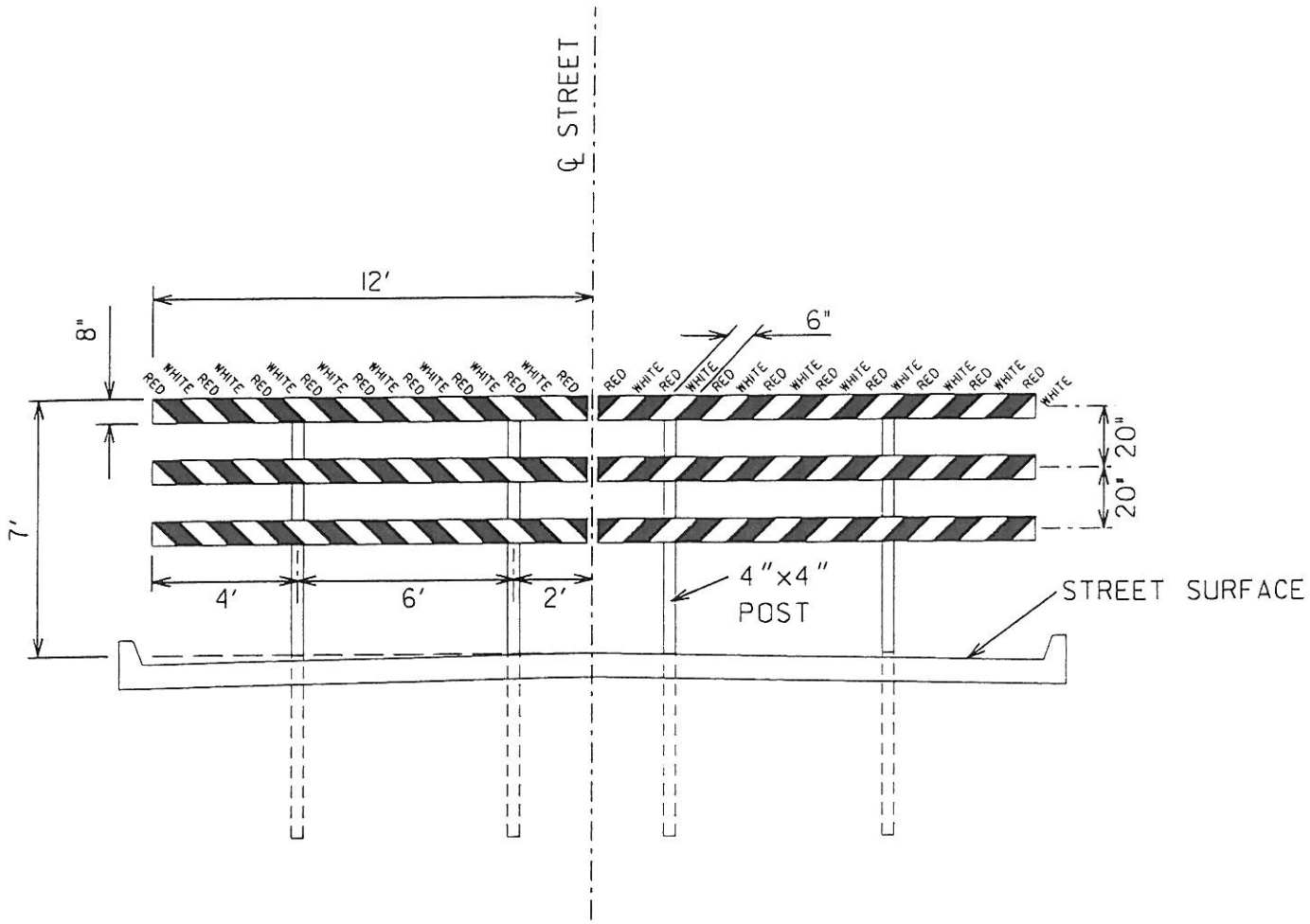

FIGURE 8.7

CITY OF WEST DES MOINES — DEPARTMENT OF PUBLIC WORKS, ENGINEERING DIVISION
DATE: 06-16-92
REVISED:
CADD PRODUCED

PROJECT:

# STANDARD 26' CUL-DE-SAC AND MINOR LOCAL STREET

DRAWN BY: JDH
DESIGNED BY:
N/A




Type III Barricades shall be constructed as follows to cover the entire road surface.

Per Barricade:

1. Two (2) 4" x 4" x 12' pressure treated - 7 feet from road surface to top of 4 x 4 per barricade level with each other.
2. Three (3) 2" x 8" x 12' pressure treated - top board shall be level with top of the 2 4 x 4's. then 20" from center of the top board to center of the second board and 20" from the center of the 2nd board to the center of the third board.
3. The stripes shall be red and white alternating and shall slope towards the center of the road at a 45° angle and be 6" wide reflective engineering grade material.
4. There shall be no space between barricades at the middle of the road surface.

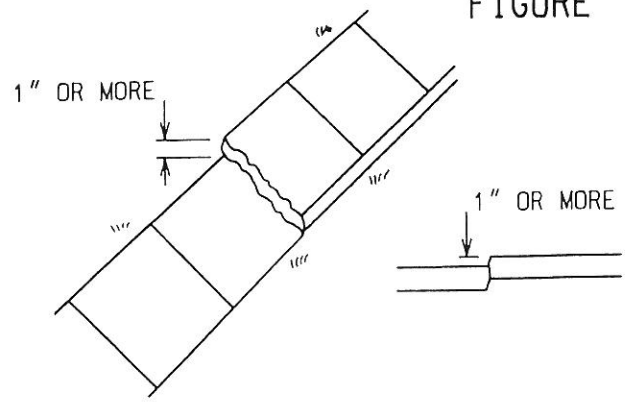
CITY OF WEST DES MOINES
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
568 S. 16TH STREET (515)222-3475
WEST DES MOINES, IOWA 50265
FAX NO. (515)222-3478
CADD PRODUCED

# TYPE III BARRICADE

REVISED:
11-96

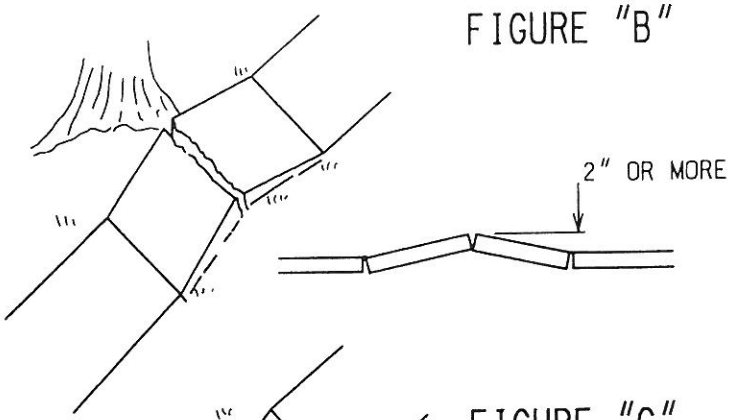
DRAWING NUMBER:

FIGURE "A"



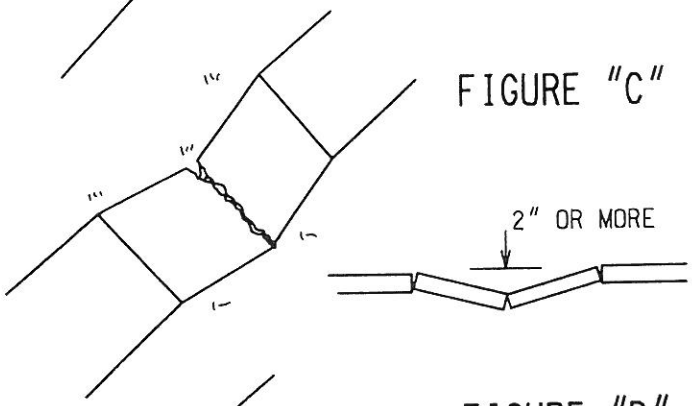

"A" Sidewalk faulted at joint or crack with 1" or more deflection.

FIGURE "B"



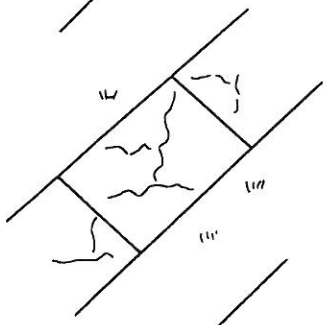

"B" Sidewalk raised more than 2" in 8 ft. from normal profile line of sidewalk.

FIGURE "C"



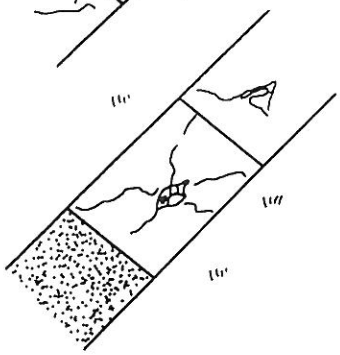

"C" Sidewalk sunken more than 2" in 8 ft. from normal profile line of sidewalk.

FIGURE "D"



"D" Sidewalk cracked into 3 or more pieces per panel, or any single crack with $1/2$" or greater openings.

FIGURE "E"



"E" Sidewalk cracked and / or spalled (small crater like holes deeper than $3/8$") with part of sidewalk missing, forming holes deeper than $3/8$".

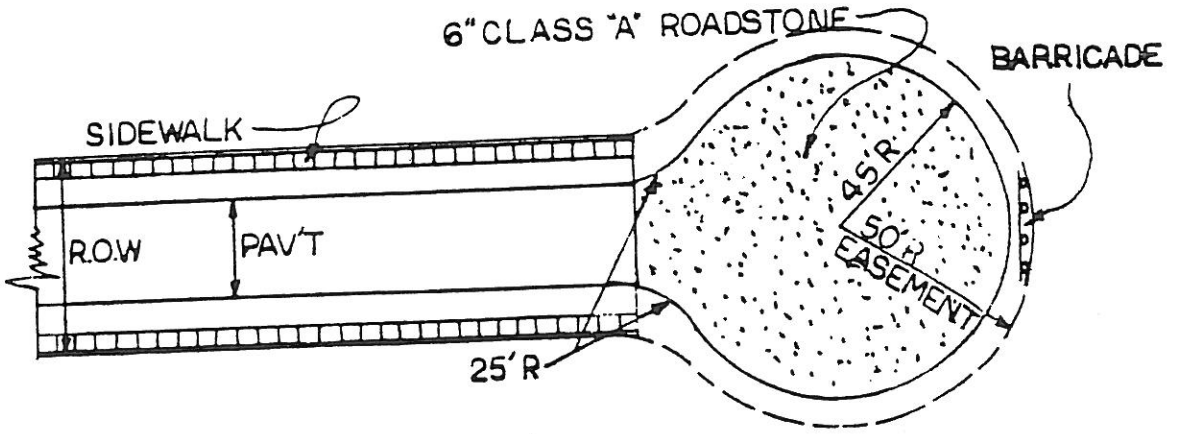
CITY OF WEST DES MOINES
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
5608 S. 16TH STREET (515)222-3475
WEST DES MOINES, IOWA 50265
FAX NO. (515)222-3478
CADD PRODUCED

# SIDEWALK DEFECTS

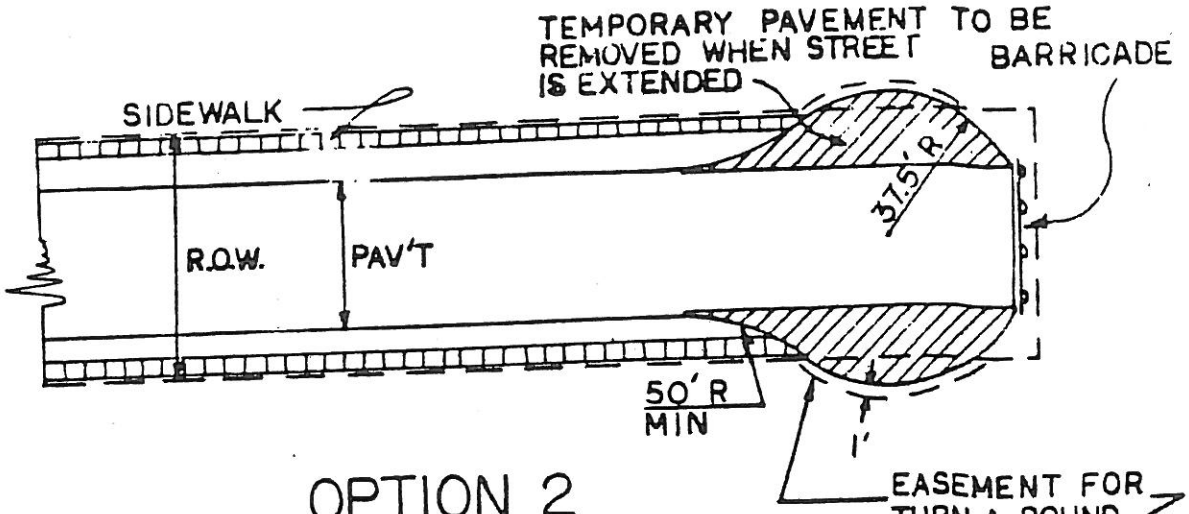
REVISED:
7-10-96

DRAWING NUMBER:

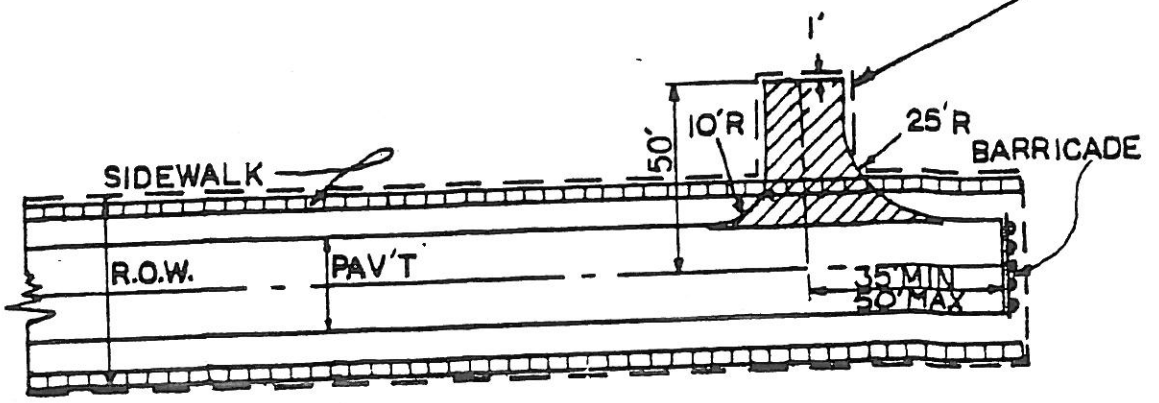
H:/CADD/SPECDGNS/SIDEWALK.DGN




OPTION 1




OPTION 2




OPTION 3

# INTERIM TURN-A-ROUNDS

SKETCH NO. 4

# WEST DES MOINES

# STANDARD CONSTRUCTION SPECIFICATIONS

# FOR

# SUBDIVISIONS


I HEREBY CERTIFY THAT THESE SPECIFICATIONS WERE PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY REGISTERED ENGINEER UNDER THE LAWS OF THE STATE OF IOWA.

3-28-94

Duane C. Wittstock, P.E. March 28, 1994
Iowa Registration No. 9678
Registration Expires December 31, 1994

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# PART 1 - GENERAL REQUIREMENTS

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## 1. INTENT

A. The intent of the Specifications is to describe the performance requirements and standards of materials and construction for public improvements for new subdivisions and for public improvements built privately and dedicated to the City of West Des Moines, Iowa.

B. The Specifications are intended to assist in implementing the Subdivision Ordinance and Comprehensive Plan, and to insure quality construction and compliance with requirements of City, County, State, and Federal Governments.

C. Subdivider is expected to prepare and submit construction details for items not specifically covered in these Standard Specifications. Proposed details must be approved by City Engineer prior to construction.

D. These Specifications are to be considered minimum standards for normal situations. Nothing in these Specifications shall preclude the City from requiring higher standards in special cases.

E. The Standard Specifications are not intended to discourage new or innovative technology for methods, materials, or equipment. Submit proposed details to City Engineer for review and approval.

F. Detailed Specifications are in outline form and include incomplete sentences. Omission of words or phrases is intentional. Supply omitted words or phrases by inference.

## 2. DEFINITIONS

A. **Approved Plans** - Plans that have been reviewed and formally approved by the City Engineer and/or City Council and/or Planning and Zoning Commission.

B. **City** - City of West Des Moines, Iowa, or the area within the corporate limits of the City of West Des Moines and such territory outside the City over which the City has jurisdiction or control by virtue of any constitutional or statutory provisions; City shall also mean the City Engineer, the Department of Public Works or any person or group of persons with delegated authority to enforce, interpret, modify, or waive City Codes and Standards.

C. **City Engineer** - The Director of the Engineering Division or a person or persons employed by the City, either full or part-time, with the authority to perform official inspection, plan reviews and other functions as designated by the City Council and/or City Engineer for the enforcement of City Codes and Standards.

D. **Contractor** - Any person, firm, partnership, association, or corporation constructing street and/or utility improvements for a subdivider, the City, or a utility company.

E. **Standard Drawings** - The detailed drawings included in these Specifications.

F. **Subdivision** - A subdivision of land, a plat of a subdivision, a planned unit development, a master plan, or a site plan for residential development.

G. **Subdivider** - Any person, individual, firm, partnership, association, corporation, estate, trust, or any other group or combination acting as a unit, dividing or proposing to divide land so as to constitute a subdivision as defined herein and includes any agent of the subdivider.

H. **Subdivider's Engineer** - The registered professional engineer, or his employees, under contract with the subdivider to provide the various engineering and technical duties defined and implied herein.

I. **Subdivider's Surveyor** - The registered land surveyor, or his employees, under contract with the subdivider to provide the various surveying and technical duties defined and implied herein.

J. **Subdivision Ordinance** - Any ordinance included in the West Des Moines Municipal Code relating to or establishing regulations for the subdivision and platting of land, for the preparation of plats or for the design, construction, inspection, and maintenance of planned improvements.

K. **Utilities** - All franchised and non-franchised utility companies utilizing public right-of-way.

## 3. GENERAL

A. The Standard Specifications includes construction of site grading, earthwork and grading for pavement, sanitary sewers, storm sewers, paving, surface restoration, utilities, and other miscellaneous work for new subdivisions in the City of West Des Moines, Iowa.

B. Refer to West Des Moines Water Works Standard Specifications for requirements on water mains.

C. The City Engineer will answer questions concerning interpretation of the Standard Specifications or Standard Drawings. The interpretation of the City Engineer will be accepted as final.

D. All necessary permits and licenses required for construction of the improvements shall be obtained by Subdivider or the Subdivider's Agent.

E. Use and acceptance of the improvements: It may be necessary to utilize an improvement or improvements installed under these Specifications before the acceptance of the improvement by the City Council. This use may be by adjacent land owners (or others) through water or sewer connections or by access across an open pavement. Such use shall not be construed as acceptance of the improvement but rather as a customary practice for work done under this Specification. Acceptance shall be by City Council motion or resolution.

## 4. RESPONSIBILITIES

A. Subdivider

1. Assume total and direct responsibility for subdivision.

2. Provides liaison services for all parties.

3. Personally assumes responsibility or names an agent with full authority to make decisions on behalf of subdivider regarding issues which may arise.

B. Subdivider's Engineer

1. Prepare and certify construction drawings and specifications as necessary for construction of public improvements for subdivisions.
2. Coordinate construction activities and schedules. Insure that City Engineer is advised of progress of work at regular intervals.

3. Propose changes in the approved plans and specifications if necessary during construction. Submit details of any changes to City Engineer for review and approval prior to construction.

4. Provide construction staking by qualified personnel with sufficient points or stakes to provide adequate horizontal and vertical control to insure improvements are constructed as shown on approved plans and specifications.

5. Provide design services as required to resolve problems which develop during construction.

C. Contractor

1. Supervise and direct the construction work and be responsible for the means, methods, techniques, sequences, and procedures of construction including safety.

2. Employ and maintain at the project site a qualified supervisor or superintendent during construction to perform adequate supervision and coordination.

3. Furnish and install materials and perform all work and services required by the approved plans and specifications.

D. Project Representative

1. Project Representative is the City Engineer's agent and will act under the supervision and direction of the City Engineer. Subdivider to reimburse City the costs of providing Project Representative.

2. Observe construction to insure that the improvements are being constructed in accordance with the approved plans and specifications.

3. Report to City Engineer whenever any work is unsatisfactory, faulty, or defective.

4. Verify that required tests are conducted and that adequate records are maintained.

5. Shall not undertake any of the responsibilities of the Contractor.

6. Shall not authorize any deviation from the approved plans and specifications without written authorization from the City Engineer.

E. Utility Company

1. Utility companies shall be responsible for complying with all applicable aspects of

the approved plans and Standard Specification for Subdivisions while performing work within the public right-of-ways.

## 5. INSURANCE REQUIREMENTS

A. The Contractor shall purchase and maintain insurance to protect himself and City against all hazards enumerated herein for all work within City right-of-way. All policies shall be in the amounts, form, and underwritten by a company satisfactory to the City.

B. All certificates of insurance required herein shall state that thirty (30) days written notice will be given to the City before the policy is cancelled or changed. All certificates of insurance shall be delivered to the City prior to the time that any construction operations are started.

C. All of said Contractor's certificates of insurance shall be written by an insurance company authorized to do business in the State of Iowa.

D. The Contractor shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's operations, whether such operations be by himself or by any sub-contractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

1. Claims under Worker's or Workmen's Compensation, Disability Benefit, and other similar employee benefit acts;

2. Claims for damages because of bodily injury, occupational sickness of disease, or death of his employees;

3. Claims for damages because of bodily injury, sickness, or death of any person other than his employees;

4. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;

5. Claims for damages, other than to the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and,

6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle.

E. The insurance required shall be written on an occurrence form of policy for not less than any limits of liability specified herein, or required by law, whichever is greater:

| | | |
|---|---|---|
| 1. | General liability:<br>(including contractual, independent contractors, Broad Form Property damage, Personal Injury, Underground Explosion and Collapse hazards). | $500,000 Combined Single limit per occurrence<br><br>$500,000 Aggregate |
| 2. | Automobile Liability:<br>(including all owned, non-owned and hire autos). | $500,000 Combined Single Limit |
| 3. | Worker's Compensation | Statutory Benefits<br>$100,000 Coverage B |
| 4. | Umbrella Liability:<br>(applying directly excess of above liability coverage). | $1,000,000 Combined Single Limit<br>$1,000,000 Aggregate |

## 6. BOND REQUIREMENTS

A. The Contractor shall furnish a good and sufficient surety bond in the full amount of the construction cost for all public improvements. This surety bond, executed by the Contractor to the City, shall guarantee the payment to the City, their successor or assigns of all damage, loss, and expense which may occur to the City, their successor or assigns by reason of defective materials used, or by reason of defective workmanship done in the furnishing of materials and equipment in construction of public improvements, or in lieu thereof the City, their successors or assigns may require the Contractor to maintain such items in need of repair for the said periods specified herein.

B. All provisions of the bond shall be complete and in full accordance with the statutory requirements. The bond shall be executed with the proper sureties through a company licensed and qualified to operate in the State and approved by the City. The bond shall be signed by an agent resident in the State.

C. If at any time the surety on the Contractor's bond becomes irresponsible, the City shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the City within ten (10) days after notice to do so.

D. Maintenance Bonds are required on the following public improvements. The bond term begins upon acceptance of the public improvement by the City.

| DESCRIPTION | BOND TERM |
|---|---|
| Sanitary Sewer | 4 Years |
| Storm Sewer | 4 Years |
| Paving | 4 Years |
| Other | As may be required by City |

## 7. PLANS AND SPECIFICATIONS

A. Construction plans and specifications must be approved by City Engineer prior to beginning construction.

B. Any addendum or modifications to the approved plans and specifications must be submitted and approved by City Engineer in writing prior to construction.

C. Provide one (1) set of approved plans and specifications for each foreman and superintendent in charge of each crew on the job.

## 8. CONSTRUCTION FACILITIES

A. Contractor shall provide suitable storage facilities necessary for property storage of materials and equipment.

B. Provide telephone number where Contractor's representative can be reached during work day and on nights and weekends in event of emergency.

C. Provide and maintain suitable sanitary facilities for construction personnel for duration of work; remove upon completion of work.

D. Do not store construction equipment or materials on streets open to traffic. Location for storage of equipment by Contractor during non-working hours is subject to approval of City.

## 9. EXISTING UTILITIES

A. Before starting operations in any area in the vicinity of utility facilities, the Contractor shall notify each utility of any operation which may affect their facilities. Such notice shall be provided to each utility sufficiently in advance of such operations to allow the utility time to mark the location of, relocate, adjust, or otherwise protect their facilities. The Contractor shall reach an agreement with each utility on appropriate action necessary to protect or relocate the utility facilities. The cost of such action to protect the facilities, except for locates, shall be borne by the Contractor. The One-Call System (1-800-292-8989) shall be utilized for locates for those utilities which subscribe to this service.

B. At all times the Contractor shall conduct his operations so that necessary clearances are maintained and said utility facilities are protected. The Contractor must comply with all Local, State, and Federal, or other regulations in performing work near utility facilities.

C. Should the Contractor damage any of the utility facilities during Contractor's operations or determine the work cannot be performed safely, the Contractor shall immediately notify the utility involved and cease work until arrangements are made to prevent further damage or a serious accident. Any and all damage, including disruption of service, to any utility facility resulting from Contractor's operation will be repaired by the utility; the cost of said repairs and service disruption shall be borne by the Contractor.

D. Failure of the Contractor to provide timely notice to the utility or to conduct his operations in such manner that proper clearances are maintained and the utility facilities are protected at all times will be grounds for the issuance of a Stop Work Order.

## 10. TRAFFIC CONTROL

A. Prepare Traffic Control Plan for construction in City right-of-way and submit with construction plans.

B. Provide signs, barricades, or other traffic control devices in accordance with "Manual on Uniform Traffic Control Devices" (MUTCD).

C. Contractor shall check traffic control devices daily. Repair or replace damaged traffic control devices promptly.

D. Flaggers may be required to protect the traveling public or workmen.

E. Furnish and install permanent Type III barricades at all dead-end streets with no cul-de-sac.

## 11. EROSION PROTECTION

A. Comply with soil erosion control requirements of Iowa Code and local ordinances. Protect against erosion and dust pollution on project site and any off-site borrow or deposit areas used for project. Developer is responsible for obtaining NPDES permit if applicable.

B. Protect adjoining property including public sanitary and storm drainage systems and streets from any damage resulting from movement of earth or other debris from project site. Repair any damage immediately.

C. Prevent accumulation of earth or debris on adjoining public or private property from project site. Remove any accumulation of earth or debris immediately.

D. Prevent repetition of any instance where earth or debris moves from project site to adjoining pug public or private property.

E. Provide erosion control measures necessary to protect against siltation and erosion or flow of storm water. Maintain storm sewer system throughout construction period.

F. Use straw bales and other means at all intakes, outfall structures, drainage courses, and swales to protect against siltation and erosion.

## 12. SUBMITTALS

A. Provide construction schedule showing dates of starting and completing various portions or work.

B. Submit following information for City's review:

1. Materials test reports.

2. Manufacturer's data for pipes, manhole covers and frames, castings, and other special items.

3. Details of proposed methods of sheeting, shoring, and bracing.

4. Such other information as City may request.

C. Submit two (2) copies, certified by Subdivider's Engineer, of "As-Built" plans depicting any changes from the original approved plans including street grades, jointing patterns, sewer locations, service connections, manhole locations, and any additional pertinent information as needed or as required by the City Engineer: one set of which is produced on reproducible stable plastic drafting film; show work actually constructed clearly and concisely; provide information also on electronic media if available.

## 13. STANDARDS AND CODES

A. Conform with and test in accordance with applicable sections of the latest revisions of the following standards and codes.

1. American Association of State Highway and Transportation Officials (AASHTO).

2. American Concrete Institute (ACI).

3. American Society for Testing Materials (ASTM).

4. Iowa Department of Transportation Standard Specifications (IDOT) and current Supplemental Specifications.

5. American National Standards Institute (ANSI).

6. American Water Works Association (AWWA).

7. American Welding Society (AWS).

8. Federal Specifications (FS).

9. National Electrical Safety Code (NESC).

10. Iowa Occupational Safety and Health Act of 1972. (IOSHA).

11. Manual of Accident Prevention in Construction by Associated General Contractors of America, Inc. (AGC).

12. American Disabilities Act (ADA).

13. Standards and Codes of the State of Iowa and the Ordinances of the City of West Des Moines, Iowa.

14. Other Standards and Codes which may be applicable to acceptable standards of the industry for equipment, materials, and installation under the contract.

## 14. MATERIALS TESTS

A. Subdivider shall employ and pay for services of an independent testing laboratory for tests required to show compliance with Specifications. City will provide transportation of all samples to laboratory. Submit test results directly to City.

B. Selection of testing laboratory subject to approval of the City.

C. Provide materials tests as listed herein and as listed in detailed parts of the Specifications. Minimum testing frequency is listed; City Engineer reserves the right to require additional testing.

D. Provide gradation and materials tests for pipe bedding and stabilizing material.

E. Certify that reinforced concrete pipe and special fittings are manufactured in accordance with applicable specifications. Provide copies of concrete cylinder compression tests made during manufacture of pipe.

F. Certify that other pipe, manholes, fittings, and materials are manufactured in accordance with applicable specifications.

G. Certify that reinforcing steel meets applicable specifications.

H. Determine moisture density relations of soils encountered during construction in accordance with Standard Proctor Method in accordance with ASTM D 698. Provide graph of Proctor soil density versus moisture content for each soil encountered.

I. Test trench backfill soil density and moisture at three tests per three foot (3') lift per four-hundred lineal feet (400 LF) of trench under streets and driveways and within street right-of-way at locations designated by City.

J. Test pavement subgrade moisture and density at one test per six inch (6") lift per one-hundred and fifty lineal feet (150 LF) at locations designated by City.

K. If trench backfill or pavement subgrade fail density tests, rework backfill or subgrade and retest until specified density is obtained; Subdivider shall pay all costs for retesting.

L. Provide portland cement concrete mix designs: make two (2) concrete compression cylinders from trial batch of each proposed concrete mix before start of construction; provide seven (7) day and twenty-eight (28) day tests in accordance with ASTM C 39.

M. Certify that sources of portland cement, asphaltic cement, and aggregates for concrete are IDOT approved. Provide analysis of materials used.

N. Structural Concrete: prepare four (4) cylinders each day concrete is poured; provide seven (7) day and twenty-eight (28) day test in accordance with ASTM C 39.

0. Portland Cement Concrete Pavement: prepare at least two (2) concrete compression cylinders for each two-hundred cubic yards (200 CY) placed; prepare at least four (4) cylinders each day concrete is poured; provide seven (7) day and twenty-eight (28) day tests in accordance with ASTM C 39. City will prepare concrete test cylinders.

P. Core samples for pavement: locate as directed by City; measure thickness as directed; minimum one (1) core sample for each section of approximately one thousand square yards (1,000 SY).

## PART 1 - GENERAL REQUIREMENTS

Q. Test portland cement concrete slump and entrained air at project site. City will perform tests.

R. Sample and test asphalt mix during construction to show conformance with Specifications.

1. Provide two uncompacted samples of each mixture used each day from each project site at location designated by Engineer to independent testing laboratory.

a. Determine gradation and asphalt content.

b. Compact samples in laboratory and determine lab density, marshall stability, and flow.

2. Cut a minimum of three four inch (4") diameter core samples per day; take samples at locations designated by Engineer.

a. Testing laboratory employed by Contractor will determine thickness, density, and percent air voids of core samples.

S. Provide profilograph tests on pavement smoothness as specified in Parts 7 and 8.

## 15. FIELD TESTS

A. Notify City when installation is complete and ready for testing. Notify City at least forty-eight (48) hours prior to field testing.

B. City will supervise tests on sewers and other work.

C. If tests results do not meet those specified, make necessary corrections and repeat.

## 16. FINAL REVIEW

A. Contractor shall clean project site and remove all waste materials, tools, and equipment.

B. Clean all storm sewers, intakes, manholes, and sanitary sewer manholes of all construction debris or soil.

C. Broom clean all street surfaces.

D. Notify City Engineer when construction is complete and ready for final review.

E. Subdivider and Contractor shall submit statements that improvements have been constructed in accordance with approved Plans and Specifications.

F. Subdivider and Contractor responsible for maintenance of improvements and traffic control until accepted by the City.

# PART 2 - EARTHWORK AND SITE GRADING

## INDEX


1. GENERAL
2. DISPOSAL
3. CONCRETE AND ASPHALT REMOVAL
4. TREE REMOVAL
5. MISCELLANEOUS REMOVAL
5. MISCELLANEOUS REMOVAL
6. EXCAVATION
7. EMBANKMENT CONSTRUCTION
8. SUBGRADE PREPARATION
9. FIXTURE ADJUSTMENT
10. GRANULAR SURFACING


## 1. GENERAL

A. This part of the Specifications includes excavation, demolition, grading, and incidentals to complete earthwork, site grading, and associated work.

B. Reference to percent maximum density shall mean a soil density not less than the stated percentage of maximum density for soil as determined by ASTM D 698, "Moisture Density Relations of Soils" Standard Proctor Method.

## 2. DISPOSAL

A. West Des Moines Public Works Department has first right of refusal of salvaged manhole sections, castings, culverts, and other salvageable items removed from public right-of-way.

B. Remove from project site and dispose of vegetation, rubbish, building materials, concrete, asphalt, culverts, fences, and other non-salvageable materials.

C. Remove from project site and dispose of organic material at sanitary landfill.

## 3. CONCRETE AND ASPHALT REMOVAL

A. Saw cut concrete pavement full depth as required and at designated removal lines.

B. Saw cut concrete driveways, sidewalks, and asphalt pavements full depth at designated removal limits.

C. Concrete or asphalt broken or damaged by Contractor beyond designated removal lines shall be removed to new line designated by City and replaced by Contractor at no expense to City.

## PART 2 - EARTHWORK AND SITE GRADING

### 4. TREE REMOVAL

A. Remove from project site and dispose of trees located in the public right-of-way and other locations on the site as shown on the plans; grub, remove and dispose of stumps and roots. Trees, stumps, and roots may be buried on site if the burial location is shown on the final subdivision plat, written permission is obtained from the Iowa Department of Natural Resources, and all site specific conditions of the West Des Moines Departments of Public Works and Community Development are met.

B. Coordinate removal with utility companies. Protect existing utilities during removal operations.

C. Protect all trees not designated for removal during construction.

### 5. MISCELLANEOUS REMOVAL

A. Remove and temporarily reset private mailboxes as necessary for construction.

B. Replace private mailboxes in approximate original location after construction is complete; installation subject to approval of property owner, U.S. Post Office Department, and City.

C. Notify West Des Moines Public Works Department when removal of street signs is necessary for construction; City will remove and reset street signs after construction.

### 6. EXCAVATION

A. Strip grass and vegetation from construction area and dispose of at landfill or at location designated by City.

B. Remove topsoil to minimum depth of eight inches (8") or as directed by City and stockpile for reuse to finish earth surfaces.

C. Provide temporary drainage facilities to prevent damage when necessary to interrupt natural drainage or flow of artificial drains.

### 7. EMBANKMENT CONSTRUCTION

A. Prepare site, place, and compact excavated materials to required elevation and cross section.

B. Scarify, disc, and roll foundation areas as necessary to provide proper bond with first layer of new fill.

C. If soft or yielding materials are encountered, remove unstable materials and replace with suitable materials and compact.

D. Place no roots, brush, grass, or other organic material in embankment; place no material on embankment when material or foundation is frozen.

E. Step or bench all existing slopes greater than five (5) horizontal to one (1) vertical to connect existing grade with new fill.

F. Select material for each portion of embankment with approval of City; select materials to avoid sharp change in texture.

G. Use fill material free of lenses, pockets, streaks or layers, or materials differing from surrounding materials.

H. Construct embankment in horizontal layers not more than eight inches (8") in loose thickness.

I. Deposit each layer over full width of embankment as separate and distinct operation.

J. After layer is deposited, smooth to uniform depth by means of suitable motor patrol or bulldozer.

K. Compact selected materials in horizontal layers with tamping or sheepsfoot roller; use roller designed to provide at least two hundred pounds per square inch (200 psi) distributed on one (1) row of knobs; tamping feet must project not less than six and one-half inches (6-1/2") from face of drum.

L. Compact layer by rolling with tamping type roller until full weight of roller is supported by tamping feet, but with not less than one (1) pass per inch of loose thickness of layer.

M. Roller will be considered to be supported entirely on its tamping feet when feet do not penetrate more than three inches (3") into material being compacted.

N. If soil is wet so that it will not sufficiently compact by one (1) passage of roller per inch of loose thickness, provide minimum of one discing per two inches (2") of loose thickness.

1. Cut and stir full depth of layer.

2. Allow interval of not longer than two (2) hours between successive discings, or as directed by City.

3. After discing is completed, compact layer by specified rolling.

0. If soil is dry so that it will not satisfactorily compact by rolling, moisten material before compaction; manipulate material to secure proper distribution of moisture before compaction.

P. Place fill and compact on all sides of structures to same level as fill operation progresses to protect structures against displacement or other damage.

Q. Areas adjacent to structures which cannot be tamped with rollers: hand tamp with mechanical tamper to same degree of compaction as specified for other parts of embankment.

R. Whenever operations are suspended during periods of rain or the likelihood thereof, smooth and compact surface to shed water readily.

S. Compact fill areas in street right-of-way under pavement and under utilities to not less than ninety-five percent (95%) maximum density; moisture content not less than two percent (2%) below optimum or more than three percent (3%) above optimum moisture content.

## 8. SUBGRADE PREPARATION

A. Shape and consolidate subgrade in preparation for placement of pavement.

B. Provide uniform composition of at least twelve inches (12") below top of subgrade under new paving plus two feet (2') on each side.

C. Excavate top six inches (6") of all subgrade constructed in cut section, and scarify, pulverize, mix, and recompact next six inches (6") of subgrade with moisture and density control. Pulverize, mix and replace top six inches (6") of subgrade and compact with moisture and density control.

D. Compact to not less than ninety-five percent (95%) maximum density; moisture content not less than two percent (2%) below optimum or more than three percent (3%) above optimum moisture content.

E. Remove stones over four inches (4") in size from subgrade and dispose of as directed by City.

F. If ruts or other objectionable irregularities form in subgrade during construction, reshape and reroll subgrade before placing pavement; fill ruts or other depressions with material similar to other subgrade material and compact.

G. Construct to elevation and cross section such that, after rolling, surface will be above required subgrade elevation.

H. Complete final subgrade by excavation to grade by use of steel-shod template supported on side forms or support rollers or by use of automatically controlled subgrade excavating machine.

I. Check subgrade elevation and grade by method approved by City prior to paving.

J. Maintain subgrade prior to and during paving operations; repair any damaged or disturbed areas prior to paving.

## 9. FIXTURE ADJUSTMENT

A. Set existing manholes to finished pavement grade or finished topsoil grade.

1. Remove existing manhole castings and precast concrete cone section as required; add precast concrete manhole sections and replace cone section; manhole sections as specified in SANITARY SEWERS AND STORM SEWERS.

2. Use adjusting rings to set casting at finished grade; twelve inches (12") maximum height; bed each ring with cold applied bituminous jointing material; Sewertite, Gibson-Homans or equal.

3. Install new frame and cover for manholes located within new pavement; use castings as specified in SANITARY SEWERS AND STORM SEWERS.

4. Pour manhole castings in slab; do not use box out without approval from City Engineer.

## 10. GRANULAR SURFACING

A. Material: Class A crushed stone; IDOT 4120.04.

B. Temporary Accesses: Compact and shape subgrade to drain, place and maintain all weather surface capable of providing two way access to emergency vehicles and residents.

C. Permanent Accesses (winter shutdown and permanent): Compact and shape subgrade to drain, place granular surfacing a minimum of twenty-four feet (24') wide by six inches (6") thick, uniformly spread and compact material; maintain surfacing until project acceptance.

# PART 3 - EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES

## INDEX


1. GENERAL
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3. EXCAVATION FOR STRUCTURES
4. TRENCH EXCAVATION
5. ROCK AND RUBBLE EXCAVATION
6. SHEETING, SHORING, AND BRACING
7. CONFLICT WITH EXISTING UTILITIES AND SERVICES
8. TUNNELING
9. DEWATERING
10. BACKFILL FOR STRUCTURES
11. TRENCH BACKFILL


## 1. GENERAL

A. This part of Specifications includes excavation and backfill for sanitary sewers, storm sewers, and structures.

B. Excavate all materials encountered to depth indicated or specified; comply with State and Federal safety regulations.

C. Remove, replace, and repair fences, signs and other obstructions as necessary for construction; return all items to equal or better than original condition; comply with SURFACE RESTORATION.

D. Pile excavated material suitable for backfill in an orderly manner sufficient distance back from edge of excavation to avoid roll back, slides, or cave-ins.

E. Remove soil unsuitable for backfill; waste as directed by City.

F. Where new construction crosses or closely parallels existing utilities or utility services, excavate in advance of pipe laying; determine location and crossing arrangement including line and grade.

G. Excavate in open cut under existing streets, utilities, and structures except as required and as directed by City.

H. Earth: all materials not classified as rock or rubble; includes clay, silt, sand, gravel, hardpan, disintegrated shale and rock debris, junk brick, loose stones, and boulders that can be removed by use of suitable excavating equipment.

I. Rock: boulders larger than seventy-five per cent (75%) of rated capacity of excavating equipment in use or solid deposits so firmly cemented together that they cannot be removed without continuous use of pneumatic tools or blasting.

J. Rubble: buried concrete foundations, beams, walls , and other materials which require continuous use of pneumatic tools or blasting.

K. Reference to percent maximum density shall mean a soil density not less than the stated percent of maximum density for soil as determined by ASTM D 698, "Moisture Density Relations of Soils" Standard Proctor Method.

## 2. SURFACING REMOVAL

A. Remove existing street, sidewalks and driveways as directed by City.

B. Remove on lines approximately parallel or perpendicular to centerline of trench.

C. Cut vertically and horizontally on straight line; saw cut full depth of surfacing.

D. Remove and replace surfacing damaged beyond removal limits.

E. Remove from project site and dispose of removed surfacing.

## 3. EXCAVATION FOR STRUCTURES

A. Remove topsoil above excavation to a depth of one foot (1') and store separately from remainder of excavated material. Following installation of structures and appurtenances and backfill of major portion of trench, place stored topsoil as final surface layer.

B. Includes excavation for manholes, intakes, and other appurtenances.

C. Excavate as required to firm, undisturbed soil; if excavation is carried below bottom of foundations, fill with granular pipe bedding material and compact.

D. When unstable material which may not provide suitable foundation is encountered, notify the City.

1. If material is considered unsuitable for foundations, Developer will submit detailed plan of action to City for approval.

2. If removal of unstable material is authorized, overexcavate and replace with stabilizing material.

E. Provide sheeting, shoring, and bracing where required to hold walls of excavation to protect existing structures or utilities or to provide safety of workmen.

## PART 3 - EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES

### 4. TRENCH EXCAVATION

A. Remove topsoil above trench in non-paved areas to a depth of one foot (1') and store separately from remainder or excavated material. Following installation of pipe and backfill of major portion of trench, place stored topsoil as final surface layer.

B. Keep width of trench as narrow as possible and still provide adequate room for backfill, jointing, and compaction.

C. Maximum width of trench at top of pipe: as shown on Standard Drawings.

D. Keep sides of trench as nearly vertical as practical; maintain vertical walls below top of pipe.

E. Excavate to required grade to provide proper bedding; if trench is overexcavated, fill with stabilizing material.

F. When unstable material which may not provide suitable foundation for pipe is encountered, notify the City.

1. If material is considered unsuitable for pipe foundation, Developer will submit detailed plan of action to City for approval.

2. If removal of unstable material is authorized, overexcavate and replace with stabilizing material. Place pipe bedding on top of stabilizing material.

G. Stabilizing material: sharp, clean crushed stone; comply with following gradation:

| Sieve | Per-Cent Passing |
|---|---|
| 2-1/2" | 100 |
| 2" | 90-100 |
| 1-1/2" | 35- 70 |
| 1" | 0- 15 |
| ½" | 0- 5 |

H. Remove large clods, stones, and other foreign material from bottom of trench.

I. Bottom of storm sewer or sanitary sewer service trench:

1. Provide pipe bedding for flexible or rigid pipes as shown on Standard Drawings.

2. Granular pipe bedding: sharp, clean crushed stones; comply with following gradation, dependent upon pipe diameter:

| | Pipe Diameter | |
|---|---|---|
| Sieve | 4" - 18" Percent Passing | Over 18" Percent Passing |
| 1-1/2" | ---- | 100 |
| 1" | 100 | 95-100 |
| 3/4" | 80-95 | 35- 70 |
| ½" | 35-60 | 25- 50 |
| 3/8" | 20-40 | 10- 30 |
| No. 4 | 0- 5 | 0- 5 |

3. Alternate granular pipe bedding material: IDOT 4120.04 Class A crushed stone may be used in stable trench conditions.

4. City may authorize change in gradation subject to materials available locally at time of construction.

5. Provide suitable bell holes at each pipe joint so bells provide no point bearing; provide access around circumference of pipe for proper jointing.

6. Compact pipe bedding by rodding or slicing with shovel. No lift shall have a depth greater than six inches (6").

## 5. ROCK AND RUBBLE EXCAVATION

A. If trench bottom is extremely hard or is in rock or rubble where there is a possibility of pipe being subjected to point bearing:

1. Overexcavate trench bottom six inches (6") minimum below grade.

2. Backfill overexcavation with suitable material; place pipe bedding material on top of resulting bottom of trench.

B. Use of explosives: submit detailed plans to City outlining all proposed blasting operations, locations, methods, and use of mats and other safety measures.

1. Obtain written approval from City before using explosives.

2. Use thoroughly experienced demolition personnel.

C. Dispose of excavated rock and rubble not suitable for backfill.

## 6. SHEETING, SHORING, AND BRACING

A. Where required or when the material to be excavated is unstable, or the bottom of the trench will not hold its form when excavated, install tight sheeting and shoring to a depth necessary to control the action of the bottom.

B. Support to prevent any movement which would in any way injure the sewer or adjacent property, private or public utilities, minimize the width necessary for proper construction procedures, or otherwise injure or delay the work.

C. Contractor to assume all liability for any and all damages to property, or injury to workmen and other persons, which may occur if sheeting is not used.

D. Contractor shall furnish and place such sheeting and shoring, sheet piling, planking, and bracing as may be required to support both sides of excavation.

E. Contractor shall install sheeting and shoring in a manner to minimize vibration in adjacent buildings and structures.

F. Leave in place all sheeting below a level two feet (2') above top of pipe.

G. Leave sheeting and shoring in place two feet (2') over top of pipe when removal might damage new pipe.

## 7. CONFLICT WITH EXISTING UTILITIES AND SERVICES

A. Provide temporary support for existing water, gas, telephone, power and other utility services that cross the trench until backfilling of the trench has been completed; do not use support methods which transfer weight or forces to other utilities.

B. All cables, conduit, and pipe exposed during construction will be secured in such a manner that no deflection or sagging occurs during or after construction. All backfill shall be natural earth materials excluding rocks, foreign materials, or other abrasive materials that may be injurious to the cables.

C. Compact backfill under existing utility crossing to ninety-five per cent (95%) maximum density; moisture content not less than two percent (2%) below optimum or more than three percent (3%) above optimum moisture content.

## PART 3 - EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES

D. Drain tile repair:

1. Notify City promptly when drain tile are encountered during excavation; note location of tile; promptly repair all drain tile damaged during construction.

2. Replace drain tile with length of ductile iron pipe as specified for sanitary sewers or helically corrugated steel pipe with standard galvanizing coating extending at least twelve inches (12") into undisturbed earth on each side or trench.

3. Diameter of replacement piping greater than or equal to existing tile diameter.

4. Install steel or reinforced concrete support beams as required and subject to City's review.

5. Connect to existing pipe with manufactured pipe adaptor, coupling or six inches (6") thick by twelve inches (12") long concrete collar.

6. Compact backfill under drain tile repair to ninety-five percent (95%) maximum density for distance equal to trench depth each side of drain tile.

7. Leave repair exposed for inspection by City.

## 8. TUNNELING

A. Tunneling will be required under railroads, highways, and where stipulated in writing by City. Contractor to have copy of approved permit on site during tunneling.

B. Sanitary sewer must be installed in casing pipe under railroads; comply with Iowa DOT requirements at all highway crossings.

C. Steel casing pipe:

1. Smooth wall welded steel pipe, ASTM A 139; one-fourth inch (1/4") minimum wall thickness or as required by IDOT or railroad.

2. Casing pipe diameter: exceed maximum O.D. of carrier pipe and joints by four inch (4") minimum.

3. Welded joints: comply with America Welding Society (AWS) code of Arc and Gas Welding in Building Construction.

4. Bevel or space ends of pipe to insure full penetration of weld for thickness of pipe.

5. Coat outside of pipe with asphalt liquid, Iowa Paint Mfg. Co., No. 31, or equal.

6. Use for highway crossings, railroad crossings, or where directed by City.

D. Obtain approval of City, Railroad, or IDOT on methods before starting; auger or jack pipe in place.

E. If pipe is augured, clean out pipe upon completion.

F. If pipe is jacked, clean out pipe as work progresses; use dry bore method.

G. Maintain correct vertical and horizontal alignment, tolerance for sanitary sewers:

1. Vertical: 0.2 foot or as to permit gravity flow in proper direction.

2. Horizontal: 0.5 foot.

H. Attach spacers to carrier pipe to center carrier pipe in casing pipe.

I. Fill annular space between casing and carrier pipe with flowable mortar.

J. Maintain street, highway, or railroad for full use by traffic at all times.

K. Tunneling below or adjacent to structures or paving: do work in manner to prevent settlement of structures or paving.

## 9. DEWATERING

A. Do all work in dry; provide for handling water encountered during construction.

B. Lay no pipe in or pour no concrete on excessively wet soil.

C. Prevent surface water from flowing into excavation; remove water as it accumulates.

D. Divert stream flow away from areas of construction.

E. Do not pump water onto adjacent property without approval of property owner.

F. Do not use sanitary sewers for disposal of trench water.

G. Permanent dewatering facilities may be required if groundwater is excessive.

## PART 3 - EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES

### 10. BACKFILL FOR STRUCTURES

A. Backfill after concrete or masonry has cured.

B. Backfill with suitable material removed from excavation except where other backfill is specified; use no debris, frozen earth, large clods, or stones.

C. Backfill simultaneously on all sides of structure; save structure from damage at all times.

D. Compact backfill at structures to density not less than specified for adjacent trench.

E. Comply with Surface Restoration and with compaction requirements in TRENCH BACKFILL shown below.

### 11. TRENCH BACKFILL

A. Backfill trench immediately after location of connections and appurtenances have been recorded.

B. Construct junction boxes, manholes, intakes, and appurtenances and backfill as work progresses. Allow no more than four-hundred feet (400') of trench to be open at one time.

C. Backfill with suitable excavated material or borrow materials. Use no large stones, large clods, organic matter, rubbish, or frozen material.

D. If excavated materials have excessive soil moisture and cannot be compacted to specified density, dry material by discing or mixing with dry soils or remove and replace with suitable borrow materials.

E. If sufficient suitable excavated material is not available, remove and dispose of unsuitable excavated material. Furnish suitable borrow materials to complete trench backfill.

F. Backfill simultaneously on both sides of pipe.

G. Hand place and compact granular pipe bedding adjacent to pipe as shown on Standard Drawings. Provide clay plug in trench at two hundred foot (200') intervals.

H. Place and compact granular bedding material as shown on Standard Drawing. Hand place minimum of six inches (6") of suitable material over top of granular material. Protect pipe.

## PART 3 - EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES

I. Backfill trenches within street right-of-way with suitable material in maximum eight inch (8") lifts and compact to not less than ninety-five percent (95%) maximum density; moisture content not less than two percent (2%) below optimum or more than three percent (3%) above optimum moisture content.

J. Backfill trenches in other areas with suitable material in maximum twelve inch (12") lifts and compact to not less than ninety per cent (90%) maximum density; moisture content not less than three percent (3%) below optimum or more than five percent (5%) above optimum moisture content.

K. Compact backfill with pneumatic or mechanical tampers adjacent to or within twelve inches (12") over pipe. Rollers or vibrating plate compactors may be used after sufficient backfill has been placed to assure that such equipment will not damage or disturb the pipe.

L. Do not use drop hammers, backhoe bucket, flooding, or jetting for compaction of trench backfill.

M. Fill upper twelve inches (12") of trench in unpaved areas with topsoil saved from excavation.

N. Comply with SURFACE RESTORATION.

# PART 4 - SANITARY SEWERS

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7. WATER MAIN CONFLICTS
8. SERVICE CONNECTIONS
9. TESTING
10. SEWER ABANDONMENT


## 1. GENERAL

A. This part of the Specifications includes material and installation procedures for construction of sanitary sewers and appurtenances.

## 2. PIPE MATERIAL AND JOINTS

A. Polyvinyl chloride (PVCT) composite truss pipe:

1. Semi-rigid composite pipe constructed with inner and outer polyvinyl chloride walls with truss type structure between inner and outer walls; truss voids filled with lightweight concrete.

2. Dimensional, performance, and use in accordance with ASTM D 2680.

3. Rubber gasket joints, ASTM D 3212.

4. Use for sanitary sewer eight inch (8") to fifteen inch (15"); provide granular bedding for flexible pipe as shown on Standard Drawings.

5. Protect PVCT from direct sunlight. Cover pipe or store indoors.

B. Lined Reinforced Concrete Pipe (RCP): ASTM C 76.

1. Minimum Class IV, Wall B or C pipe, reinforced as shown in Table 4 of ASTM C 76.

2. Rubber ring gasket type, flexible joint; 0-ring gasket, or equal; conform with ASTM C 443.

3. Tongue and groove, machined ends.

4. Six foot (6') minimum laying length.

5. Label each piece by class and show date of manufacture.

6. Lining as specified hereinafter.

7. Concrete pipe lining: two-component coal-tar epoxy-polyamide black paint; line pipe barrel and joint surfaces; lining compound: SSPC Paint Specifications No. 16-Table 1, expoxide resin content thirty-four percent (34%) to thirty-five percent (35%) by dry film weight, forty (40) mils minimum sag resistance, minimum solids eighty-two per cent (82%) by volume.

8. Cure pipe, sandblast and thoroughly clean surface, remove all loose materials.

9. Apply lining by airless spray to pipe barrel, prime all pipe with coating thinned to fifty per cent (50%) solids in accordance with manufacturer's recommendations, coverage rate: two hundred and fifty square feet (250 SF) per gal., apply one lining coat over prime coat, minimum dry film thickness: thirty (30) mils, one coat; apply lining by brush to all joint surfaces, minimum dry film thickness: eight (8) mils, one (1) coat.

10. Conform with recommendations of lining manufacturer; cure pipe lining five (5) days, minimum.

11. Use for sanitary sewer fifteen inches (15") and larger; provide granular bedding for rigid pipe as shown on Standard Drawings.

C. Vitrified Clay Pipe (VCP): ASTM C 700-75, extra strength.

1. Factory fabricated compression joints, ASTM C 425.

2. Use for sanitary sewer eight inches (8") to fifteen inches (15"); provide granular bedding for rigid pipe as shown on Standard Drawings.

D. Polyvinyl Chloride Pipe (PVC): ASTM D 3034, SDR 26 or SDR 23.5; PVC plastic in accordance with ASTM D 1784, Cell Classification 12454-B.

1. Elastomeric gasket or solvent welded joints.

2. Use for sanitary service lines only: six inches (6") minimum; provide granular bedding for flexible pipe as shown on Standard Drawings.

3. Protect PVC from direct sunlight. Cover pipe or store indoors.

E. Ductile Iron Pipe (DIP):

1. AWWA/ANSI C150/A21.50 manufactured in accordance with AWWA/ANSI C151/Al2l.51; thickness Class 52; coat outside with standard coating; coat inside with standard cement lining AWWA/ANSI C104/A21.4.

2. Mechanical or push on joints AWWA/ANSI C11/A21.11.

3. Use for sanitary service lines and sanitary sewers at water main conflicts; provide granular bedding for rigid pipe as shown on Standard Drawings.

## 3. MANHOLES

A. Standard manholes:

1. Precast reinforced concrete manhole sections conforming to ASTM C 478, forty-eight inches (48") diameter, five inches (5") minimum wall thickness, one cage reinforcing , minimum 0.12 square inches reinforcement per lineal foot of pipe wall.

2. Precast integral concrete manhole bottom section and base, or cast in place base.

3. Joints: rubber ring gasket type, flexible joint, 0-ring gasket or equal; conform to ASTM C 443.

4. Steps: Aluminum or copolymer encapsulated steel reinforcing bar; space sixteen inches (16") on centers, top step six inches (6") below top of cone sections.

5. Conform to Standard Drawings.

B. Pipe connections:

1. Use watertight rubber gasket or flexible sleeve precast into manhole wall unless permitted otherwise by City.

2. Connection to allow differential settlement of pipe and manhole without leakage.

3. Conform to Standard Drawings.

C. Castings: Shall be as specified or as shown on the Standard Drawings or Plans.

1. Type A Casting: Use outside paved areas.

2. Type C Casting: Use outside paved areas subject to flooding.

3. Type B Casting: Use in paved areas; use Type C checkered top lid.

4. Type D Casting: Use in paved areas subject to flooding; use Type C checkered lid.

5. Provide concrete adjusting rings on manholes as necessary to place cover at grade or to required elevation; provide two adjusting rings minimum; maximum height of manhole adjustment using adjusting rings, twelve inches (12"); bed each ring with cold-applied bituminous jointing compound.

6. Securely bolt castings to precast manhole sections with a minimum of 2-1/2" bolts.

D. Manholes and castings shall be suitable for AASHTO HS-20 Highway loadings.

E. Provide smooth, semi-circular invert, same size as outlet pipe, through manhole; make curve as large a radius as practical for changes in flow direction; all water shall drain freely from manhole; slope floor one-half inch (½") per foot toward invert.

F. Completely waterproof exterior joints of sanitary sewer manholes with two coats of a heavy-bodied tar or rubber asphalt; coat area minimum six inches (6") each side of joint.

## 4. SEWER PIPE INSTALLATION

A. Provide bedding and backfill as shown on standard drawings and as specified in EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES.

B. Before laying pipe, verify all measurements at site; make necessary field measurements to accurately determine sewer makeup lengths or closures.

C. Begin at lowest point in line; lay bell ends pointing upstream.

D. Visually inspect pipe for defects before carefully lowering into trench; lay true to line and grade; provide for uniform bearing of the pipe barrel on the trench bottom while avoiding point bearing on the bells.

E. Provide smooth and uniform invert; bear spigots against bell shoulders.

F. Make joints with equipment recommended by pipe manufacturer; do not use backhoe to push joints together.

G. Seal all cut edges of PVCT pipe with coating recommended by manufacturer.

H. Keep pipe free of all dirt and foreign material; clean pipe interior of all foreign material before lowering into trench; keep clean by securely closing open ends of pipes and manholes; plug open end of pipe at end of work day and when work is not in progress. Line and grade:

1. Use laser light equipment or batter boards for line and grade control.

a. Use direction equipment to monitor laser light to prevent movement or drift of line from line and grade.

b. Use minimum of three (3) batter boards not more than twenty-five feet (25') apart.

2. Check line and grade of each pipe length; horizontal and vertical alignment of the installed pipe shall not vary more than plus or minus one-fourth inch (1/4").

3. Check sewer grade at maximum one hundred foot (100') intervals with level and level rod.

4. Continuously check alignment of sewer by flashing light between manholes or between last piece or pipe laid and opening at downstream manhole.

5. Correct misalignment, displacement, or otherwise defective sewer.

## 5. CONFLICT WITH EXISTING UTILITIES

A. Provide temporary support for existing water, gas, telephone, power, and other utility services that cross trench until backfilling of the trench has been completed.

B. Compact backfill under existing utility crossing to ninety-five per cent (95%) maximum density; moisture content not less than two percent (2%) below optimum or more than three percent (3%) above optimum moisture content.

## 6. CONNECTION BETWEEN DISSIMILAR GRAVITY PIPE

A. Use manufactured special adaptors or couplings with full-width stainless steel bands whenever possible.

B. If coupling is not available, use concrete collar six inches (6") thick and twelve inches (12") each way from joint; reinforce with 6" x 6"-W2.9 x W2.9 welded wire fabric. Concrete collar to be approved by City Engineer prior to use.

## 7. WATER MAIN CONFLICTS

A. Horizontal separation of gravity sewers from water mains: separate gravity sewer mains from water mains by horizontal distance of at least ten feet (10') unless:

1. The top of sewer main is at least eighteen inches (18") below bottom of water main.

2. The sewer is placed in separate trench or in same trench on bench of undisturbed earth at minimum horizontal separation of three feet (3') from the water main.

3. These are minimum requirements; other regulating authorities may require more stringent limitations.

B. Sewers with less than ten feet (10') lateral clearance and top of sewer less than eighteen inches (18") below bottom of water main: use ductile iron pipe as specified for sewer.

C. Where new sewer crosses over water main or service or where top of sewer is within eighteen inches (18") of bottom of water main or service: provide twenty feet (20') length of ductile iron pipe as specified for sewer centered on the water main; backfill trench with low permeability soil for twenty feet (20') length centered on crossing.

## 8. SERVICE CONNECTIONS

A. Install service connections where shown on plans or as directed by the City; conform to Standard Drawings.

B. Service pipe: ductile iron pipe (DIP) or polyvinyl chloride (PVC) SDR 26 or SDR 23.5, minimum size six inches (6").

C. Wye or Tee: Use fittings for service connections.

D. Install watertight stopper in end of new sewer services stubbed to vacant lots; install steel fence post painted green to mark location.

E. Use wye or tee branch where invert of sewer is less than ten feet (10') below ground surface or where required to avoid water main conflicts; rotate branch minimum of thirty degrees (30°) from horizontal.

F. Use tee branch and riser pipe where sewer invert is twelve feet (12') or more below ground surface; riser shall be extended up to ten feet (10') below ground surface; conform to Standard Drawings.

G. Service connections on sewers where wyes or tees were not originally installed with sewer, shall be installed by cutting out a section of main line sewer and having a wye fitting installed or a sewer tap shall be made with a mechanical sewer tap machine designed for that purpose and a factory made sewer tap saddle installed. The new wye fitting or sewer tap shall have water tight joints. The sewer tap saddle shall not extend beyond the inside of the main line sewer. The installation shall be inspected by the City Engineer prior to backfill.

H. Backfill trench after exact location of service connection has been recorded. Two compaction tests per service are required as specified for TRENCH BACKFILL.

## 9. TESTING

A. Deflection tests:

1. Perform deflection tests on PVCT Truss sewer pipe after final backfill has been in place at least thirty (30) days.

2. Run deflection test using a rigid ball or mandrel with diameter equal to ninety-five per cent (95%) of the pipe; perform without mechanical pulling devices.

3. No pipe shall exceed a deflection of five per cent (5%).

B. Leakage Tests:

1. Maximum allowable infiltration or exfiltration for any new sanitary sewer section, including all manholes, is two hundred (200) gallons per inch of diameter per mile of pipe per day. Test manholes separately as specified below.

2. Line Low-Pressure Air Test: ASTM C 828:

a. Plug ends of line and cap or plug all connections to withstand internal test pressures.

b. Introduce low pressure air until internal air pressure is four pounds per square inch (4.0 psi) greater than the average back pressure of ground water above the pipe.

c. Allow two (2) minutes for air pressure to stabilize.

d. Time for pressure to decrease from 3.5 to 2.5 psi greater than the average back pressure of any ground water above the pipe shall not be less than the time in the following table for the given diameters:

| Pipe Diameter (inches) | Time (minutes) |
|---|---|
| 6 | 3.0 |
| 8 | 4.0 |
| 10 | 5.0 |
| 12 | 5.5 |
| 15 | 7.0 |
| 18 | 8.5 |

e. Repeat test as necessary after all leaks and defects have been repaired.

3. Manhole exfiltration test:

a. Plug inlet and outlet of manhole and fill with water to at least two feet (2') above top of highest pipe or two feet (2') above ground water table, whichever is higher; let water stand in manhole for one (1) hour and then refill to original elevation; measure water loss after next hour.

b. The allowable manhole leakage shall not exceed 0.05 foot per hour.

c. Alignment Test - Sewers shall be checked for alignment by either using a laser beam or lamping. The light shall be visible through the section of pipe lamped. The results of the alignment test to be evaluated by the City.

## 10. SEWER ABANDONMENT

A. Contact Engineering Division of the Department of Public Works for specific requirements.

# PART 5 - STORM SEWERS

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8. SUMP PUMP DRAIN LINES
9. SUBDRAINS
10. RIP RAP


## 1. GENERAL

A. This part of the Specifications includes material and installation procedures for construction of storm sewers and appurtenances.

## 2. PIPE MATERIAL AND JOINTS

A. Reinforced concrete pipe (RCP): ASTM C 76, minimum class III, Wall B, tongue and groove joints, machined ends; use for storm sewers.

1. Reinforced concrete pipe joints: use cold applied bituminous jointing material: Sewertite, Gibson-Homans, or equal.

2. Apply joint material to bottom one-half (½) of groove and top one-half (½) of matching tongue in sufficient quantity to fill jointing; force adjoining pipe together.

3. Fill al remaining voids in joints both inside and outside of pipe; trowel inside of pipe twenty-four inches (24") and larger; wipe interior joint clean in pipes smaller than twenty-four inches (24").

4. Reinforced concrete flared end section: construct with reinforcing steel and concrete in accordance with ASTM C 76; strength not less than adjoining pipe sections; use where shown on plans; comply with Standard Drawings.

B. Plastic pipe, use for sump pump drain lines and subdrains:

1. Polyvinyl chloride pipe (PVC): ASTM D 3034, SDR 35, PVC plastic in accordance with ASTM D 1784, Cell Classification 12454-B; joints according to manufacturer's recommendation; use for sump pump and subdrain lines.

2. Polyvinyl chloride (PVC) corrugated pipe: ASTM F 949; PVC plastic in accordance with ASTM D 1784, Cell Classification 12454-B; joints according to manufacturer's recommendation; use for sump pump and subdrain lines and for perforated and non-perforated subdrain lines.

3. Polyvinyl chloride composite pie (PVCT) truss pipe: Semi-rigid composite pipe, ASTM D 2680, joins according to manufacturer's recommendations; use for sump pump collector lines and non-perforated subdrain lines.

4. High Density Polyethylene (HDPE) corrugated pipe: ASTM F 405; HDPE plastic in accordance with ASTM D 1248, Type III, Category 4 or 5, Grade P 33 or P 35, Class C; use for sump pump drain lines and subdrains.

5. Install manufacturer recommended tees or wyes at all sump pump collector lines for services.
6. Install manufacturer's recommended tees or wyes at all connections between non-perforated subdrains/sump pump collector lines and perforated subdrains.

## 3. MANHOLES

A. Construct manholes and end of line cleanouts (sump pump drain lines and subdrains only for cleanouts) in accordance with Standard Drawings.

B. Construct base and top slab of reinforced concrete as specified; precast top.

C. Construct walls of precast reinforced concrete manhole sections conforming to ASTM C 478, five inch (5") minimum wall thickness, diameter as shown on plans.

D. Type E Casting: use outside paved areas.

E. Type F Casting: use in paved areas; use Type C checkered top lid.

F. Type H Casting; use for end of line clean out for sump pump drain lines and subdrains only.

G. Provide concrete adjusting rings on manholes to place cover at finished grade or required elevation; provide at least two (2) adjusting rings; maximum height of adjusting rings: twelve inch (12"); bed each ring in cold applied bituminous jointing compound.

H. Manholes and casting shall be suitable for AASHTO HS-20 Highway loadings.

I. Securely bolt castings to intakes and precast manhole sections with a minimum of 2-1/2" bolts.

## 4. CURB INTAKES

A. Construct in accordance with Standard Drawings.

B. Construct base and top slab of reinforced concrete as specified.

C. Construct walls of solid precast concrete block, ASTM C 139 and cement mortar or cast in place concrete.

D. Mortar: one part portland cement to two parts mortar sand; hydrated lime, five pounds (5 lbs.) Per sack of cement may be added for workability.

E. Completely fill joints with mortar for watertight structure; tool each joint.

F. Install horizontal masonry wall reinforcement in each bed joint of wall; reinforcement; nine (9) gauge side and cross rods.

G. Thoroughly cover inside and outside of walls with Block Bond or equal.

H. In freezing weather, heat materials and protect work from cold; maintain temperature of work at forty degrees Fahrenheit (40° F.) For at least twenty four (24) hours after placing.

I. Intake castings: Shall be as specified or as shown on Standard Drawings or Plans.

1. Type R Casting: use for Type M-A, M-C, M-D, and M-E curb intakes unless otherwise specified.

2. Type Q Casting: use for Type M-A and M-C driveway intakes unless otherwise specified.

3. Type E Casting: use for Type M-C and M-E intakes unless otherwise specified.

4. Type G Casting: use for Type M-G intake only.

## 5. STORM SEWER INSTALLATION

A. Provide bedding and backfill as shown on Standard Drawings and as specified in EXCAVATIONS AND BACKFILL FOR PIPES AND STRUCTURES.

B. Before laying pipe, verify all measurements at sire; make necessary field measurements to accurately determine sewer makeup length or closures.

C. Begin at lowest point in line; lay groove ends pointing upstream.

D. Visually inspect pipe for defects before carefully lowering into trench; lay true to line and grade; provide for uniform bearing of the pipe barrel on the trench bottom.

E. Provide smooth and uniform invert; bear tongue against groove shoulders.

F. Make joints with equipment recommended by pipe manufacturer, do not use backhoe to push joints together.

G. Keep pipe free of all dirt and foreign material.

H. Saw cut end of pipe at manholes and intakes; do not hammer, cut, or break pipe.

I. Line and grade:

1. Use laser light equipment or batter boards for line and grade control.

   a. Use detection equipment to monitor laser light to prevent movement or drift of line from line and grade.

   b. Use minimum of three (3) batter boards not more than twenty five feet (25') apart.

2. Check line and grade of each pipe length; horizontal and vertical alignment of the installed pipe shall not vary more than plus or minus one-fourth inch (1/4").

3. Check sewer grade at maximum one hundred foot (100') intervals with level and level rod.

4. Continuously check alignment of sewer by flashing light between manholes or between last piece of pipe laid opening at downstream manhole.

5. Correct misalignment, displacement, or otherwise defective sewer.

## 6. CONFLICT WITH EXISTING UTILITIES

A. Provide temporary support for existing water, gas, telephone, power, and other utility services that cross trench until backfilling of the trench has been completed.

B. Compact backfill under existing utility crossing to ninety-five percent (95%) maximum density; moisture content not less than two percent (2%) below optimum or more than three percent (3%) above optimum moisture content.

## 7. CONNECTION BETWEEN DISSIMILAR GRAVITY PIPE.

A. Use manufactured special adaptors or couplings whenever possible.

B. If coupling not available, use concrete collar six inches (6") thick and twelve inches (12") each way from joint; reinforce with 6"x6"-W2.9 x W2.9 welded wire fabric.

## 8. SUMP PUMP DRAIN LINES

A. Provide adequately sized storm sewers or sump pump drain lines to receive discharge from foundation drains or sump pumps.

2. Install sump pump drain lines with a minimum of forty-two inches (42") cover.

3. Install pipe, manholes, and/or end of line cleanouts as specified for STORM SEWERS.

4. Provide water tight sump pump service connections to sump pump collector lines or storm sewer for each platted lot or building; extend service line from storm sewer to one foot (1') beyond property line.

5. Place watertight stopper or plug in end of service line.

6. Mark locations of sump pump service connection with steel post painted yellow.

## 9. SUBDRAINS

1. Construct perforated and/or non-perforated subdrains as shown on plans.

2. Install subdrains with a minimum of forty-two inch (42") cover with perforations down.

3. Slope subdrains to drain.

4. Backfill perforated subdrain with washed, round, durable, porous backfill material approximately 3/8" in size, commonly known as pea gravel.

5. Connect subdrains to storm sewer, sump pump collector lines or daylight in drainage way.

6. Install pipe, manholes, and/or end of line cleanouts as specified for storm sewers.

## 10. RIP RAP

A. IDOT 4130, class E Revetment with following gradation:

| Stone Size | % Larger Than |
|---|---|
| 250 pounds | 0 |
| 90 pounds | 50-100 |
| 5 pounds | 90-100 |
| ½" sieve | 95-100 |

B. Sound and durable broken limestone, dolomite or quartzite, maximum abrasion loss: fifty percent (50%) in accordance with AASHTO T96; broken concrete or rubble not acceptable.

C. Place on four inch (4") thick stone filter or engineering fabric; stone filter material; pipe bedding as specified in EXCAVATION AND BACKFILL FOR PIPES AND STRUCTURES; engineering fabric: IDOT 4196.

# PART 6 - CONCRETE AND REINFORCING STEEL

## INDEX


1. GENERAL
2. CONCRETE MATERIALS
3. CONCRETE QUALITY
4. FORMS
5. MIXING, PLACING, PROTECTING AND CURING
6. FINISHING
7. REINFORCING STEEL
8. WIRE FABRIC
9. RESTRICTIONS ON OPERATIONS


## 1. GENERAL

A. This part of the Specifications details requirements for portland cement concrete and reinforcing steel used in the construction of utility structures.

## 2. CONCRETE MATERIALS

A. Portland cement: ASTM C 150, Type I.

1. Keep clean, dry, and free from weather damage and contamination.

B. Aggregates: strong, durable, uniformly graded mineral grains conforming with IDOT 4110 and 4115 for structural concrete.

1. Stockpile each gradation separately on clean, noncontaminating surfaces.

C. Water: clean and free from injurious materials.

D. Admixtures:

1. Plasticizing material: Pozzolith by Master Builders Company, or approved equal; maintain cement content specified.

2. Non-shrink: Embeco by Master Builders Company, or approved equal.

## 3. CONCRETE QUALITY

A. Mix Design: IDOT 2403.03, Class C or Class M, 4000 psi minimum strength.

B. Water-cement ratio: 0.488 lb. of water per lb. of cement, maximum, including free moisture in aggregates.

C. Slump: Maintain between two and one half inches (2-1/2") to four inches (4").

D. Air content: Maintain between five percent (5.0%) to eight per cent (8.0%).

E. Admixtures: per manufacturer's recommendations.

F. Concrete mix: meet approval of City.

## 4. FORMS

A. Form all concrete, unless permitted otherwise by City.

B. Use metal or plywood-lined forms for exposed surfaces; erect true to line and grade; brace and tie securely.

C. Coat forms with non-staining mineral oil before placing reinforcing.

D. Strip forms only after concrete has cured for at least twenty-four (24) hours and has developed sufficient strength to withstand subsequent stress.

## 5. MIXING, PLACING, PROTECTING, AND CURING

A. Provide accurate control for measuring materials.

B. Mix until mass is homogeneous and uniform in color.

C. Ready-mixed concrete: conform with specifications and ASTM C 94.

D. Clean and dampen forms, reinforcing steel and embedded items; thoroughly compact by tamping or vibrating.

E. Prevent segregation during placing; do not drop concrete more than three feet (3').

F. Place concrete continuously in each section until complete; permit not more than thirty (30) minutes between depositing adjacent layers of concrete within each section.

G. Thoroughly compact, puddle, and vibrate concrete into corners and around reinforcing and embedded items.

H. Place sections of concrete in a sequence which eliminates the effect of shrinkage to greatest extent practicable.

I. Immediately after finishing or stripping forms, apply continuous cover of polyethylene film, IDOT 4106; minimum lap: six inches (6"); keep film in place for seven (7) days.

J. Alternate to polyethylene film, cure using white-pigmented liquid curing compound after end of bleeding in accordance with IDOT 2403.10.

K. Maintain concrete temperature between sixty degrees (60°) and ninety degrees (90°) when placing and not less than fifty degrees (50°) for seventy-two (72) hours after placing.

L. Place concrete footings and slabs only on subgrades capable of supporting anticipated loads.

## 6. FINISHING

A. Patching:

1. Chip out honeycomb to sound concrete. Patch immediately after removing forms and inspection by City.

2. Fill holes with patching mortar consisting of one (1) part portland cement and three (3) parts sand.

3. Fill holes left by form ties with non-shrink grout to within one inch (1") of surface; fill remainder with patching mortar.

4. Where existing concrete has been removed, patch uneven surfaces with patching mortar.

B. Surfaces: float to uniform finish with cork float; use edger on exposed edges.

C. Chamfer corners.

## 7. REINFORCING STEEL

A. Billet steel bars: ASTM A 615, Grade 40.

B. Bend cold to conform with required details; bend bars in fabricating shop before delivery to site.

C. Space properly and tie securely in position before placing concrete; tie with minimum No. 18 tie wires or as permitted by city.

D. Lap bars 36 diameters, unless noted otherwise on plans.

E. Remove scale, dirt, or other coatings which may impair bond; comply with ACI 318.

F. Install reinforcing steel in position with preformed wire bar bolsters and spacers.

G. Place concrete only after reinforcing system is in place and approved by City; install reinforcing system plumb and true; tie securely; reinforcing must remain in proper position without distortion or displacement of individual bars or system during pour.

## 8. WIRE FABRIC

A. Electrically welded wire fabric: ASTM A 185 and A 82.

B. Size and mesh: as shown.

C. Place securely as shown or as directed by City.

D. Lap fabric not less than six inches (6").

E. Remove scale, dirt, and other bond-impairing materials.

## 9. RESTRICTIONS ON OPERATIONS

A. Weather:

1. Do not place concrete when stormy or inclement weather or temperature prevents good workmanship.

2. Use no aggregates containing frozen lumps and do not place concrete on frozen foundation.

3. With weather conditions, begin concrete mixing and placement when ambient temperature is at least thirty-four degrees Fahrenheit (34° F.) and rising.

4. Concrete delivered to site must have temperature of at least forty degrees Fahrenheit (40° F.).

5. Stop concrete mixing and placement when ambient temperature is thirty eight degrees Fahrenheit (38° F.) and falling.

6. Stop concrete mixing and placement when ambient temperature exceeds ninety-five degrees Fahrenheit (95° F.).

# PART 7 - PORTLAND CEMENT CONCRETE PAVEMENT

## INDEX


1. GENERAL
2. MATERIALS
3. PROPORTIONS FOR MIX
4. STORAGE & PROTECTION OF MATERIALS
5. CONCRETE PROPORTIONING AND MIXING EQUIPMENT
6. PLACEMENT EQUIPMENT
7. PAVEMENT CONSTRUCTION
8. CURING AND PROTECTION
9. JOINTS
10. RESTRICTIONS ON OPERATIONS
11. DEFECTS OR DEFICIENCIES
12. DRIVEWAYS AND SIDEWALKS


## 1. GENERAL

A. This part of the Specifications includes construction of portland cement concrete pavement with integral curb, and curb and gutter on prepared subgrade using preset forms or slip forms methods.

B. This part of the Specifications includes deformed tie bars and reinforcement dowels for joints and deformed reinforcement bars for pavement reinforcement.

C. This part of the Specifications includes construction of concrete driveways and sidewalk.

## 2. MATERIALS

A. Portland cement: ASTM C 150, Type I.

B. Admixtures:

1. Air entraining: ASTM C 260.

2. Retarding: a suitable retarding admixture may be used during hot weather, with approval of City.

3. Calcium chloride shall not be used.

4. Fly ash : ASTM C 618; IDOT 4108 (Type C Mixes only).

5. Water Reducing Agents: ASTM C 494; IDOT IM 529.

6. Other admixtures may be used subject to approval of City.

C. Fine aggregate: IDOT 4110.

D. Coarse aggregate:

1. Clean, hard, durable particles of crushed limestone free from injurious amounts of objectionable materials; minimum Class 2 durability limestone; IDOT 4115.

2. Gradation: IDOT 4115, Gradation Number 5.

E. Water: clean and clear, free from salt, oil, acid, strong alkalis, vegetable matter, or other substances injurious to concrete.

F. Reinforcing steel:

1. Deformed bars: ASTM A 615, Grade 40.

2. Plain and smooth dowel bars: ASTM A 615; Grade 40.

3. Epoxy coated reinforcement: AASHTO M 284 and IDOT 4151.03B, use on all plain and smooth dowel bars and as shown on Plans.

G. Expansion tubes:

1. Fabricated steel or plastic tubes; provide tubes with internal diameter one-sixteenth inch (1/16") larger than dowel bar; bar stop capable of withstanding twenty pounds (20 lbs.) push, minimum.

H. Metal keyways:

1. Fabricated twenty-four (24) gauge sheet steel; conform to details shown on plans; provide lengths in multiples of tie bar spacing; punch to receive tie bars; support metal keyway with legs unless installed by paving machine.

I. Supports for reinforcing steel:

1. Support tie bars as required to place and maintain correct location during construction.

2. Support dowel bars at expansion and contraction joints as shown on Standard Drawings.

3. Epoxy coated reinforcement: support with metal chairs and supports coated with epoxy or other inert material reviewed by Engineer; tie with plastic coated tie wires.

J. Joints

1. Joint sealer: hot poured joint filler composed of petropolymers, ASTM D 3405 with ninety (90)-one hundred and fifty (150) penetration at seventy-seven degrees Fahrenheit (77° F.) and passing three (3) cycles, two hundred per cent (200%) extension bond test at minus twenty degrees Fahrenheit (-20° F.).

2. Backer rope: cellulose or plastic foam suitable for use with hot-poured sealer; size and compression such that it maintains position during filling operation.

3. Preformed expansion joint filler: asphalt saturated fiber strips; AASHTO M213; furnish in strips of plan dimensions.

K. Liquid curing compound: IDOT 4105.

1. Use white curing compounds on all pavements not receiving ACC overlay.

2. Use dark colored compounds an all pavements receiving ACC overlay.

L. Plastic film: opaque, white pigmented polyethylene plastic, 0.00085" minimum thickness, use only once if less than 0.0034" thick.

## 3. PROPORTIONS FOR MIX

A. Mix No. C-3 or C-4 in accordance with IDOT 2301.04.

1. Air entraining admixture: produce 6.5% $\pm$ 1.5% air voids in fresh concrete measured by pressure method.

2. Water reducing admixture: furnish at contractor's option; IDOT IM 529.

3. Fly Ash: furnish at contractor's option; Type C or Type F Fly Ash; IDOT IM 529; use in accordance of IDOT 2301.04E.

B. Mix No. M-4 in accordance with IDOT 2301.04E; use as directed by City Engineer.

1. Air entraining admixture: produce 6.5% $\pm$ 1.5% air voids in fresh concrete measured by pressure method.

C. Proportion of adjustments:

1. Basis: when actual quantity of concrete is more than one hundred and one per cent (101%) or less than ninety-nine per cent (99%) of calculated quantity or if combination of materials does not produce quality of concrete specified.

2. Fine aggregate shall not exceed fifty per cent (50%) of total aggregate in any adjustment.

3. Do not exceed maximum water-cement ratio specified.

D. Water quality and concrete consistency:

1. Use proper amount of mixing water to produce concrete of uniform consistency; adapt to mix, characteristics of materials used, methods of consolidation, weather conditions and slope of finished surface.

2. Modify proportion if maximum water-cement ratio does not produce workability; increase cement to aggregate proportion to produce specified degree of workability without exceeding maximum water-cement ratio.

E. Tests on trial batches and concrete placed at project site:

1. Slump: ASTM C 143; one and one-half inch (1-1/2") to three inches (3") for machine finished concrete; four inches (4") maximum, for hand finished concrete.

2. Air voids of fresh concrete, by pressure method: ASTM C 231; 6.5% $\pm$ 1.5%.

3. Minimum compressive strength: ASTM C 39; 2,750 psi when tested at seven (7) days and 4,000 psi when tested at twenty eight (28) days.

## 4. STORAGE AND PROTECTION OF MATERIALS

A. Aggregates: store and handle aggregates to avoid contamination and frequent variations in specific gravity, gradation or moisture content of materials used.

1. Store fine and course aggregates in separate piles or bins.

2. Minimize changes in aggregates with different specific gravities or gradations in working day.

3. Handle aggregates to prevent variations of more than one-half percent (0.5%) in moisture content of successive batches.

4. Thoroughly wet and allow to drain for at least one (1) hour course aggregate having an absorption greater than one-half percent (0.5%).

5. Drain fine aggregate at least twenty-four (24) hours after washing and before batching.

B. Cement: store in suitable weathertight enclosures and handle to prevent loss.

1. If lumps develop in cement, cement must be reprocessed, retested, and reapproved prior to use.

2. Cement in storage at site or local warehouses for more than sixty (60) days must be retested prior to use.

C. Admixtures: store in suitable weathertight enclosures which will preserve quality.

D. Reinforcing steel: store off ground on timbers or other supports.

## 5. CONCRETE PROPORTIONING AND MIXING EQUIPMENT

A. Plant batching and mixing equipment shall be IDOT calibrated and approved. Provide copy of current certification.

B. Equipment may be either stationary central plant mixer or central plant-proportioned with truck mounted transit mixer.

C. If concrete is central mixed, it may be transported in agitating or non-agitating units.

1. Concrete must be placed on grade within thirty (30) minutes after mixing if transported in non-agitating units.

2. Concrete must be placed on grade within ninety (90) minutes after mixing if transported in agitating units.

D. When concrete is mixed on truck mounted transit mixers and agitated thereafter, concrete must be handled in accordance with IDOT 2301.13.D.2.

E. Truck Mounted Transit Mixers: capacities and mixing capability as defined in ASTM C 94 with attached plate containing required information.

1. Equipment shall include reliable reset-revolution counter which will register the number of revolutions at mixing speed.

2. Unit must have signed certifications that concrete producer or authorized representative has inspected unit within previous thirty (30) day period and that interior of mixing drum is clean and reasonably free of hardened concrete, that fins or paddles are not broken or worn excessively, and that other parts are in proper working order.

F. Plant or transit mixers must produce concrete with consistent quality; if uniformity, entrained air or slump varies, concrete producer must take corrective action.

G. Each truck load of concrete must be identified by an acceptable plant charge ticket showing plant name, Contractor, project name, date, quantity, class, time batched, and water added at site.

## 6. PLACEMENT EQUIPMENT

A. Subgrade finishing equipment: use mechanical excavating equipment designed for this purpose, approved by City.

1. Form line or path area for slip-form paving machine shall be constructed to final grade by form-line excavating equipment with automatic grade controls.

2. Subgrade between forms or between path areas for slip-form machines constructed to final grade with steel shod template or automatically controlled subgrade excavating machine.

B. Side forms: steel, minimum thickness: five (5) gauge, height at least equal to design thickness of pavement, base width at least six inches (6").

1. Minimum section length: ten feet (10'), joint connections designed to permit horizontal and vertical adjustment with locking device to hold abutting sections firmly in alignment when set.

2. Bracing, support, and staking must prevent deflection or movement of forms from pressure of concrete or weight or thrust of machinery operating on forms.

3. Forms must be free from scale and surface irregularities; coat with form oil prior to concrete placement.

C. Flexible forms: use steel or wood flexible forms for curves with radius less than one hundred feet (100').

1. Bracing, support, and staking must prevent deflection or movement of forms from pressure of concrete or weight or thrust of machinery operating on forms.

2. Forms used to form back of curbs at returns shall have height at least equal to design thickness of pavement and curb height.

3. Forms must be free from scale and surface irregularities; coat with form oil prior to concrete placement.

D. Consolidating and finishing equipment: fixed form or slip form paving machines specifically designed for placing, striking off, consolidating, and finishing in single passage to required cross section.

1. Consolidation of concrete by single pass of approved surface, tube or internal vibrator operated in accordance with manufacturer's recommendations.

2. Slip form equipment: automatic horizontal and vertical controls required; equipment must spread concrete to uniform depth prior to striking off.

3. Air screeds and vibrating screeds are approved consolidating and finishing equipment for cul-de-sacs and drives only.

4. Equipment subject to approval of City.

E. Hand finishing equipment: Contractor shall provide tools including wood or magnesium floats, wood hand floats, pointing trowels, edgers, or other equipment necessary for proper finishing of concrete.

1. Provide two (2) light straightedges, ten feet (10') long, with handles not less than twelve feet (12') long for use in detecting irregularities in surface; provide two (2) heavy straightedges of similar size for use in correcting surface; provide two (2) light straightedges six feet (6') long for checking curb and gutter line.

2. Provide approved vibrators for consolidating concrete.

3. Provide metal or wood screed true to crown.

F. Curing equipment: use pressure sprayer capable of applying a continuous uniform film of curing compound.

G. Concrete saws: power operated concrete saws capable of cutting hardened concrete neatly.

H. Joint sealing equipment: equipment capable of heating and installing sealant in joints in accordance with manufacturer's recommendations.

## PART 7 - PORTLAND CEMENT CONCRETE PAVEMENT

### 7. PAVEMENT CONSTRUCTION

A. General:

1. Place, strike off, consolidate, and finish concrete with fixed form or slip form mechanical paving equipment to cross section shown on plans.

2. Use paving machine for all uniform width slabs eight and one-half feet (8 ½') or more in width and two hundred feet (200') or more in length.

3. Use hand placing, consolidating, and finishing in areas of irregular dimensions or narrow widths.

4. Set paving stakes at twenty-five feet (25') maximum spacing on curves, fifty feet (50') maximum spacing on tangents.

B. Setting and removing forms:

1. Use form line excavating machine to establish subgrade for forms used to support mechanical subgrader, mechanical spreader or finisher, or other similar equipment.

2. Set base of forms at or below subgrade elevation with top of forms at pavement surface elevation at edge of slab.

3. Extra height forms may be used to back up integral curb; set base at or below subgrade elevation with top of form at top of curb elevation.

4. Set forms accurately to required grade and alignment and secure in place to maintain grade and alignment during concrete placement and finishing.

5. If voids occur under forms, remove forms and rework subgrade to proper elevation and density.

6. If soil supporting form is softened by rain or standing water so that form is inadequately supported, remove forms and rework subgrade to proper elevation and density.

7. Check form joints with ten foot (10') straightedge prior to paving; adjust as necessary to proper grade and alignment; maximum deviation of top surface is one-fourth inch (1/4") in ten feet (10').

8. Coat forms with form oil before concrete is placed to prevent adherence to concrete.

9. Leave side forms in place not less than six (6) hours after concrete is placed; if form removal damages concrete, City may require remaining forms to remain in place more than six (6) hours.

10. Remove forms with care to prevent cracking, spalling, or overstressing concrete; remove form stakes prior to raising forms.

11. Clean forms before resetting.

C. Concrete and steel placement:

1. Uniformly moisten subgrade just prior to concrete placement or place plastic film on prepared subgrade, lap joints twelve inches (12").

2. Adjust manhole castings, valve boxes, or other fixtures within pavement to finished surface grade; clean outside of castings.

3. Place dowel and tie bars as shown on Standard Drawings or specified; support and secure bars by approved chairs and wire assemblies. Place steel centered in the pavement a minimum of three hundred feet (300') ahead of paving operation.

4. Place concrete to full depth in single operation; do not pile concrete more than eight inches (8") above design elevation of surface.

5. Carefully place concrete on subgrade to prevent segregation of materials and at locations which require minimum rehandling; do not displace reinforcing.

6. Vibrate and consolidate to prevent formation of voids; do not displace reinforcing.

D. Finishing:

1. Begin finishing operations promptly after concrete has been placed and consolidated.

2. Screed surface to grade and crown as shown on plans.

3. Do not add free water to surface.

4. Finish surface with wood or magnesium floats; finish from both sides simultaneously if pavement is placed to full width with one pass of paving machine.

5. Check surface longitudinally with ten feet (10') long straightedge while concrete is still plastic; correct any surface deviations greater than one-eighth inch (1/8") in ten feet (10').

6. Provide uniformly gritty surface with astroturf drag; round edges of pavement to one-eighth inch (1/8") radius.

7. Check pavement surface longitudinally after concrete has hardened with ten feet (10') long straightedge; grind high spots over one-eighth inch (1/8") with approved grinding device or device consisting of multiple saw blades.

E. Curb and gutter and integral curb:

1. Construct curb and gutter and integral curb, as shown on Standard Drawings, along with pavement or immediately following finishing or pavement.

2. Use paving machine with integral slip-form for curb; curb mule or similar mechanical equipment providing equivalent results.

3. Construct depressed curb at driveways and where sidewalk intersect street; use templates to form faces of such curbs.

4. Form and construct curb by hand only where barrier or depressed curb is required and where small radii or other special sections preclude use of mechanical equipment.

5. Construct curb as rapidly as finishing operations on pavement permit; maximum distance behind paving machine: one hundred feet (100').

6. Remove free water, laitance, dust, leaves, or other foreign matter prior to placing concrete for curb.

7. Use freshly mixed concrete; do not store concrete in receptacles at side of pavement for use in curb at a later time; do not use concrete requiring retempering.

8. Vibrate or puddle concrete to secure bond with paving slab and eliminate rock pockets.

9. Secure final finish on curbs by hand method, including six foot (6') straightedge or six foot (6') slipform.

10. Edge, protect, and cure curb in same manner as pavement.

11. Check surfaces of curb and gutter with ten foot (10') straightedge; correct variations greater than one-eighth inch (1/8"); remove and replace curbs having varying cross section.

F. Joints:

1. Round edges of concrete adjacent to header boards and preformed joint material to one eighth inch (1/8") radius.

2. Provide supplemental vibration adjacent to header boards and preformed joint material as required.

3. Construct "CD" joint when delays caused by weather conditions, end of day's work, or when concrete placement is interrupted for thirty (30) minutes.

4. Construct double width expansion joint in curb over expansion joint in pavement.

## 8. CURING AND PROTECTION

A. Apply liquid curing compound in fine spray to form continuous, uniform film on surface and vertical edges of pavement and curbs immediately after bleeding stops.

B. Apply compound with power sprayer; rate of application not less than 0.067 gallon per square yard (fifteen (15) square yards per gallon); do not dilute compound.

C. Apply to pavement surface after finishing and after surface moisture has disappeared; apply to pavement edges within thirty (30) minutes after forms are removed.

D. Protect concrete pavement during cold weather for at least seventy-two (72) hours after placement as follows: (Forecast based on National Weather Service 3:00 p.m. forecast for overnight low.)

| Forecast or Actual Temperature | Protection |
|---|---|
| 35 to 32 F. | One layer of burlap. |
| 31 to 25 F. | Two layers burlap or one layer plastic film on one layer burlap. |
| Below 25 F. | Six inch (6") layer of straw or hay on top of one layer plastic film. Protect straw or hay from disturbance with a second layer of plastic or burlap. |

1. Burlap: AASHTO M182, Class 3.

2. Commercial insulation may be substituted for straw or hay, when approved by City.

3. Protect straw, hay, or insulation from disturbance by wind; leave in place for five (5) days, minimum, or until pavement is opened to traffic.

4. Lap plastic film eighteen inches (18") at junctions.

E. Provide cold weather protection as specified for temperature below twenty-five degrees Fahrenheit (25° F.) for all concrete.

F. Provide burlap, paper, or plastic film, and planks and stakes at or near job site to cover and protect fresh concrete and to construct temporary forms for protection against rain.

G. Contractor responsible for pavement protection against effects of weather; failure to properly protect pavement may result in removal and replacement of damaged pavement.

## 9. JOINTS

A. Saw cut transverse and longitudinal joints in pavement and integral curb as shown on plans.

B. Begin saw cutting as soon as concrete can be sawed without objectionable tearing of sawed edges; complete work within twenty four (24) hours after concrete is placed.

C. Saw cutting shall not be allowed from 10:00 p.m. to 7:00 a.m. without permission of City Engineer. Plan saw cutting operations accordingly. Maintain dust abatement control measures until saw cutting operation is completed.

D. Clean wet sawed joints by water blasting; clean dry sawed joints by air blasting. Resawing of joints may be required if joints are not cleaned adequately.

E. Do not seal joints until concrete is at least three (3) days old and only when pavement and air temperature is forty degrees Fahrenheit (40 F.) or higher.

F. Lightly sandblast joint surfaces and clean joint by air blasting as shown on Standard Drawings.

G. Place backer rope and seal as shown on Standard Drawings.

I. Seal all joints before pavement is opened to contractor's forces and general traffic.

## 10. RESTRICTIONS ON OPERATIONS

A. Weather:

1. Do not place concrete when stormy or inclement weather or temperature prevents good workmanship.

2. Use no aggregates containing frozen lumps and do not place concrete on frozen subgrade.

3. With favorable weather conditions, begin concrete mixing and placement when ambient temperature is at least thirty-four degrees Fahrenheit (34° F.) and rising or as directed by City Engineer.

4. Concrete delivered to subgrade must have temperature of at least forty degrees Fahrenheit (40° F.).

5. Stop concrete mixing and placement when ambient temperature is thirty-eight degrees Fahrenheit (38° F.) and falling or as directed by City Engineer.

6. Stop concrete mixing and placement when ambient temperature exceeds ninety-five degrees Fahrenheit (95° F.) or as directed by City Engineer.

7. Pavement damaged by inclement weather shall be removed and replaced.

B. Night operation:

1. Place no concrete when darkness prevents good workmanship in placing and finishing as determined by City Engineer.

2. Do not place or finish concrete under artificial light.

C. Use of pavement:

1. Time for opening pavement for use will be determined by results of tests on cylinders taken during concrete placement.

2. Pavement may be opened to Contractor's forces after seven (7) days for purpose of removing coverings and building shoulders or if tests of cylinders from section show compressive strength of three thousand (3,000) psi or higher.

3. Open pavement to general traffic when authorized by City Engineer.

4. Concrete placed in cold weather may require additional curing time, as directed by City Engineer; keep all vehicles off pavement until such curing time has been completed.

## 11. DEFECTS OR DEFICIENCIES

A. Pavement containing excessive cracks, fractures, spalls, or other defects shall be removed and replaced, or repaired, at no cost to City. Severity of defects and remedy, determined by City Engineer.

B. Pavement thickness: determined by random cores; one (1) four inch (4") diameter core taken for each section of approximately one thousand (1,000) square yards.

C. Restore core holes by tamping non shrink cement grout into hole and finish by texturing surface.

D. If the concrete cores taken are less than the specified thickness, remove and replace pavement at no cost to City. Deficient thickness pavement will not be accepted.

E. Area represented by each core is one-half (½) of distance to next core or to end of pavement.

F. Additional core samples may be made and measured at Contractor's expense to determine the extent and severity of pavement deficiency.

G. Finished pavements on arterial and major collector streets to have a smoothness of 30 inches per mile or less when measured by a profilograph in accordance with IDOT 2316.01.

## 12. DRIVEWAYS AND SIDEWALKS

A. Construct driveways and sidewalks as shown on Standard Drawings.

B. Construct drop curbs in existing pavements in general conformance with the Standard Drawings.

1. Mill or saw curb to create a smooth uniform surface for the approach.

2. Remove concrete curb and gutter section and replace with depressed curb in accordance with Standard Drawings.

3. Should the result of construction not be acceptable, construct remedial action as directed by the City Engineer.

C. Use concrete with air entrainment and other materials as specified for CONCRETE PAVEMENT.

D. Forms: use wood or steel forms adequately staked and braced to maintain grade and alignment while concrete is placed and finished.

1. Set base of forms at or below subgrade elevation with top of forms at surface elevation at edge of slab.

2. Coat forms with form oil before concrete is placed to prevent adherence of concrete.

3. Leave forms in place not less than twenty-four (24) hours after concrete is placed.

4. Remove forms with care to prevent cracking, spalling, or overstressing concrete.

E. Sand used for fill under sidewalks shall be less than two inches (2") in depth. Depths greater than two inches (2") provide suitable material and compact.

F. Place and secure all-expansion joint material prior to concrete placement.

G. Concrete placement: uniformly moisten subgrade just prior to concrete placement.

H. Vibrate and consolidate to prevent formation of voids.

I. Screed concrete flush with forms; finish surface with wood or cork float .

J. Saw cut and seal joints in driveways as shown on Standard Drawings.

K. Edge sidewalk and mark off surface in square blocks.

L. Cure and protect driveways and sidewalks as specified for CONCRETE PAVEMENT.

M. Restrictions on operations for driveways and sidewalks as specified for CONCRETE PAVEMENT.

# PART 8 - ASPHALTIC CEMENT CONCRETE PAVEMENT

## INDEX


1. GENERAL
2. MATERIALS
3. PROPORTIONS FOR MIX
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5. PAVING PLANT EQUIPMENT AND OPERATION
6. PAVEMENT CONSTRUCTION
7. MAINTENANCE OF BASE COURSE
8. RESTRICTIONS OF OPERATIONS
9. TESTING
10. DEFECTS OR DEFICIENCIES


## 1. GENERAL

A. This part of the Specifications includes construction of full depth asphaltic cement concrete (ACC) pavement with non-integral portland cement concrete (PCC) curb and gutter.

## 2. MATERIALS

A. Asphaltic Cement: IDOT 2303.02A for mix design specified.

B. Tack Coat: SS-1, SS-1H, CSS-1 or CSS1-H; IDOT 2303.02A.

C. Aggregates

1. Type A Binder and Surface Course: one-half inch(½") mixture size; IDOT 2303.02B and IDOT 3203.02C.

   a. Surface course must have 50% of plus 4 sieve of Type 4 stone.

2. Type B Binder Course: one-half inch (½") mixture size; IDOT 2303.02B and IDOT 2303.02C, use only upon approval of Engineer.

3. Type B Class 1 Base Course: three-fourth inch (3/4") mixture size; IDOT 2303.02B and IDOT 2303.02C.

4. Tack Coats: IDOT 2303.02E.

D. Fabric Reinforcement: IDOT 2303.02D.

E. Reclaimed Material: IDOT 2303.02F.

## 3. PROPORTIONS FOR MIX

A. Type A Binder and Surface Course: Basic asphalt content 6.00%; mix design to be performed by certified testing laboratory; IDOT 2303.02C.

B. Type B Binder Course: Basic asphalt content 6.00%; mix design to be performed by certified testing laboratory; IDOT 2303.02C.

C. Type B Base Course: Basic asphalt content 6.00%; mix design to be performed by certified testing laboratory; IDOT 2303.02C.

D. PAC-30 Admixture required on all surface courses on arterial streets.

## 4. STORAGE AND PROTECTION OF MATERIALS

A. Aggregate storage: Prevent contamination and intermingling; IDOT 2303.04A.

## 5. PAVING PLANT EQUIPMENT AND OPERATION

A. Paving Plant Equipment: IDOT 2001.

B. Paving Plant Operations: IDOT 2303.04.

## 6. PAVEMENT CONSTRUCTION

A. Trucks: IDOT 2001.03.

B. Placement equipment: IDOT 2303.05 and IDOT 2001.

C. Tack Coat: Place bitumen at 0.02 to 0.05 gallon/SY on horizontal surfaces, 0.10 to 0.15 gallon/SY on vertical surfaces; provide sand cover if required; IDOT 2303.17.

D. Handling and Delivering: ACC not to be placed when asphalt temperature is less than 245°F for lifts 1 ½" or less or 225°F for lifts in excess of 1 ½"; material delivery should be at a continuous uniform rate, do not incorporate cold segregated material; IDOT 2303.09.

E. Leveling Courses: Leveling courses to be used to fill depressions greater than one inch (1"); IDOT 2303.06.

F. Wedge Courses: Conform with general requirements of IDOT 2303.07.

G. Fixtures: Adjust all fixtures to final grade prior to placing surface course; IDOT 2303.14.

H. Fabric Reinforcement: Place as shown on plans; IDOT 2303.11.

I. Joints: Offset longitudinal joints between succeeding layers a minimum of three inches (3"), offset transverse joints between succeeding layers a minimum of six feet (6'); provide sawed vertical face at all transverse joints and when meeting existing pavements; IDOT 2303.13.

1. The use of wood or metal headers to form the edge of the joint during the rolling of the fresh mixture will not be permitted. The edges of all fixtures in the streets, edges or curbs, bridges or cold asphaltic concrete shall be tacked to facilitate a tight joint with the fresh mixture.

J. Base and Surface Courses: Conform with general requirements of IDOT 2303.08

1. Thickness of courses to be placed as shown on plans. After the base has been prepared and tack coated, the succeeding courses may be placed.

2. The surface of each layer shall be clean and free from foreign matter when each succeeding layer is placed. Any surface which becomes dirty shall be cleaned and if necessary the surface shall be primed to provide bond between succeeding courses.

3. When laying surfaces which require three or more adjacent passes of the finishing machine, the outer lanes shall be laid first and closure of the surface made by the interior strips near the center line.

4. Except for unavoidable delay or breakdown, the delivery of hot asphaltic concrete to any individual spreading unit shall be continuous and uniform at a rate sufficient to provide continuous operation of the spreading unit.

5. All handling and manipulation of the hot mixture from the mixer to the final placement on the road shall be so controlled that uniform composition is maintained and segregation of coarser particles is prevented.

6. Machine Spreading: On areas of uniform width the surface course shall be spread with a finishing machine. The spreading of surface courses shall be at such rate that when compacted the layer will be of the thickness and dimensions specified on the plans. Hand raking or disturbance of the layer spread by the machine shall be avoided.

K. Compaction: Conform with general requirements of IDOT 2303.12.

1. Thoroughly compact asphaltic concrete while hot by rolling to specified density or tamping. All areas of binder or surface course inaccessible to the roller shall be thoroughly hand tamped while hot enough to compact properly.

   a. Marshall density obtained from approved testing lab for that day's run.

   b. Base Course: 94% laboratory density; less than 8% voids; IDOT Class C1 compaction.

   c. Surface Course: Minimum of 95% laboratory density, less than 8% voids; IDOT Class B1 compaction.

2. Initial rolling to be performed at such temperature that the mixture will compact without deleterious movement or distortion under the roller. Target temperatures are between 250° and 275°F. When a three-wheel roller is used, it shall be used for the initial rolling. When a three-axle tandem roller is used, it shall be used for the final rolling of the surface. The number of rollers shall be sufficient to compact the hot mixture as rapidly as it is laid. The initial contact with the hot mixture will be made by power or driving rolled. The rolling shall continue until the pavement has a density has been obtained.

L. Hand Work: When practical all wearing surface mixtures shall be spread by finishing machine. Irregular areas may be spread by hand methods. Do not dump truck loads of hot mixture directly upon the surface on which they will be spread. Loads may be dumped on metal pans or the material may be spread by hot shovels directly from the truck to the road surface. Spread hot mixture uniformly to the desired depth with shovels and rakes. Tines of the rake to be at least one-half inch (½") longer than the loose depth of the mixture. The hot mixture shall be carefully smoothed with a lute after spreading. The handles of the lutes shall be long enough to reach from the edge to the middle of the strip under construction. Loads shall not be dumped faster than they can be spread properly. Laborers shall not stand on the loose mixture while spreading; IDOT 2303.10.

M. Pavement Smoothness:

1. The surface courses shall be checked after the second rolling with a ten (10) foot straightedge placed parallel to the center line. Any variation greater than one-fourth inch (1/4") in the surface course shall be corrected. Prior to removal of bumps the surface shall first be warmed with a surface heater to soften the mixture until the surface can be loosened, and smoothed with rakes and straightedge. Do not burn asphalt, while still hot the mixture shall be rolled to obtain proper density; IDOT 2303.15.

2. Finished pavements on arterial and major collector streets to have a smoothness of 30 inches per mile or less when measured by a profilograph in accordance with IDOT 2316.01.B.

N. Fillets: Conform with general requirements of IDOT 2303.19.

## 7. MAINTENANCE OF BASE COURSE

A. Contractor responsible for maintenance of base course; IDOT 2303.22 and IDOT 2303.23.

B. Clean bituminous material from cracks one-half inch (½") or more in width; blow clean with compressed air and fill with a hot-poured joint filler from a pressure type nozzle; all cracks one-eighth inch (1/8"), or more, in width; remove all direct and debris which would interfere with placement of binder or surface course.

## 8. RESTRICTIONS ON OPERATIONS

A. Limitations: mixtures not to be placed on damp or frozen surfaces; IDOT 2303.18.

B. Temperature Restrictions:

1. Surface Courses: ambient temperature not less than 40°F and rising.

2. Base Courses: ambient temperature not less than 40°F and rising.

## 9. TESTING

A. Samples: All testing by approved testing laboratory; IDOT 2303.21.

1. Contractor shall cut samples from any course or from finished pavement not to exceed two (2) in number per 600 feet of lane for tests of density and composition. These samples shall be taken at points designated by the Engineer by drilling with a four inch (4") diameter core drill. The surfaces from which samples have been taken shall be restored by the Contractor on the next succeeding day of plant operation.

B. Area represented by each core is one-half (½) of distance to next core or to end of pavement.

C. Additional core samples may be made and measured at Contractor's expense to determine the extent and severity of pavement deficiency.

## PART 8 - ASPHALTIC CEMENT CONCRETE PAVEMENT

### 10. DEFECTS OR DEFICIENCIES

A. Pavement containing excessive cracks, cold joints, deformities, or other defects shall be removed and replaced, or repaired, at no cost to City. Severity of defects and remedy determined by City Engineer.

1. When removals are required, remove all materials to the depth specified by the City Engineer. Sawcut vertical edges to depths specified.

2. Partial depth patches: In areas where bituminous material is removed for a depth greater than one inch but less than the total thickness of the pavement, the depressions shall be given a tack coat and filled with hot asphaltic concrete mixture to be deposited in layers not exceeding three inches (3") compacted thickness. Thoroughly compact while hot by rolling with an adequately weighted pneumatic tire or by tamping with a mechanical tamper until it has attained a density satisfactory to the Engineer. Succeeding layers may be placed as soon as the preceding layer has been properly compacted. The final compacted surface shall be level with, or not in excess of approximately one-fourth inch (1/4") above, the surrounding surface.

   a. Depressions less than one-half inch (½"): The surface shall also be first heated with surface heaters, then loosened and covered with hot, fresh, mixture from which the coarse particles have been removed and raked to the proper elevation and rolled to proper density.

   b. Depressions of one-half inch (½") or greater: The surface course over the entire area below the required elevation for the pavement surface shall be removed and replaced with fresh mixture, smoothed and compacted in layers to the density required to provide a surface at the correct elevation.

3. Full depth patches:

   a. Fill material which is used to adjust the subgrade elevation to be approved by the Engineer and compacted by rolling or by tamping with a mechanical tamper. The surface of the subgrade and edges of the old pavement shall be lightly tacked.

   b. The asphaltic concrete patch mixture to be deposited in layers not to exceed six inches (6") in compacted thickness. Each layer shall be thoroughly compacted while hot, by rolling or by tamping with mechanical tampers until it has attained a density satisfactory to the Engineer. Succeeding layers may be placed as soon as the preceding layer has been properly compacted. The final compacted surface shall be level with, or not more than approximately one-fourth inch (1/4") above, the surrounding concrete.

4. Opening to traffic: Patches shall not be opened to traffic until the mixture has cooled sufficiently to provide stability. If the bituminous coating has not set sufficiently when the surface is opened to traffic, the Engineer may require the surface to be lightly sanded in order to prevent traffic from picking up the coating.

B. If the concrete cores taken are less than the specified thickness, remove and replace pavement or mill surface a normal one and one-half inch (1 ½") in depth and replace surface course. Deficient thickness pavement will not be accepted.

# PART 9 - SURFACE RESTORATION

## INDEX


1. GENERAL
2. GRADING
3. PREPARATION OF SEED BED
4. FERTILIZER
5. SEEDING
6. MULCHING
7. SODDING
8. PAVEMENT REPLACEMENT


## 1. GENERAL

A. The work under these Specifications include incidental grading, preparation of seedbed, fertilization, planting of seed, mulching, sodding, and watering of sod.

B. Seeding Dates: Spring seeding dates shall be between March 1st and May 30th. Fall seeding dates shall be between August 10th and September 30th. Legumes shall only be seeded during Spring planting season before April 15th.

C. The Contractor and Subdivider are responsible for complying with all Local, State, and Federal regulations regarding erosion control and clean water regulations.

D. Restore parking areas in existing right-of-way to similar or better condition than existed prior to construction.

1. Sod all areas disturbed in manicured yards.

2. Seed all other areas.

## 2. GRADING

A. Erosion & Drainage: The Contractor shall be responsible for incidental grading on site to eliminate erosion gullies and ruts, and shall provide proper cross section for drainage as directed by City Engineer.

B. Fill Material: If extra earthwork fill is needed, the Contractor shall provide fill to conform to lines and grades as shown on plans.

## 3. PREPARATION OF SEED-BED

A. Areas Accessible to Machinery: Areas accessible to field machinery shall be thoroughly worked to a depth of not less than three inches (3"). The soil shall be brought to a loose, friable condition, and shall be picked free of rocks and concrete chunks in excess of one inch

(1") diameter where weed growth has developed extensively, the use of a disk will be allowed to disk these weeds into the ground if the weeds can be completely covered by this method.

B. Areas Inaccessible to Machinery: Areas inaccessible to field machinery shall be prepared by hand to a depth of not less than one and one-half inches (1-1/2"). The soil shall be brought to a loose friable condition.

C. The seedbed shall be inspected and approved by the City Engineer prior to seeding.

## 4. FERTILIZER

A. Quality of Fertilizer: Fertilizer shall be granular type and shall be delivered to site in the original bag in good condition for proper distribution.

B. Rate of Fertilizer: Fertilizer shall be spread uniformly at a rate of 650 pounds per acre of 15-15-15 commercial fertilizer or equivalent per acre. All areas seeded shall be fertilized.

C. Fertilize all areas to be seeded or sodded.

## 5. SEEDING

A. Lawn Seed Mixture: Unless otherwise specified the recommended lawn seed mixture shall be the following:

| | |
|---|---|
| Creeping Red Fescue | 22 lbs. per acre |
| Kentucky Blue Grass | 44 lbs. per acre |
| Perennial Rye Grass | 7 lbs. per acre |

B. Temporary Seed Mixture: Apply as soon as practical following grading operation. The following seed mixture shall be used:

| | |
|---|---|
| Oats | 20 lbs. per acre |
| Rye Grass - Annual | 15 lbs. per acre |
| Rye Grass - Perennial | 15 lbs. per acre |
| Fescue - Kentucky - 31 | 10 lbs. per acre |

C. Special Seed-Steep Slopes:

1. Crownvetch: Where specified on steep slopes the following seed mixture shall be used:

| | |
|---|---|
| Crownvetch | 10 lbs. per acre |
| Creeping Red Fescue | 5 lbs. per acre |

| | |
|---|---|
| Alfalfa (Northern Grown) | 5 lbs. per acre |
| Birdsfoot Trefoil (Empire) | 5 lbs. per acre |
| Annual Rye Grass | 5 lbs. per acre |

2. Inoculation: All Crownvetch seed shall be inoculated with the type specified for crownvetch. Inoculated seed shall not be exposed to direct sunlight for a period of time exceeding one half (½) hour. Seed which is not sown within eight (8) hours after inoculation shall be reinoculated prior to use. Crownvetch and Birdsfoot Trefoil shall be inoculated at five (5) times the rate specified by the manufacturer of the inoculate. All other legumes shall be inoculated at two (2) times the rate specified by the manufacturer of the inoculate.

3. Special Handling: All Crownvetch seed shall be treated with a non-mercurial fungicide seventy-five percent (75%) concentration or equivalent at the rate of one (1) per one hundred (100) pounds of seed. All crownvetch seed shall be treated with an approved sticking agent to be applied prior to application of the inoculate and fungicide.

4. Time of Application: Crownvetch seed shall be applied only in the Spring. The crownvetch seeding shall be considered the final operation of seeding, fertilizing and mulching. Crownvetch shall be applied within twenty-four (24) hours after completion and mulching operation.

D. Method of Seeding: on areas accessible to field machinery, all grasses and legume seed shall be sown with a broadcast seeder or hydraulic seeder on areas inaccessible to field machinery, use or hand-cyclone seeders will be permitted.

E. Covering and Compaction of Grasses and Legumes: sowing of grasses and legumes shall be followed by not less than one (1) complete rolling with a cultipacker or approved equipment. Where the compaction equipment will not operate satisfactorily, the seeded area shall be lightly dragged or raked in by hand.

F. Guarantee: if less than fifty percent (50%) of seed fails to become established and survive to the next season in any given area three (3) square feet or larger, the Contractor shall be responsible for preparing the seed bed as specified in Section 3 and overseeding at the rate specified in Section 5A.

## 6. MULCHING

A. Mulch all seeded areas as soon as seed is applied.

B. Material & Rate: Mulch material shall be oat straw or equivalent, applied at a rate of two (2) tons per acre.

C. Application of Mulch: With exception to Crownvetch, the mulching shall be the final operation of seeding. The mulch shall be evenly and uniformly distributed and anchored into the soil. Anchor mulch into soil by means of dull blades or disc.

## 7. SODDING

A. Material: Sod material shall be a good commercial grade of sod, predominantly containing Kentucky Blue Grass and Fescue. The sod shall be free of noxious and other weeds.

B. Preparation of Sodbed: The sodbed shall be prepared in accordance with SECTION 2 of this Specification. In addition, the grade at sidewalks and driveways shall be lowered such that the final grade of the sod does not protrude above the concrete surfaces. The sod shall be blended to natural ground lines to promote drainage.

C. Watering Sod: The sod shall be watered within one (1) hour after placement and shall receive enough water to thoroughly soak sod plus sodbed. Sod shall thereinafter be watered every other day for at least a two (2) week period.

D. Guarantee: If fifty percent (50%) of sod fails to survive until next seeding season, the Contractor shall be responsible for resodding or overseeding with the specified lawn seed mixture.

## 8. PAVEMENT REPLACEMENT

A. This section describes work to replace existing pavement removed or damaged during construction; comply with applicable requirements of Concrete Pavement; equal or exceed the before construction condition and City Standards.

B. Saw cut edges of removal with saw, concrete cutter, or other equipment which will produce vertical edge; cut pavement full depth.

C. Break up and remove existing concrete or asphalt pavement through use of pneumatic hammer or other suitable equipment; do not damage remaining pavement; remove pavement to existing joint when required to maintain joint spacing greater than two feet (2') and when required by City Engineer.

D. Provide temporary granular surfacing on streets and driveways immediately following completion of backfill.

1. Should weather condition or traffic preclude the option of immediately installing the permanent repairs, temporary measures may be taken upon approval of the City Engineer.

E. Install and maintain dust abatement control measures until surface replacement is complete.

F. Temporary granular surfacing is incidental to construction.

G. Granular Surfacing: replace or supplement existing granular surfacing as shown on plans and as directed by City Engineer; place, compact, and grade granular surfacing to drain; minimum thickness of gravel surfacing restoration: six inches (6"); supplement displaced surfacing to bring surface to grade; maintain dust abatement control measures until construction is completed and accepted.

H. Concrete Pavement: remove existing concrete pavement full depth and replace with concrete pavement thickness one inch (1") greater than existing.

I. When new concrete pavement is constructed adjacent to existing concrete pavement install "BD" joint.

J. Concrete Curb and Gutter: remove existing concrete curb and gutter and replace with new concrete curb and gutter to thickness shown on Standard Drawings; construct new curb to uniform cross section matching existing curb; depress curb at pedestrian curb ramp as shown.

K. Concrete Driveway removal and replacement: remove existing driveways and replace with new concrete driveways as shown on Standard Drawings and as directed by City Engineer; score or sawcut driveway to match existing driveway; protect from traffic for seven (7) days after the concrete is placed.

L. Concrete Sidewalk removal and replacement: remove existing sidewalk and replace with new concrete sidewalk as shown on Standard Drawings and as directed by City Engineer; score sidewalk to match existing sidewalk in sections not less than nine (9) nor more than thirty six square feet (36 sq. ft.) in area; construct expansion joints where sidewalk meets other sidewalk, curb, or fixtures in the surface; construct expansion joint by installing a one-half inch (½"), full depth of approved premolded joint material.

M. Asphalt Pavement: remove existing asphaltic concrete pavement full depth and replace with new asphaltic concrete material and compact as shown on plans and as directed by City Engineer; use asphaltic concrete only to match existing material and only where allowed by City Engineer.

1. Asphalt pavement (ACC): use commercially available asphaltic concrete plant mixture; one-half (½) mixture size equivalent to Iowa DOT Type A Surface Mixture; submit current laboratory test data; mix design subject to approval of City Engineer.

2. Clean and apply tack coat to edges of existing pavement and adjacent one foot (1') of subgrade; tack coat bitumen: SS-1, SS-1H, CSS-1, CSS-1H; IDOT 2303.02A.

3. Place asphaltic concrete mixture in layers with the upper five inches (5") in at least two (2) layers; minimum temperature of mixture during placement: two hundred and forty-five degrees Fahrenheit (245° F.)

4. Compact each layer thoroughly with vibratory compactor; final patch shall have smooth riding surface and be level with or not more than one-eighth inch (1/8") above adjacent pavement.

5. Allow mixture to cool sufficiently to provide stability prior to opening to traffic; schedule work for removal of barricades at end of each working day.

# PART 10 - GABIONS

## INDEX


1. GENERAL
2. MATERIALS
3. BEDDING AND BACKFILL
4. ASSEMBLY AND INSTALLATION


## 1. GENERAL

A. This part of the Specifications includes materials, bedding, backfill, assembly, and installation for construction of gabion channel lining and gabion retaining walls.

## 2. MATERIALS

A. Baskets: Rectangular baskets; hexagonal triple twist steel wiremesh; galvanized steel wire; zinc coating; FS QQ-W-461g being eleven and one-fourth (11-1/4) gauge mesh and nine (9) gauge selvage rod. Approved brands are Bekaert, Maccaretti, or approved equal.

B. Lacing Wire: thirteen (13) gauge galvanized steel wire; minimum galvanized coating 0.80 ounces per square foot.

C. Diaphragms: Vertical diaphragm conforming to requirements of basket wire; place on three foot (3') centers, attach to base of baskets.

D. Connecting Wire: As per manufacturer's specification and recommendations; use on three foot (3') deep baskets.

E. Fill Stone:

1. Class A quality stone conforming to IDOT; sieved, well-graded broken limestone, dolomite or quartzite; size four inches (4") to eight inches (8"); maximum per cent passing No. 4 sieve: ten percent (10%) maximum-percent wear in accordance with AASHTO T-96: forty-five (45%).

2. Maximum percent loss by weight after twenty-five (25) cycles of freezing and thawing: ten percent (10%).

3. Materials shall meet durability requirements of IDOT for use as aggregate in concrete.

F. Filter Fabric: Non-woven material; IDOT approved for subsurface drainage.

G. Porous Backfill: Well-graded limestone, gravel not exceeding two inches (2") in diameter.

## 3. BEDDING AND BACKFILL

A. Bedding:

1. Provide firm unyielding foundation for placement of gabion.

2. If unsuitable foundation exists, remove and replace with suitable materials and compact to not less than ninety-five per cent (95%) maximum density.

B. Backfill:

1. Place and compact porous backfill and earth backfill as shown on plans to not less than ninety-five per cent (95%) maximum density.

C. Filter Fabric:

1. Overlap filter fabric joints six inches (6") minimum; use where shown on plans.

## 4. ASSEMBLY AND INSTALLATION

A. Assemble, install, and erect gabions in accordance with manufacturer's instructions and recommendations.

B. Assembly:

1. Unfold gabion, flatten all kinks and bends.

2. Erect sides, ends and diaphragms, creases in proper position and all tops of sides level.

3. Lace four corners of gabion, followed by edges of internal diaphragms.

4. Lace gabion with alternating single and double loops no more than six inches (6") apart.

5. Modify above procedures in accordance with instructions provided by manufacturer and approved by City Engineer.

C. Installation:

1. Place assembled gabion units in their proper location.

2. Lace empty gabions together.

3. Fill baskets by methods recommended by manufacturer. Maintain rectangular pattern as basket is filled.

4. Place outer layer of fill stone by hand to provide a square appearance. For retaining walls place larger stone to simulate natural occurring ledge rock.

5. Gabion structures requiring more than one tier shall be laced to the lower one and lapped so end joints do not coincide.

6. Close and lace gabion basket lids by methods recommended by manufacturer. Maintain level top to provide even surface for next course.

7. Place porous backfill and earth backfill as shown on plans.

8. Modify above procedures in accordance with instructions provided by manufacturer and approved by City Engineer.