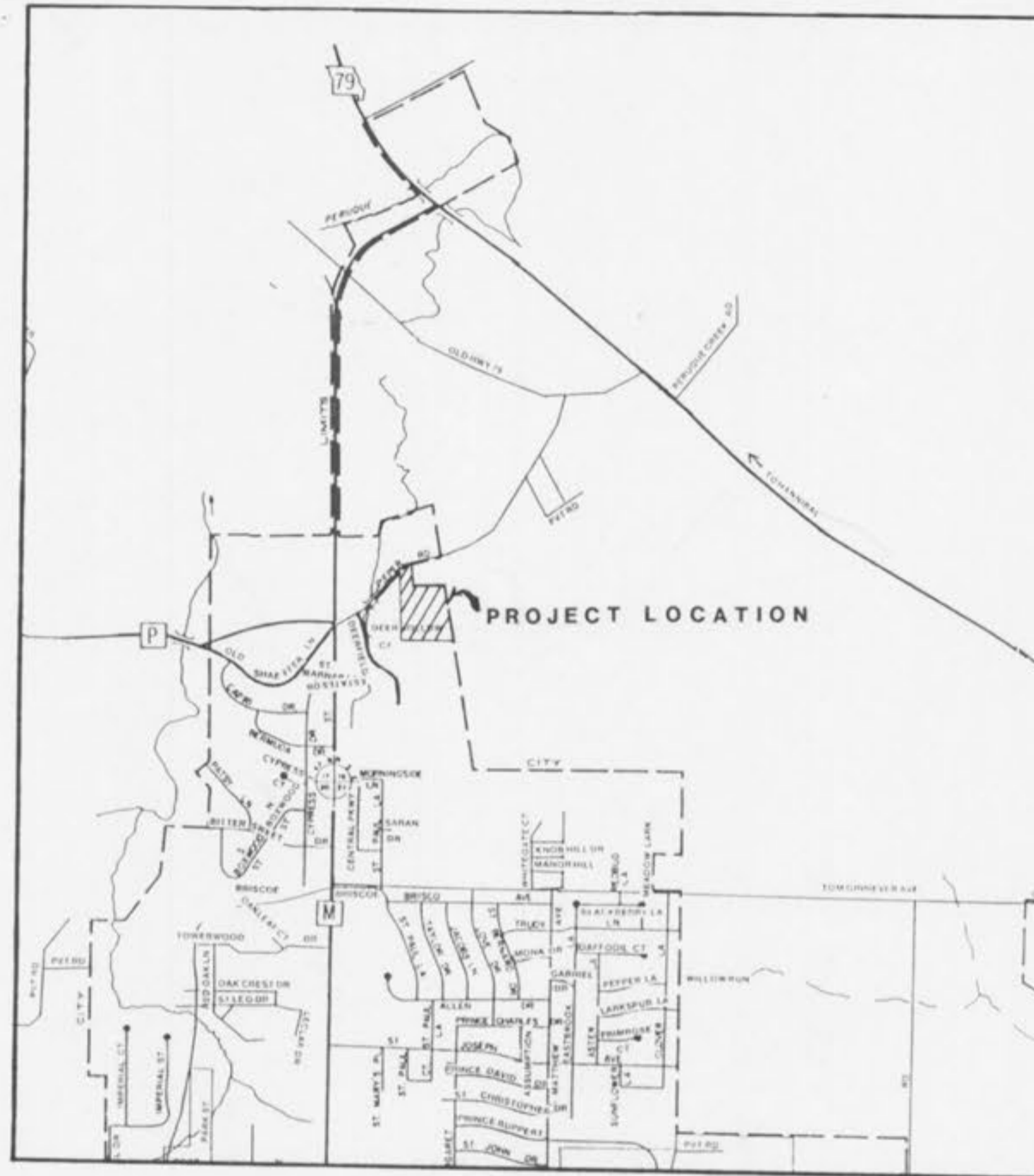


STRAWBERRY HILL ESTATES

PART OF THE SOUTH 1/2 SECTION 16
TOWNSHIP 47 NORTH, RANGE 3 EAST
CITY OF O'FALLON, MISSOURI

GENERAL NOTES

- Gas, water and other underground utilities shall not conflict with the depth or horizontal location of existing and proposed sanitary and storm sewers including house laterals.
- Underground utilities have been plotted from available information and therefore their locations must be considered approximate only. The verification of the location of all underground utilities, either shown or not shown on these plans shall be the responsibility of the contractor and shall be located prior to grading or construction of improvements.
- Polyvinyl Chloride (PVC) shall conform to the requirements of ASTM D-3034 Standard Specifications for the PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, SDR35.
- Storm sewers 18" diameter or smaller shall be A.S.T.M. C-14.
- Storm sewers 21" diameter or larger shall be A.S.T.M. C-76, Class II.
- All storm sewer pipe under pavement, regardless of size, shall be reinforced concrete pipe (A.S.T.M. C-76 II) unless noted otherwise on the plans.
- Corrugated metal pipe shall conform to the standard specifications for corrugated culvert pipe M36, A.A.S.H.O. See Plans for gauge.
- All filled places under buildings, proposed storm and sanitary sewer lines and/or paved areas including trench backfills shall be compacted to 90% of maximum density as determined by Modified A.A.S.H.O. T-180 Compaction Test (A.S.T.M. D-1557) unless otherwise specified by local governing authority specifications. All tests shall be verified by a Soils Engineer.
- All filled places in paved State, County or City roads (Highways) shall be compacted to 90% of maximum density as determined by the "Standard Proctor Test A.A.S.H.O. T-99" (A.S.T.M. D-698) unless otherwise specified by local governing authority specifications. All tests shall be verified by a Soils Engineer.
- All Storm and sanitary trench backfills will be water jetted. Granular backfill will be used under pavement areas.
- Easements shall be provided for storm sewers, sanitary sewers and all utilities on the record plat. See record plat for location and size of easements. This does not apply to house laterals.
- No area shall be cleared without permission of the developer.
- All grade shall be within 0.2 feet more or less of those shown on the grading plan.
- No slope shall be greater than 3:1 and shall be either sodded or seeded and mulched.
- Barricades will consist of three standard 12" x 36" red and white striped scotchlite hazard markers mounted on two pound "U" channel sign post, with bottom of marker seven feet above pavement surface.
- All manhole and catch basin tops built without elevations furnished by the Engineer will be the responsibility of the sewer contractor. At the time of construction stake-out of the sewer lines, all curb and grate inlets will be face staked. If normal face stakes fall in line with sewer construction the Engineer will set these stakes at a double off set. It shall be the responsibility of the sewer contractor to preserve all face stakes from destruction.
- All standard street curb inlets to have front of inlet 2 feet behind curb.
- The minimum vertical distance from the low point of the basement to the flowline of a sanitary sewer at the corresponding house connection shall not be less than the diameter of the sanitary sewer plus a vertical distance not less than two and one half feet (2-1/2').
- Water lines, valves, sleeves, meters and etc. shall meet all specifications and installation requirements of the City of O'Fallon.
- All cast iron pipe for water mains shall conform to A.W.W.A. specification C-106 and/or C-108. The cast iron fittings shall conform to A.W.W.A. specification C-110. All rubber gasket joints for water cast iron pressure pipe and fittings shall conform to A.W.W.A. specification C-111.
- All water hydrants and valves shall be cast iron and installed in accordance with plans and details.
- All sanitary and storm sewers shall meet all specifications and installation requirements of the local governing authority.
- All P.V.C. water pipe shall have a minimum pressure rating of PR-200 or SDR-21.
- All P.V.C. sanitary sewer pipe to be DR-35 or equal with crushed stone bedding uniformly graded between 1" and 1/4" size. This bedding shall extend from 6" below the pipe to 2" above the pipe dia. above the bottom of the pipe.
- A sediment control plan should be implemented as soon as possible. No graded area is to remain bare without being seeded and mulched. Also, care should be exercised to prevent this soil from damaging adjacent property and silting up existing downstream storm drainage systems.
- Interim drainage will be required to drain storm water from proposed low point in Strawberry Hill Estates Drive to the proposed detention basin area.
- A temporary P.V.C. overflow pipe, or equal, will be provided as shown on the attached detail to prevent the basin from overflowing during the grading operation. The pipe will be sized to adequately handle the total developed runoff tributary to the basin. The pipe will be discharged at a natural discharge point and will be required to be shown on the plan.



Location Map
N.T.S.

Legend

- C.I. Curb Inlet
- D.C.I. Double Curb Inlet
- M.H. Manhole
- F.E. Flared End Section
- E.P. End Pipe
- C.C. Concrete Collar
- C.P. Concrete Pipe
- R.C.P. Reinforced Concrete Pipe
- C.M.P. Corrugate Metal Pipe
- P.V.C. Poly Vinyl Chloride (Plastic Pipe)
- Fire Hydrant
- Gate Valve
- Storm Sewer
- Sanitary Sewer
- Water Main
- Existing Contour
- Proposed Contour
- Street Sign
- Lot Number

INDEX TO SHEETS

| | |
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T.B.M.: MOST S.W. COR. CONC.
FTG. OF POWER TRANS. TOWER
ELEV. 491.50
SURVEY INFORMATION SUPPLIED BY
LANDMARK SURVEYING INC.
802 EAST ELM WENTZVILLE/MISSOURI

PROPERTY OWNER: HOWARD A. PIEPER
DEVELOPED BY: HOWARD A. PIEPER
RAY BLANKENSHIP
DAVID TURNBEAUGH

GBA
GEORGE BUTLER ASSOCIATES, INC.
Engineers / Architects / Landscape Architects / Planners
Suite 200 / 225 S. Main St. / O'Fallon, Missouri 63366



APPROVED
August 25, 1987

John A. Huskey

Contractor must notify the Building Department at least 48 hours in advance before construction starts

STRAWBERRY HILL EST.
TOWNSHIP 47 NORTH, RANGE 3 EAST
ST. CHARLES COUNTY, MO.



LANDMARK SURVEYING, INC.
 802 E. MAIN
 Westville, Mo. 63385

This is to certify that at the request of David Turnbaugh, Ray Blankenship, Howard Pieper and Carol Pieper, that we have, during July, 1987, surveyed and subdivided a tract of land being part of Fractional Section 16, Township 47 North, Range 3 East, St. Charles County, Missouri, and that the results are currently represented upon this plat.

Carl W. Wainman
 Carl W. Wainman L.S. 1851
 Landmark Surveying, Inc.

The undersigned, being the owners of the land described in the foregoing surveyor's certificate, have caused the same to be surveyed and subdivided in the manner shown on this plat, which subdivision shall hereafter be known as STRAWBERRY HILL ESTATES. The streets shown hereon and known as "STRAWBERRY HILL ESTATES DRIVE" and "BLUEBERRY COURT" are hereby dedicated as public streets, and hereby covenants and agrees that the city acceptance of said streets and other site improvements, shall not be petitioned to, or accepted by, the City of O'Fallon, Missouri, until said streets and said site improvements are constructed in such a manner as to comply with the O'Fallon ordinances and the Required Improvements Section of the Rules for Land Subdivision as adopted by the City of O'Fallon, Missouri, and amendments thereto.

Said streets and all easements shown on this plat are hereby dedicated to the various utility companies as their interest may appear, and their successors and assigns, for the installation, use, maintenance, repair and replacement of storm and sanitary sewers, water lines, gas lines, electric, telephone and cable television lines, above, over and under said easements.

All lots in this subdivision shall be subject to the conditions and restrictions as set forth in an instrument dated the _____ day of _____, 1987, and filed for the record in Book _____ Page _____ in the office of the Records of Deeds, St. Charles County, Missouri.

All lots shown above are hereinafter reserved for single family dwelling purposes.

All building lines as shown on this plat are hereby established.

IN TESTIMONY WHEREOF, we, the undersigned, have hereunto set our hands and seal on the _____ day of _____, 1987.

David Turnbaugh, Ray Blankenship
 Howard Pieper, Carol Pieper

STATE OF MISSOURI)
 COUNTY OF ST. CHARLES)

On this _____ day of _____, 1987, before me personally appeared David Turnbaugh, Ray Blankenship, Howard Pieper and Carol Pieper, to me known to be the persons described in and who executed the foregoing instrument and acknowledged that they executed the same as their free act and deed.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal in the County and State aforesaid, the day and year first above written.

MY COMMISSION EXPIRES: _____
 NOTARY PUBLIC

The undersigned holder of legal owner of some surveyor's plat registered in Book _____ Page _____ of the St. Charles County Records is _____ who approves the correct detail of this subdivision of STRAWBERRY HILL ESTATES.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the _____ day of _____, 1987.

STATE OF MISSOURI)
 COUNTY OF ST. CHARLES)

On this _____ day of _____, 1987, before me personally appeared _____ who was known to me and who being duly sworn, advised me that he is _____ of the County of St. Charles, Missouri, a chartered town of the State of Missouri, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors and said undersigned said instrument to be the true act and deed of said corporation.

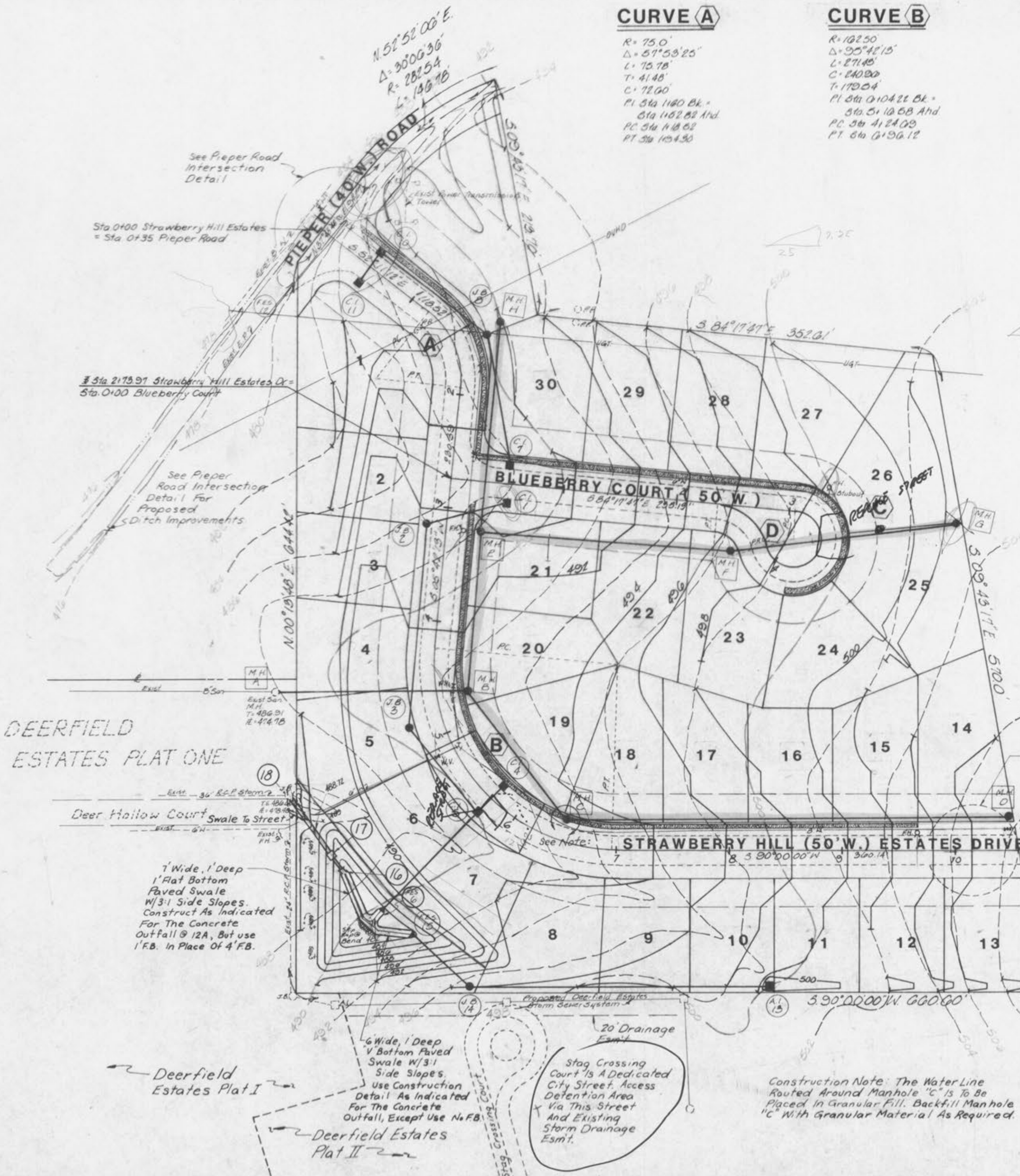
IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal in the County and State aforesaid the day and year first above written.

My Commission Expires: _____
 Notary Public

LANDMARK SURVEYING, INC.
 802 E. MAIN Westville, Missouri 63385
RECORD PLAT
 DRAWN *J.J.W.* CHECKED *D.W.M.*
 DATE _____ DATE _____ **2 of 12**

STRAWBERRY HILL ESTATES WE NEED TO BE IN BACK CHECK AS BUILDS
 NEED TO BE IN BACK CHECK AS BUILDS
 ALL C BUILDS
 ALL D BUILDS

MHC in front of lot 34 to be in back check as bualds
 For HYDRA RT GRAD IF IN 20 BUILDS UNDER SIDEWALK ALSO BASE BY 9997
 CI NEEDS SLOTTED BARS POINT TO FRONT
 EEL AT EMPLOYEE OFFICE CLEAR OUT
 FOR HYDRA GRAD FOR IS VALVE BUILDS

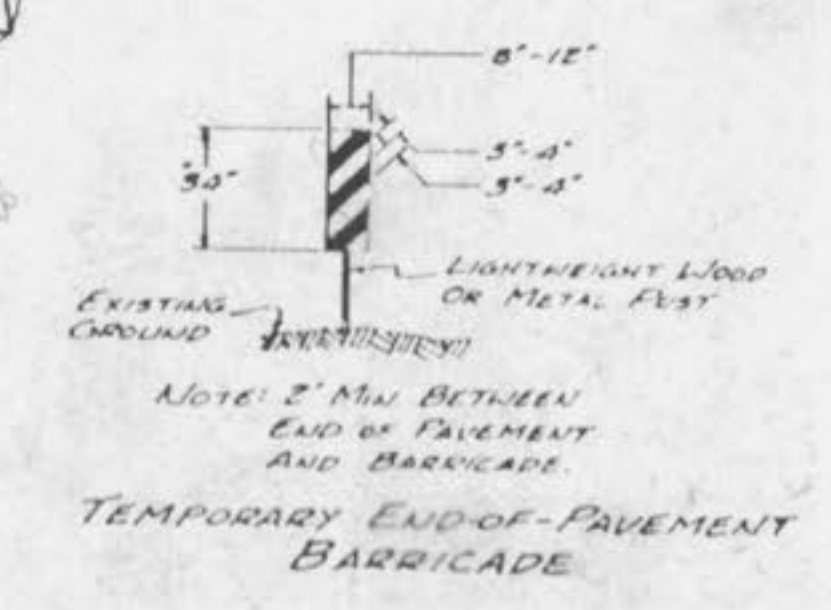


Storm Sewer - Manhole Street Stationing

| Structure Number | Type | Station | Street | Distance | Top Elevation | Flow Line Out | Notes |
|------------------|----------|----------|-------------------------------|------------|---------------|---------------|----------------------------------|
| A | Existing | 4+54.02 | Strawberry Hill Estates Drive | 129.76' RT | 486.91 | 476.78 | Existing MH in Deerfield Estates |
| B | STD. MSD | 4+64.02 | Strawberry Hill Estates Drive | 30' LT | 492.89 | 476.92 | Outside Drop |
| C | STD. MSD | 4+25.40 | Strawberry Hill Estates Drive | 22' LT | 491.89 | 481.88 | |
| D | STD. MSD | 10+40.12 | Strawberry Hill Estates Drive | 30' LT | 507.74 | 493.00 | Terminal MH Sewer Line "A" |
| E | STD. MSD | 3+18.97 | Strawberry Hill Estates Drive | 30' LT | 490.87 | 477.05 | |
| F | STD. MSD | 2+49.83 | Blueberry Court | 45' RT | 496.79 | 478.57 | |
| G | STD. MSD | 3+40.08 | Blueberry Court | 36.44' RT | 502.66 | 480.80 | Terminal MH Sewer Line "B" |
| H | STD. MSD | 1+55.31 | Strawberry Hill Estates Drive | 45.98' LT | 490.20 | 479.10 | Terminal MH Sewer Line "C" |

STORM SEWER SCHEDULE

| Structure Number | Station | Street | Distance | Type | Top Elevation | Flow Line Elevation Out | |
|------------------|---|-----------------------------|------------|--|---------------|--|--|
| 1 | 0+51.36 | Blueberry Court | 17.0' RT | STD MSD Double CI W/low Point Sumps | 488.37 | 484.66 | |
| 2 | 3+17.34 | Strawberry Hill Estates Dr. | 17.00' RT | STD MSD Junction Box/Manhole | 490.09 | 484.17 | |
| 3 | 6+17.43 | Strawberry Hill Estates Dr. | 23.76' RT | STD MSD Junction Box/Manhole | 492.05 | 483.25 | |
| 4 | 5+72.01 | Strawberry Hill Estates Dr. | 17.00' LT | STD MSD Double CI W/low Point Sumps | 491.27 | 486.96 | |
| 5 | 5+72.01 | Strawberry Hill Estates Dr. | 17.00' RT | STD MSD Double CI W/low Point Sumps | 491.27 | 482.48 | |
| 6 | 5+72.01 | Strawberry Hill Estates Dr. | 136.0' RT | F.E.S. W/Concrete Top Well | 488.12 | 482.12 | |
| 7 | 0+51.36 | Blueberry Court | 17.00' LT | STD MSD Double CI W/low Point Sumps | 488.37 | 481.81 | |
| 8 | 2+38.08 | Strawberry Hill Estates Dr. | 31.74' LT | STD MSD Junction Box/Manhole | 488.50 | 482.63 | |
| 9 | See Intersection Detail for Location and Construction Notes | | | | | | |
| 10 | 0+56 | Strawberry Hill Estates Dr. | 17.00' LT | STD MSD Double CI W/low Point Sump | 483.17 | 478.42 | |
| 11 | 0+53.75 | Strawberry Hill Estates Dr. | 17.00' RT | STD MSD Single | 483.17 | 478.08 | |
| 12 | See Intersection Detail for Location and Construction Notes | | | | | | |
| 13 | See Intersection Detail for Location and Construction Notes | | | | | | |
| 14 | 8+28.83 | Strawberry Hill Estates Dr. | 120.00' RT | STD MSD 4-Way Area Inlet | 498.85 | 494.63 | |
| 15 | 6+24.95 | Strawberry Hill Estates Dr. | 149.44' RT | STD MSD Junction Box/Manhole | 494.25 | 482.26 | |
| 16 | 5+42.90 | Strawberry Hill Estates Dr. | 138.61' RT | Concrete Headwall W/1'x1' Square Edge Orifice | 480.00 | 479.25 18" R.C.P. | |
| 17 | 5+34.98 | Strawberry Hill Estates Dr. | 139.77' RT | Special Detention Basin Discharge Structure W/Emergency Overflow | 486.38 | 479.26 36" R.C.P. 485.50 Emergency Discharge | |
| 18 | 5+01.45 | Strawberry Hill Estates Dr. | 153.11' RT | Existing Junction Box-Deerfield Estates | 486.62 | 478.48 | |



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 GEORGE BUTLER ASSOCIATES, INC.
 CONSULTING ENGINEERS ARCHITECTS
 LANDSCAPE ARCHITECTS-PLANNERS

OFFICES
 ONE PINE RIDGE PLAZA
 SUITE 200
 605 MELROSE DRIVE
 LENEXA, KANSAS 66242
 788 CITY CENTER SQUARE
 100 MARK KANAWAY DRIVE
 MISSOURI CITY, MISSOURI 64110
 2000 S. W. 126th ST. SUITE 100
 OPAWA, MISSOURI 63026

STATE OF MISSOURI
 REGISTERED PROFESSIONAL ENGINEER
 MARCUS JOHN HACKSTADT
 NUMBER E-22009

STRAWBERRY HILL ESTATES

SITE & GRADING PLAN

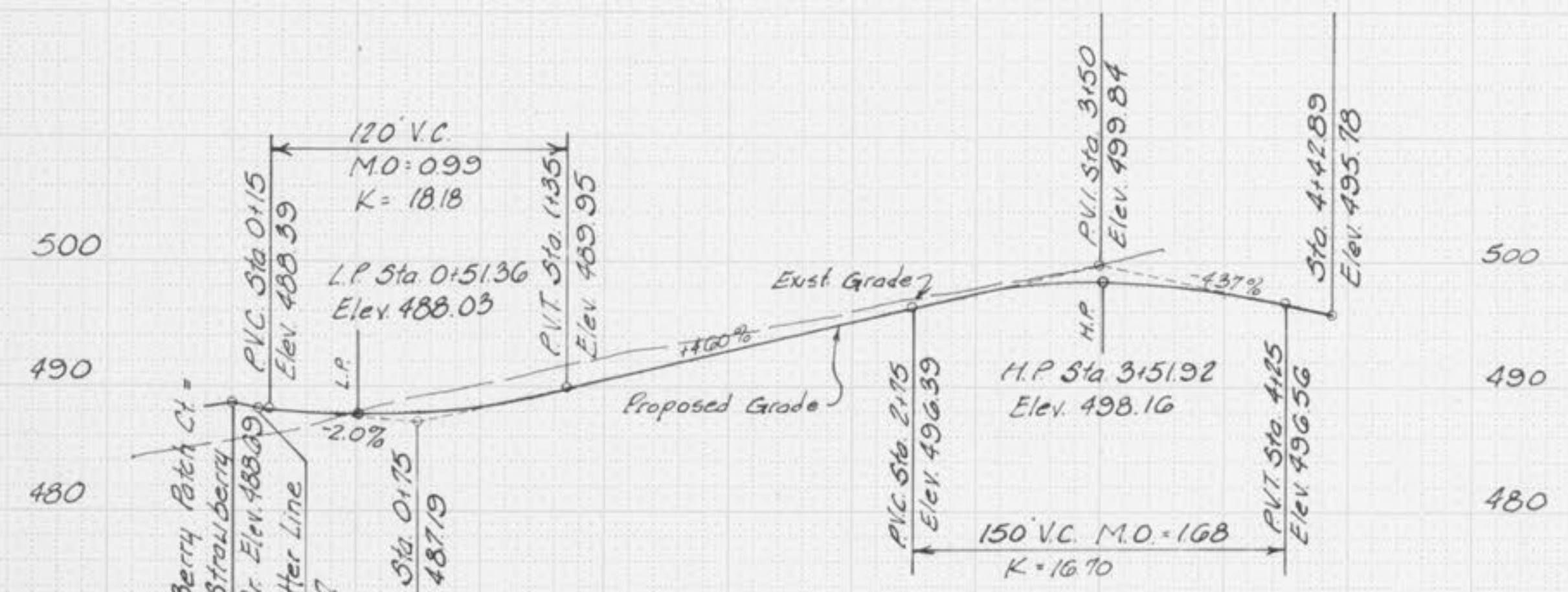
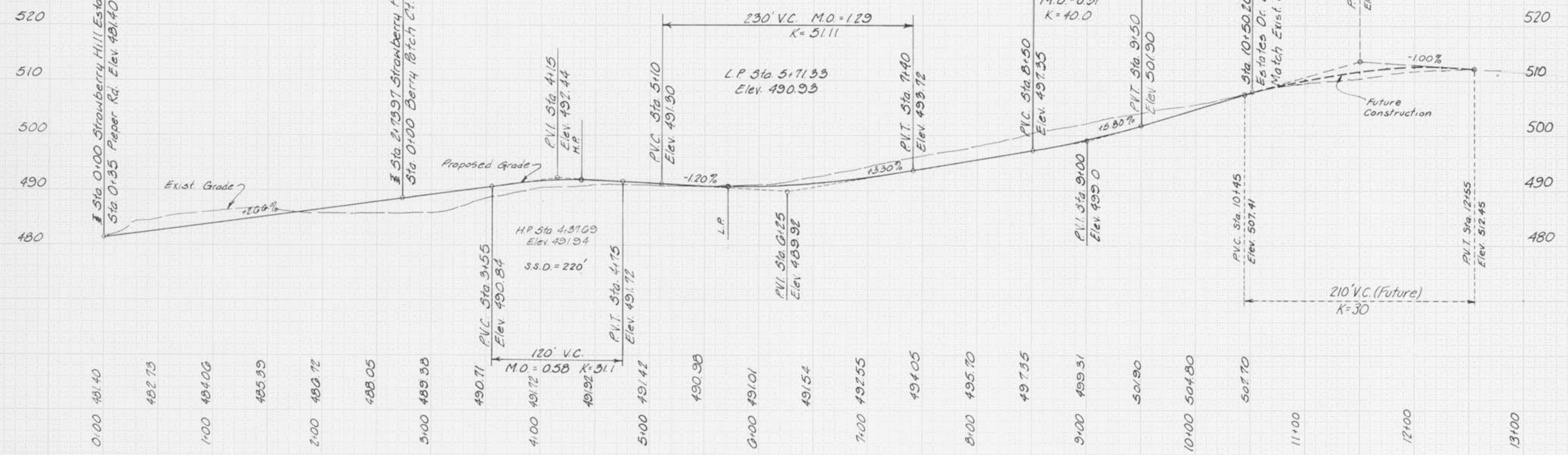
DESIGNED BY MJH DRAWN BY REB CHECKED BY GRH

JOB NO 87-4703
 DATE June, 1987
 SCALE As shown
 SHEET NO 3 OF 12



GEORGE BUTLER ASSOCIATES, INC.
Engineers / Architects / Landscape Architects / Planners

| PROJECT | SHEET NO. | TOTAL SHEETS |
|---|-----------------|--------------|
| STRAWBERRY HILL ESTATES STREET PROFILES | 4 | 12 |
| PROJECT NO.: 87-4788 | DATE: JUNE 1987 | |
| REVISIONS: | | |



Scale 1"=50' Horiz
1"=10' Vert.





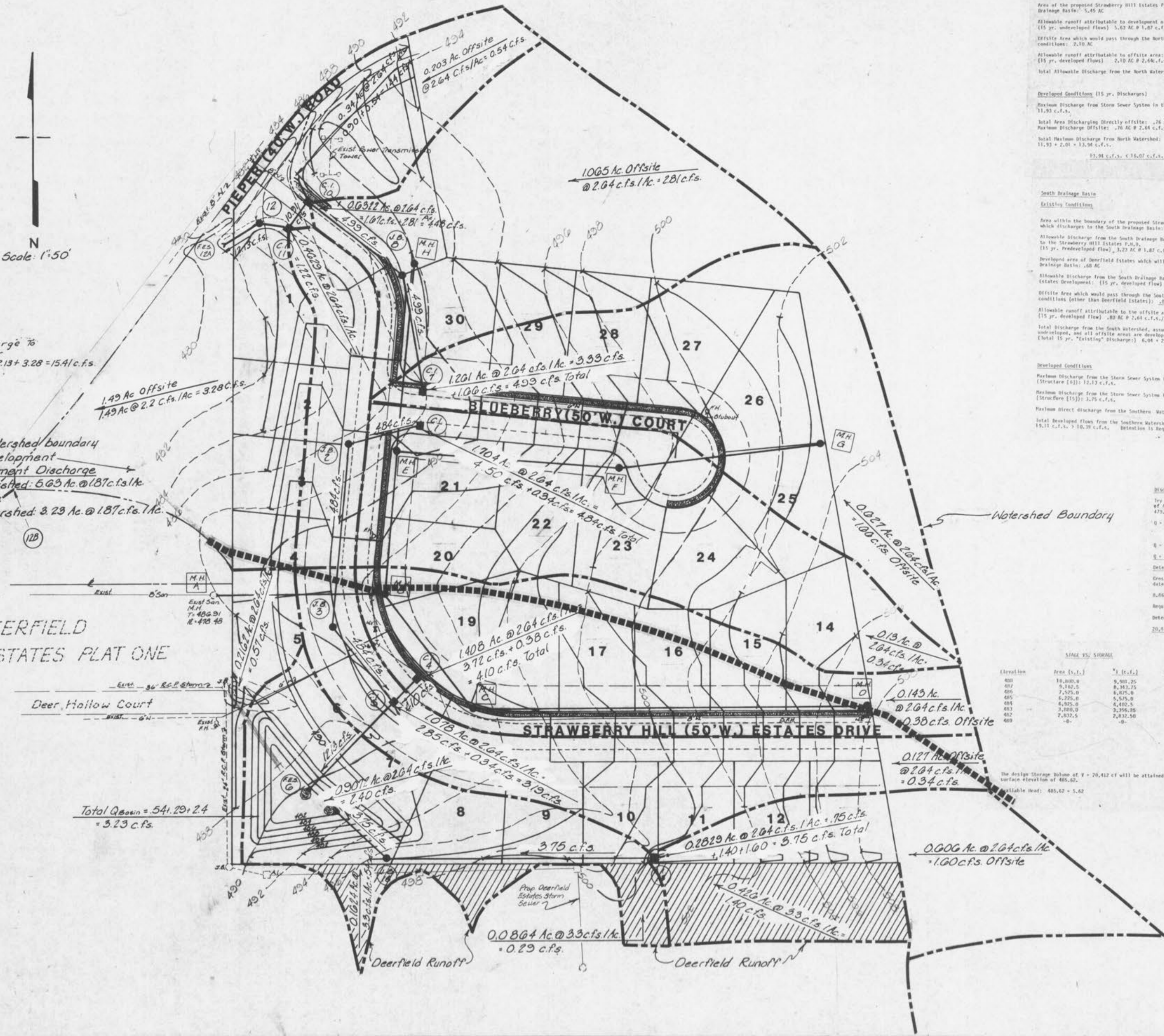
Total Discharge to Culvert Under Driveway: $12.13 + 3.28 = 15.41 \text{ c.f.s.}$

Existing Watershed boundary prior to development
Predevelopment Discharge
North Watershed: $5.63 \text{ Ac.} @ 187 \text{ c.f.s./Ac.} = 1053 \text{ c.f.s.}$
South Watershed: $8.29 \text{ Ac.} @ 187 \text{ c.f.s./Ac.} = 1549 \text{ c.f.s.}$

DEERFIELD ESTATES PLAT ONE

Deer Hollow Court

Total $Q_{\text{basin}} = 541.29 + 2.4 = 543.69 \text{ c.f.s.}$



North Drainage Basin
Existing Conditions:
Area of the proposed Strawberry Hill Estates P.O.D. within the North Drainage Basin: 5.45 AC
Allowable runoff attributable to development of Strawberry Hill Estates (15 yr. undeveloped flow): $5.43 \text{ AC} @ 1.07 \text{ c.f.s./Ac.} = 5.81 \text{ c.f.s.}$
Offsite Area which would pass through the North Watershed under existing conditions: 2.10 AC
Allowable runoff attributable to offsite area: $2.10 \text{ AC} @ 2.64 \text{ c.f.s./Ac.} = 5.54 \text{ c.f.s.}$
Total Allowable Discharge from the North Watershed: $5.81 + 5.54 = 11.35 \text{ c.f.s.}$

Developed Conditions (15 yr. Discharges)
Maximum Discharge from Storm Sewer System in the North Watershed (Structure [12]): 11.93 c.f.s.
Total Area Discharging Directly offsite: .76 AC
Maximum Discharge Offsite: $.76 \text{ AC} @ 2.64 \text{ c.f.s./Ac.} = 2.01 \text{ c.f.s.}$
Total Maximum Discharge from North Watershed: $11.93 + 2.01 = 13.94 \text{ c.f.s.}$

Detention Basin Design
Maximum Discharge from the Detention Basin:
Existing 15 yr. discharge from the Strawberry Hill Estates Development: 6.04 c.f.s.
Future 25 yr. Developed flow from offsite area will be allowed to pass through without detention: $.68 \text{ AC} @ 3.80 \text{ c.f.s./Ac.} = 2.58 \text{ c.f.s.}$
Future 25 yr. Developed flow from offsite area other than Deerfield Estates will be allowed to pass through without detention: $.88 \text{ AC} @ 3.04 \text{ c.f.s./Ac.} = 2.68 \text{ c.f.s.}$
Total Design Discharge from the Northern Watershed: $6.04 + 2.58 + 2.68 = 11.30 \text{ c.f.s.}$
Discharge from the Southern Watershed which can not be intercepted by the storm sewer system, or flow directly into the detention basin: $.77 \text{ AC} @ 3.04 \text{ c.f.s./Ac.} = 2.33 \text{ c.f.s.}$
Total Design Discharge from Detention Basin: $11.30 + 2.33 = 13.63 \text{ c.f.s.}$
Total 25 yr. Flow into the detention basin:
Structure [14] 12.13 c.f.s. (1.15) = 13.28 c.f.s.
Structure [15] 3.28 c.f.s. (1.15) = 4.43 c.f.s.
Direct Discharge to the Detention Basin: $3.23 \text{ c.f.s.} (1.15) = 3.71 \text{ c.f.s.}$
Total Design Inflow to the Detention Basin: $13.28 + 4.43 + 3.71 = 21.42 \text{ c.f.s.}$
Required Detention Basin Volume: $(21.42 - 13.63) (1800) = 14,000 \text{ cu. ft.}$

South Drainage Basin
Existing Conditions:
Area within the boundary of the proposed Strawberry Hill Estates P.O.D. which discharges to the South Drainage Basin: 3.23 AC
Allowable Discharge from the South Drainage Basin due to runoff attributable to the Strawberry Hill Estates P.O.D. (15 yr. undeveloped flow): $3.23 \text{ AC} @ 1.07 \text{ c.f.s./Ac.} = 3.45 \text{ c.f.s.}$
Developed area of Deerfield Estates which will discharge to the South Drainage Basin: .68 AC
Allowable Discharge from the South Drainage Basin attributable to the Deerfield Estates Development (15 yr. developed flow): $.68 \text{ AC} @ 3.30 \text{ c.f.s./Ac.} = 2.24 \text{ c.f.s.}$
Offsite Area which would pass through the Southern Watershed under existing conditions (other than Deerfield Estates): .68 AC
Allowable runoff attributable to the offsite area, assuming future development: $.80 \text{ AC} @ 2.64 \text{ c.f.s./Ac.} = 2.11 \text{ c.f.s.}$
Total Discharge from the South Watershed, assuming Strawberry Hill Estates is undeveloped, and all offsite areas are developed: $3.45 + 2.24 + 2.11 = 7.80 \text{ c.f.s.}$
Total 15 yr. "Existing" Discharge: $6.04 + 2.04 + 2.11 = 10.19 \text{ c.f.s.}$

Developed Conditions
Maximum Discharge from the Storm Sewer System in the South Watershed (Structure [13]): 12.13 c.f.s.
Maximum Discharge from the Storm Sewer System in the South Watershed (Structure [15]): 3.28 c.f.s.
Maximum Direct Discharge from the Southern Watershed: 3.23 c.f.s.
Total Developed flow from the Southern Watershed: $12.13 + 3.28 + 3.23 = 18.64 \text{ c.f.s.}$

Discharge Design
Try a 1'-0" x 1'-0" square edge (Manhole) with an in-flow flange of 400/50, centered in front of an 18" R.C.P. with a flowline of 475/5." See hydraulic Calculations for details of pipe
 $Q = CA \sqrt{2gh}$
 $Q = 4.00 \text{ ft}^2 \times 1.41 \text{ ft} \times 1.41 = 8.00 \text{ c.f.s.}$
 $Q = 10.00 \text{ c.f.s.} < 8.00 \text{ c.f.s.}$
OK

Detention Summary for Strawberry Hill Estates
Gross Area of Strawberry Hill Estates as Indicated on the Final Plan, dated 3-30-87 (Revision No. 2): 8.634 AC
Required Detention Volume: $8.86 (3.04 - 1.87) (1800) = 18,460 \text{ cu. ft.}$
Detention Provided: 20,412 cu. ft.
 $20,412 > 18,460$ OK

STAGE VS. STORAGE

| Elevation | Area (sq. ft.) | V (cu. ft.) | h (ft.) |
|-----------|----------------|-------------|-----------|
| 480 | 10,800.0 | 9,000.25 | 41.366-25 |
| 481 | 8,100.0 | 8,100.25 | 37.288-00 |
| 482 | 7,200.0 | 6,075.0 | 29,691-25 |
| 483 | 6,300.0 | 5,275.0 | 16,166-25 |
| 484 | 4,950.0 | 4,400.0 | 10,558-25 |
| 485 | 3,600.0 | 3,550.25 | 6,108-75 |
| 486 | 2,250.0 | 2,825.50 | 3,825-00 |
| 487 | - | - | - |

15 yr. Detention Basin Inflow: $12.13 + 3.25 + 3.23 = 18.61 \text{ c.f.s.}$
Assume the 15 yr. Inflow will rise to 485.00'
 $Q = 485.00 - 480.00 = 5.00 \text{ ft.}$
Available 1'-0" x 1'-0" Square Orifice: $Q = 4.00 \text{ ft}^2 \times 1.41 \text{ ft} \times 1.41 = 8.00 \text{ c.f.s.}$
Accumulated Inflow to 30 min. (19.11 - 16.25) (1800) = 15,960 cu. ft.
Stage elevation at accumulated volume of 15,960 cu. ft. (from Stage vs. Storage Table) = 484.96 ft.
During a 15 yr. Storm the water will rise to an elevation of 485.00', with a maximum discharge of 16.25 c.f.s.
During a 25 yr. Storm the water will rise to an elevation of 485.62 ft., with a maximum discharge of 16.53 c.f.s.

NOT FOR CONSTRUCTION

GBA
GEORGE BUTLER ASSOCIATES, INC.
CONSULTING ENGINEERS/ARCHITECTS
LANDSCAPE ARCHITECTS/PLANNERS

OFFICES:
THE ENTERPRISE BUILDING
8300 ENTERPRISE ROAD
KANSAS CITY, MISSOURI 64126
ONE PINE RIDGE PLAZA
801 MELROSE DRIVE
LENEXA, KANSAS 66042
THE CITY CENTER SQUARE
700 MAIN
KANSAS CITY, MISSOURI 64108
Suite 200 / 225 S. Main St.
O'Fallon / Missouri / 63366

STRAWBERRY HILL ESTATES
DRAINAGE AREA PLAN

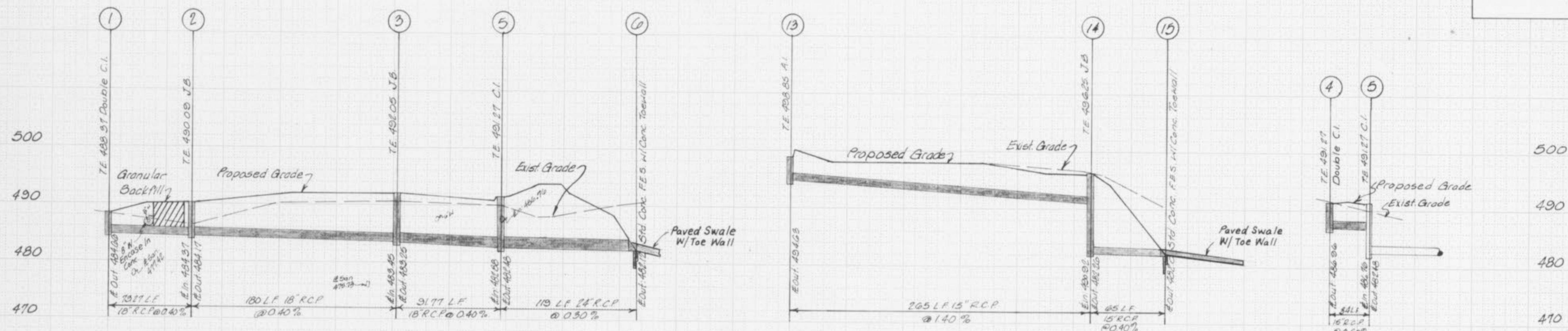
DESIGNED BY MJH DRAWN BY REB CHECKED BY GRH

JOB NO 87-4708
DATE May 1987
SCALE As shown
SHEET NO 5 of 12

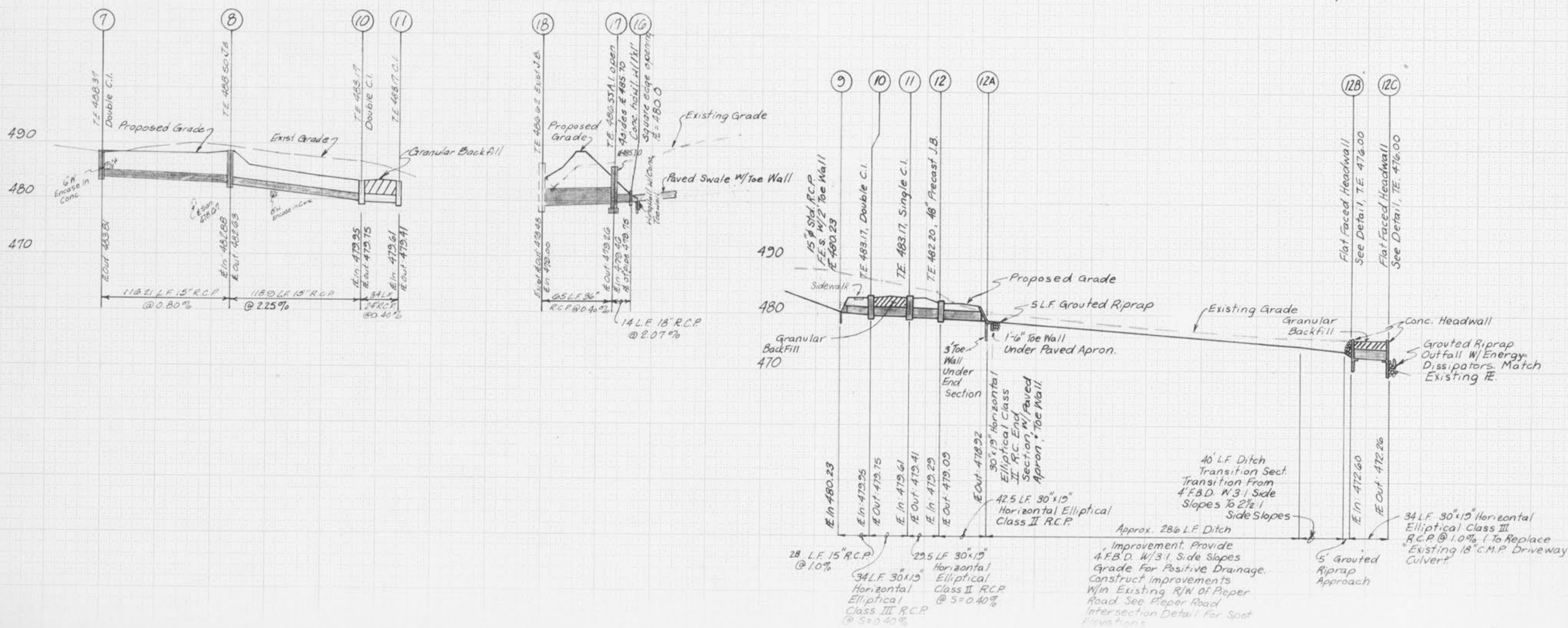


GEORGE BUTLER ASSOCIATES, INC.
Engineers / Architects / Landscape Architects / Planners

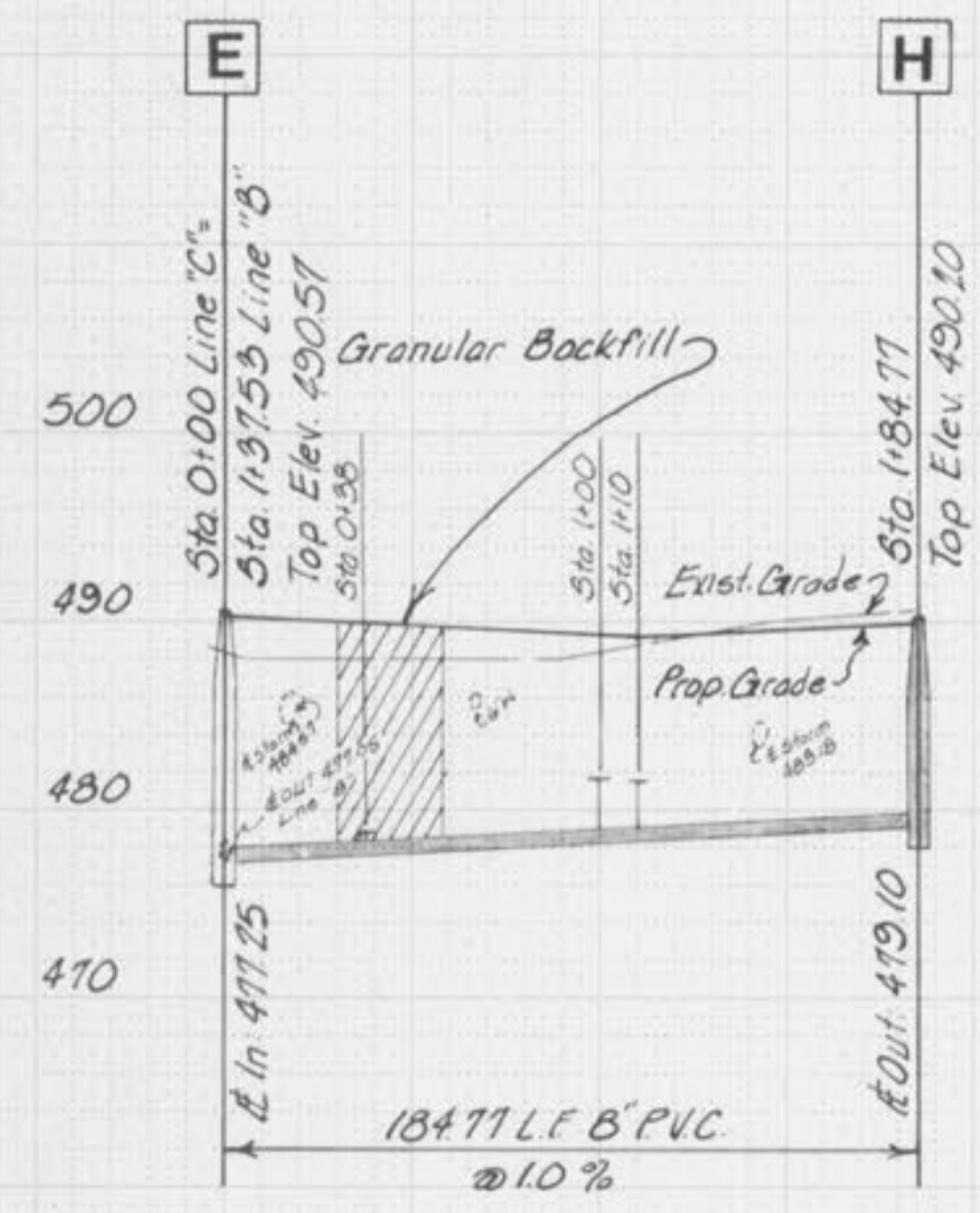
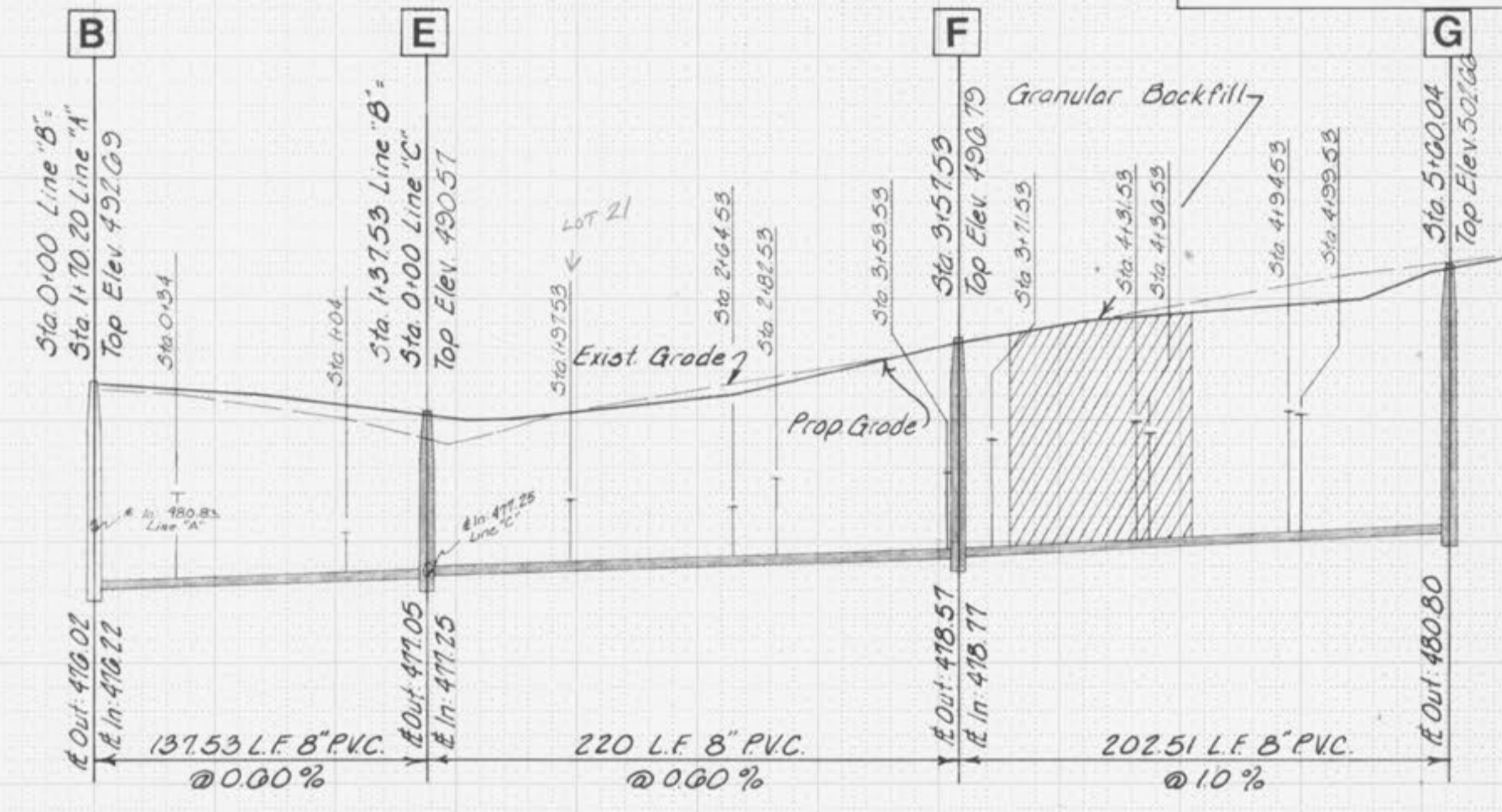
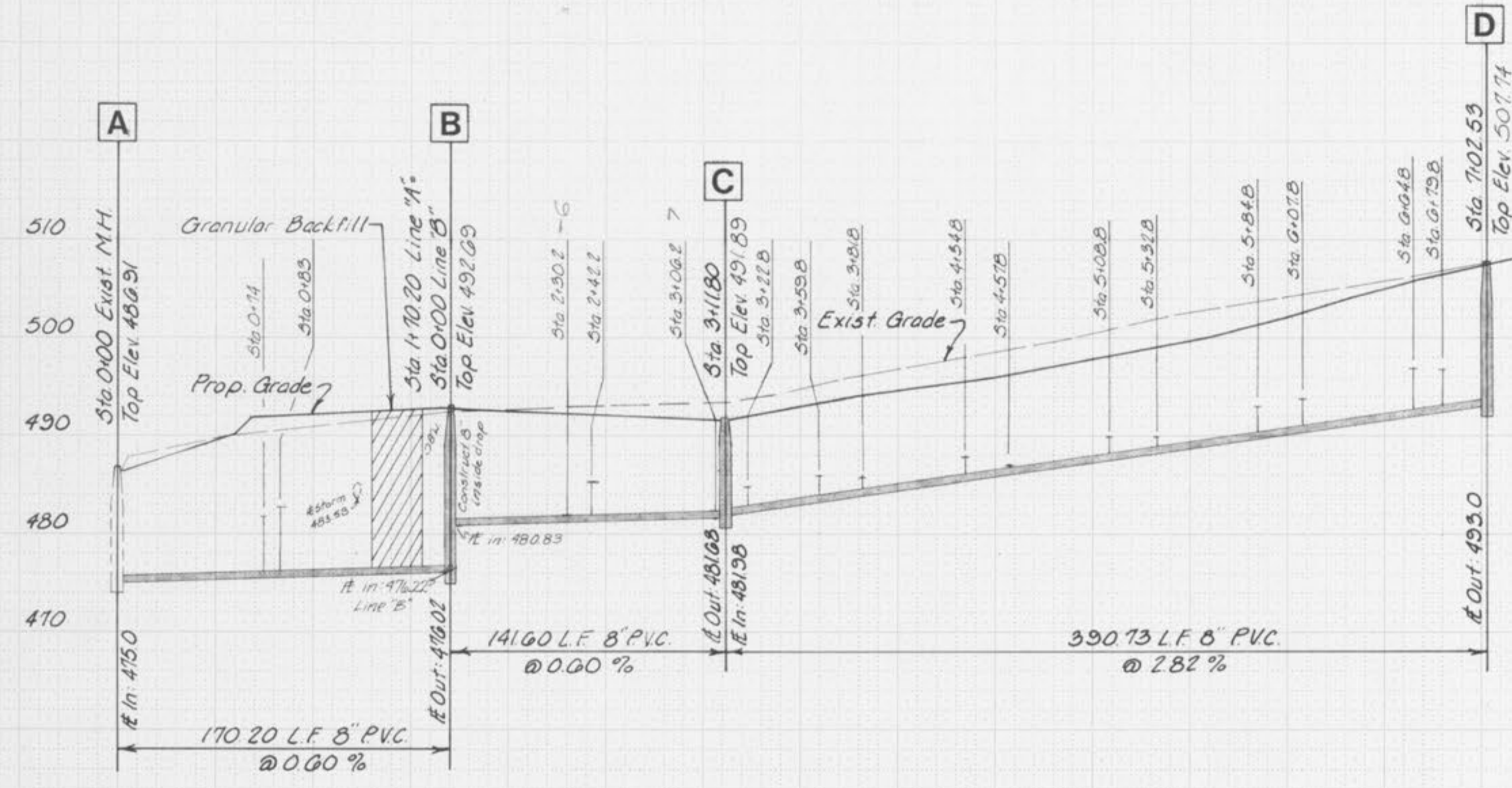
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|-------------------------|----------------|--------------|
| PROJECT | SHEET NO. | TOTAL SHEETS |
| STRAWBERRY HILL ESTATES | 6 | 12 |
| STORM SEWER PROFILES | | |
| PROJECT NO.: 87-4788 | DATE: MAY 1987 | |
| REVISIONS: | | |



See Cover Sheet for General Notes.
See Sheet 8 for Bid M.S.D. Details



Scale: 1"=50' Horiz.
1"=10' Vert.



SEWER LINE "A"

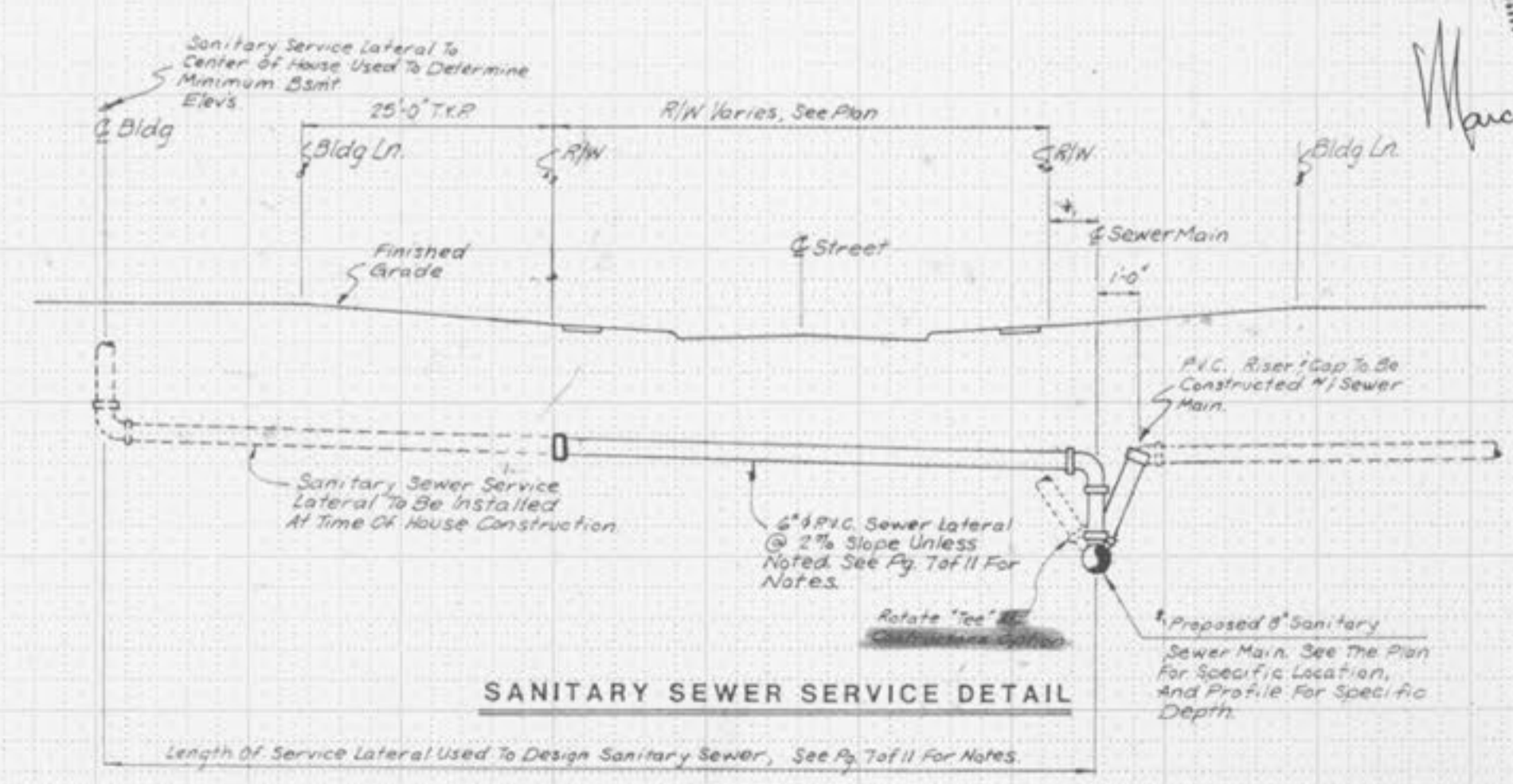
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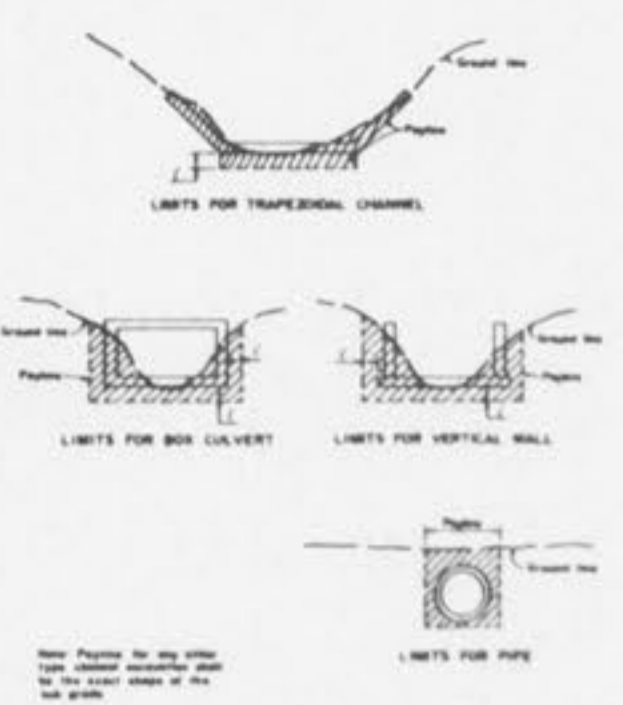
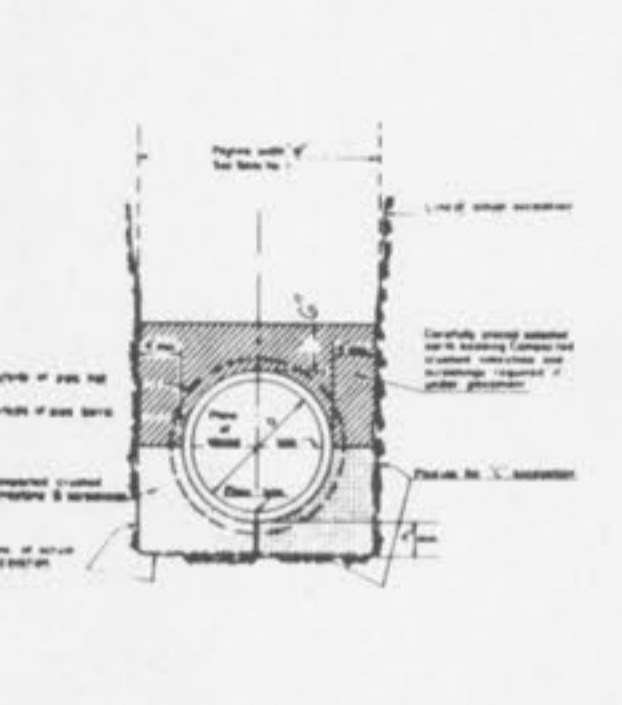
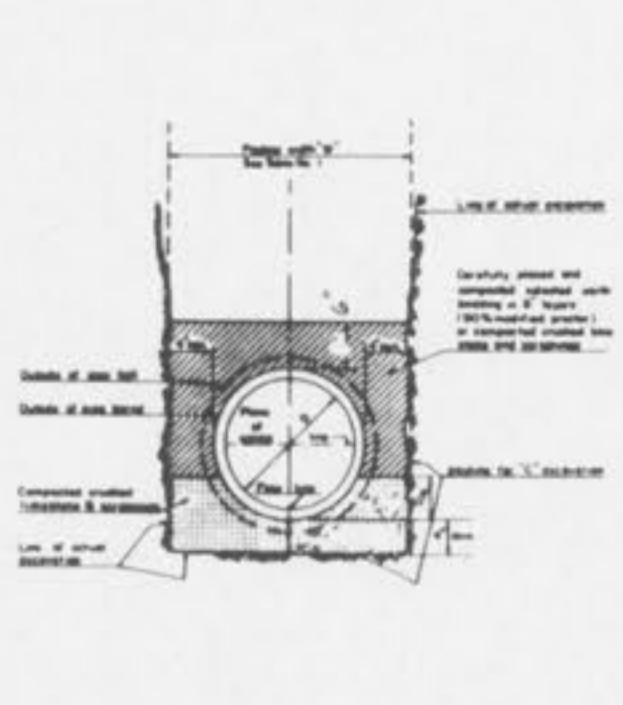
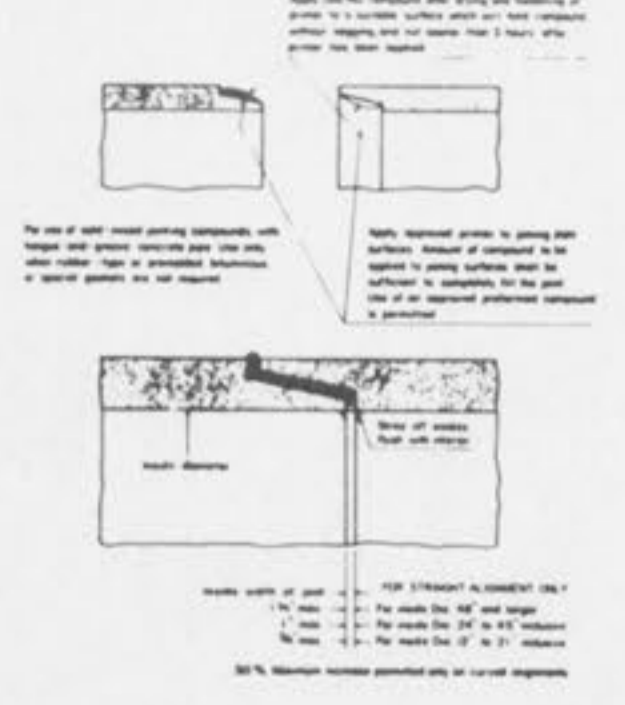
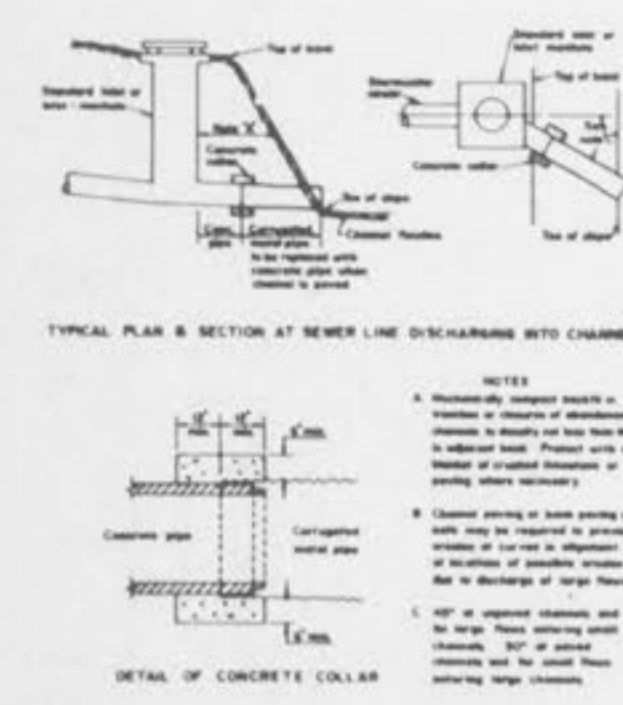
SEWER LINE "C"

Manhole frame and cover shall be Clay & Bailey No. 2008, Neenah R-1736, Deeter 1315 or approved equal. The outside of the manholes shall be waterproofed with a minimum of 31 mils of coal tar pitch or approved equal. Brick manholes are not allowed. For PVC sewer pipe, use only compacted, crushed, clear limestone at least 12" over the top of the pipe.

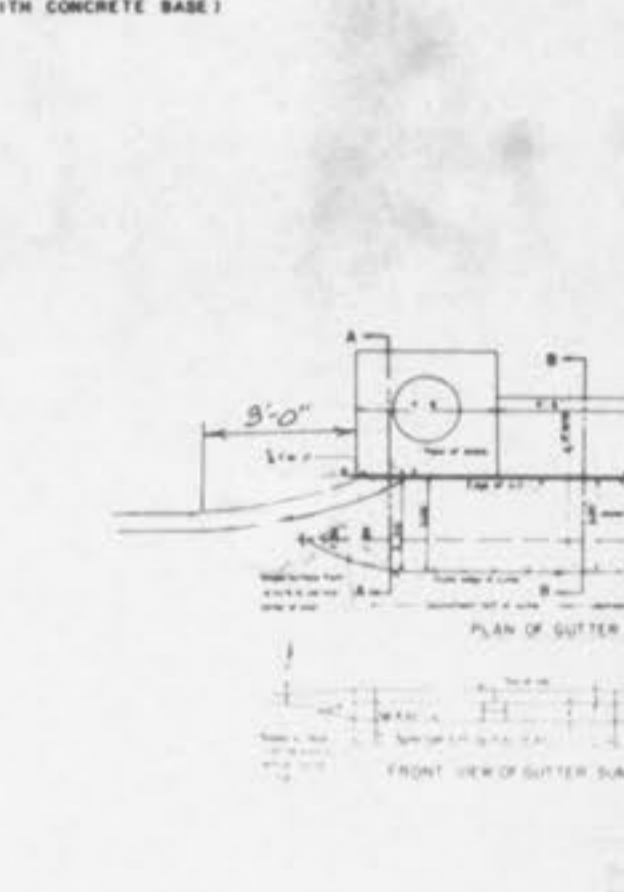
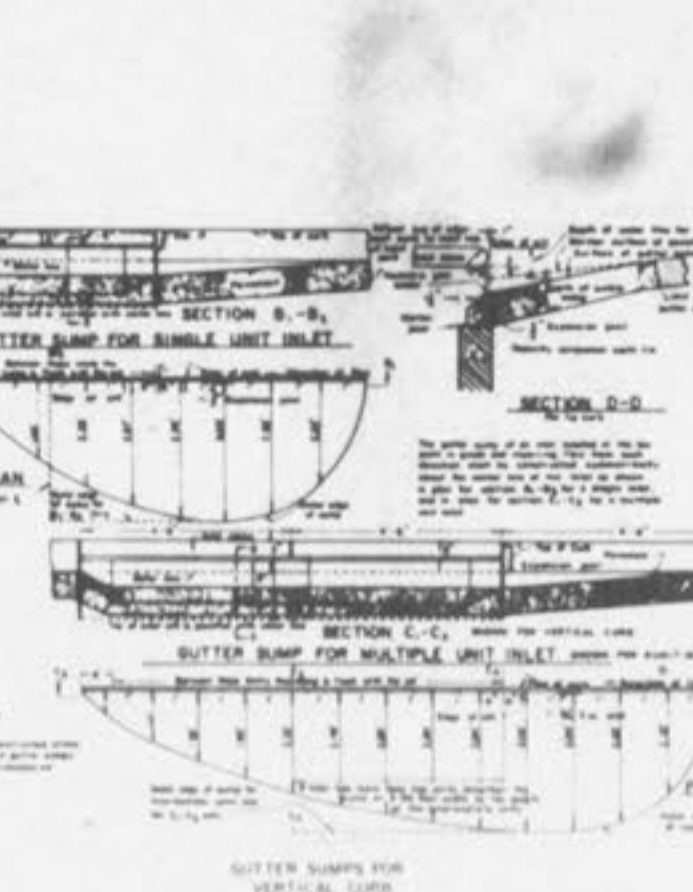
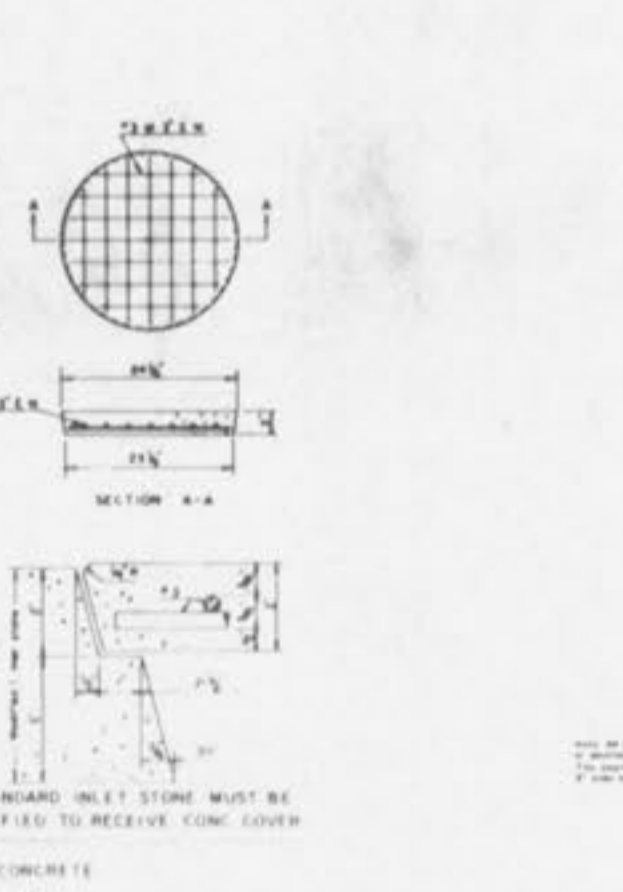
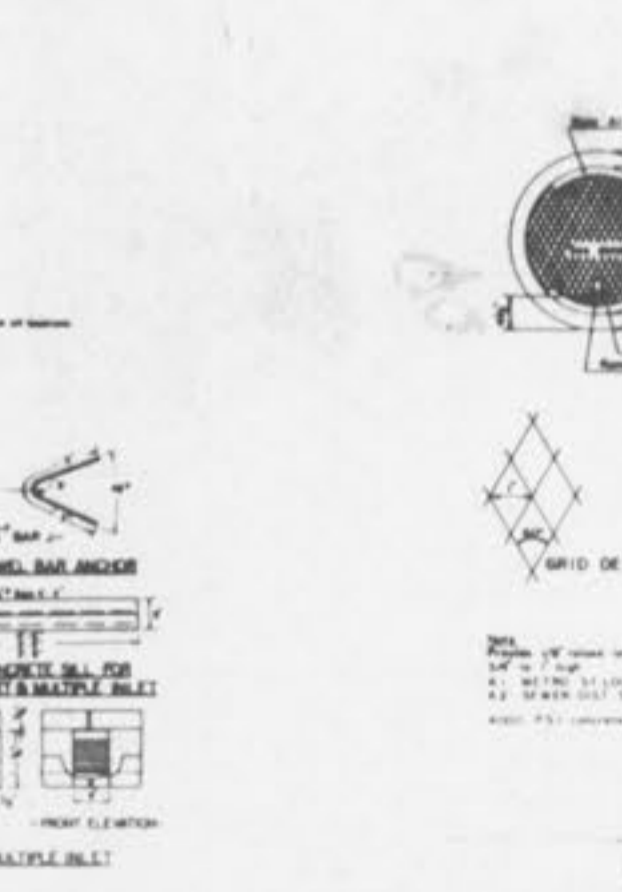
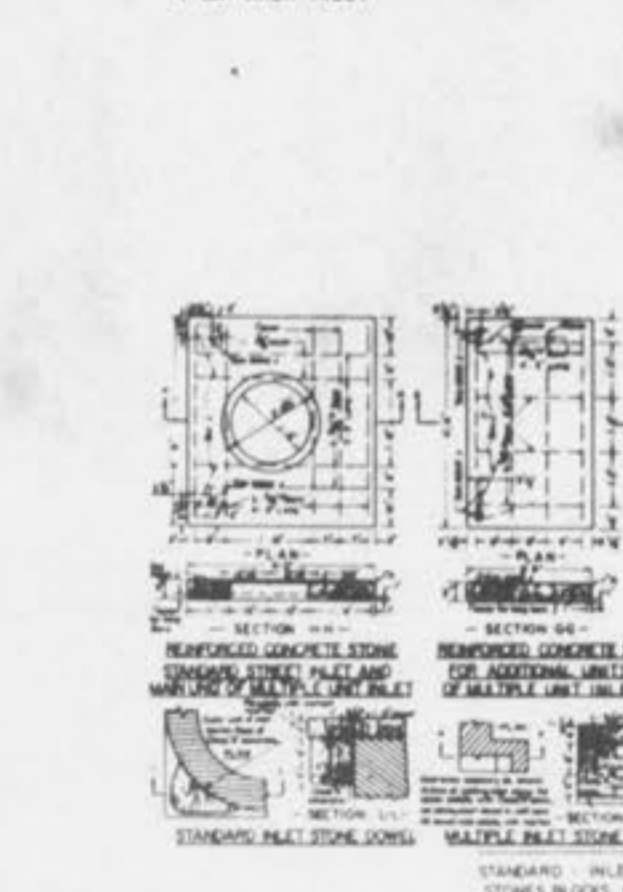
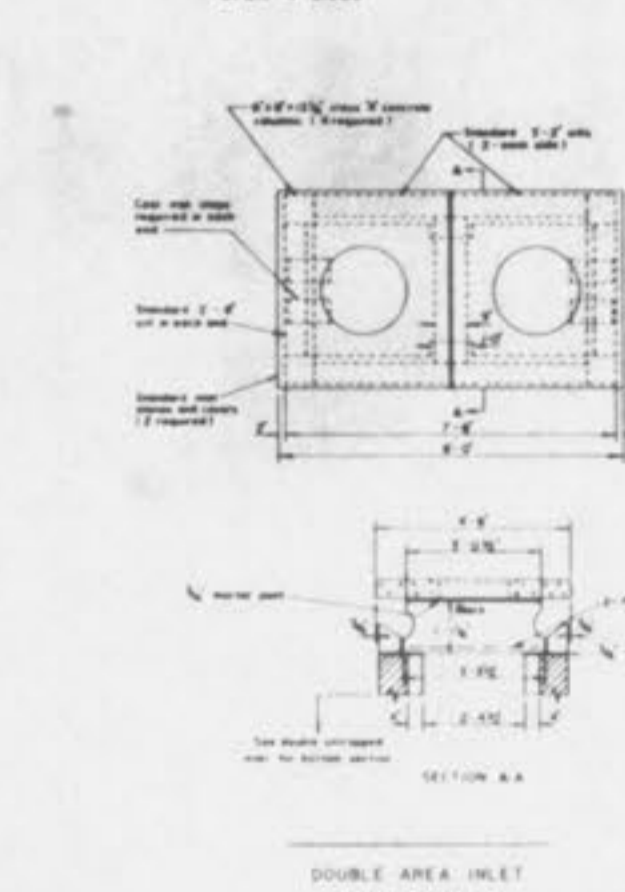
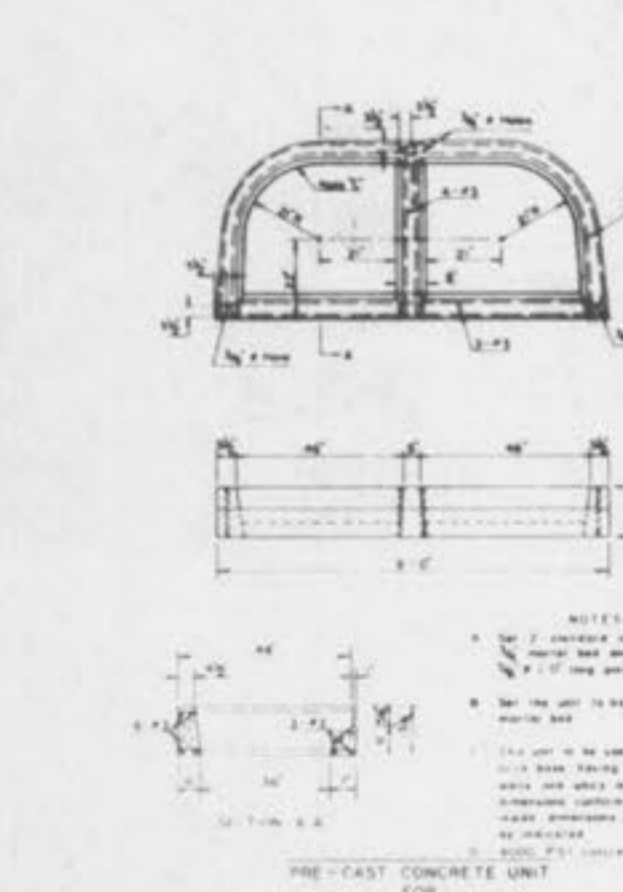
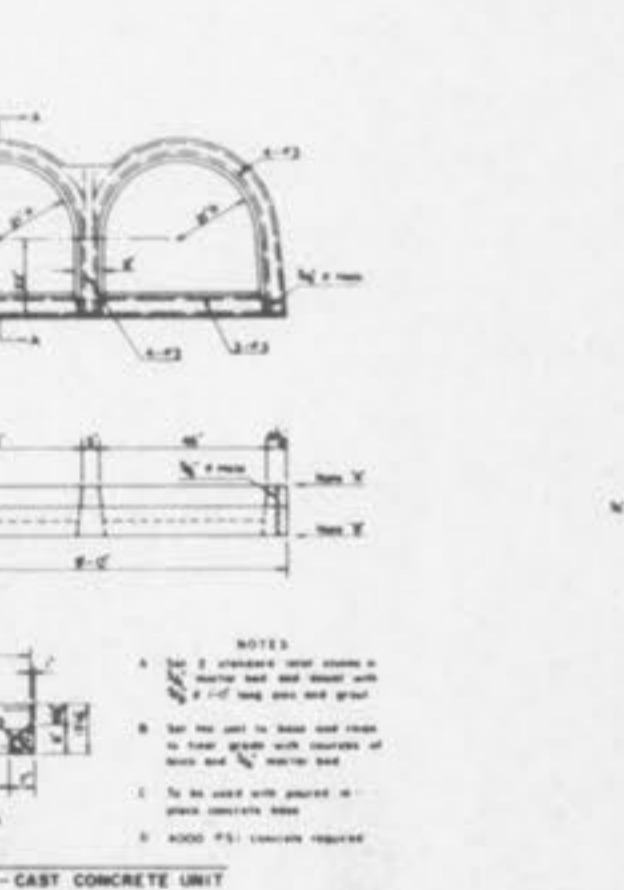
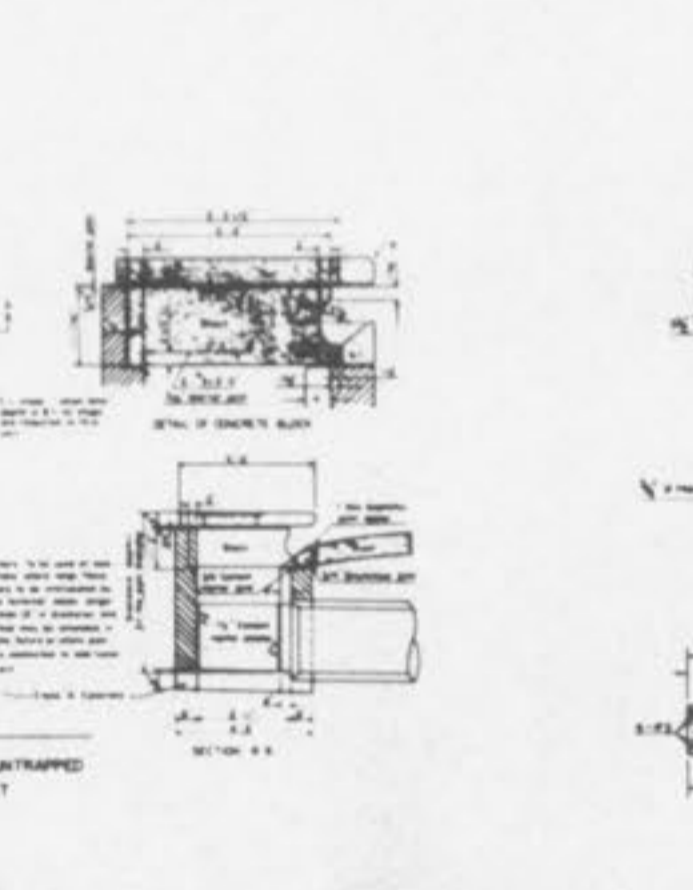
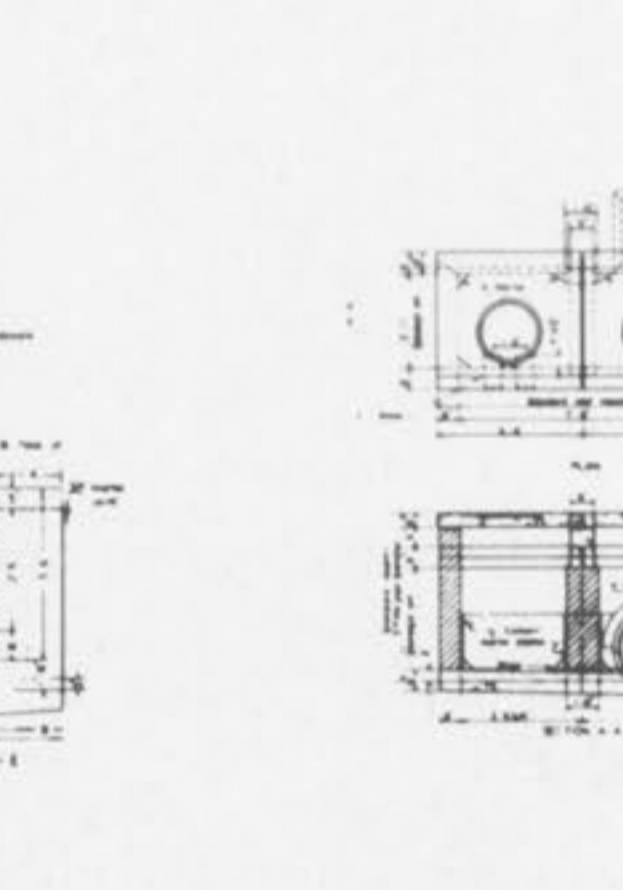
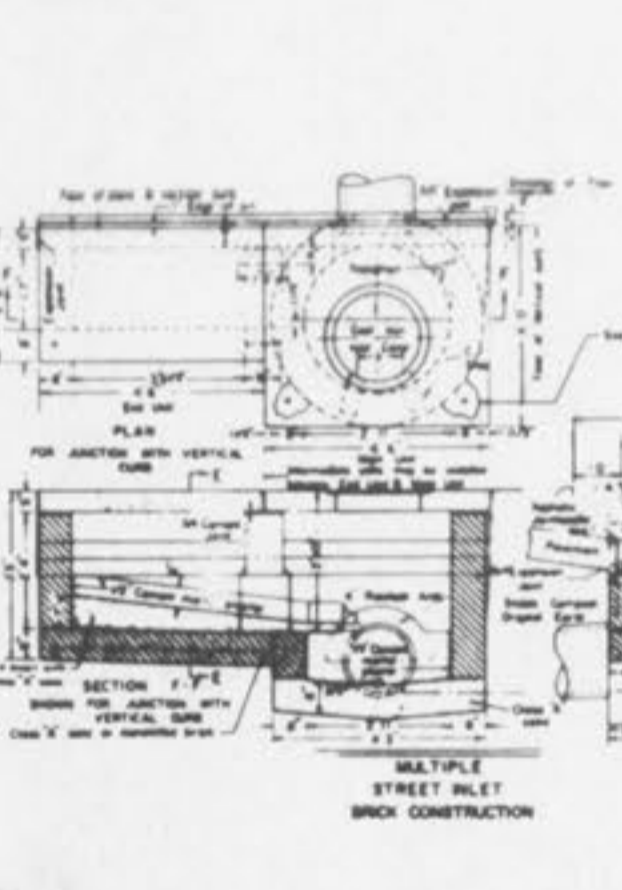
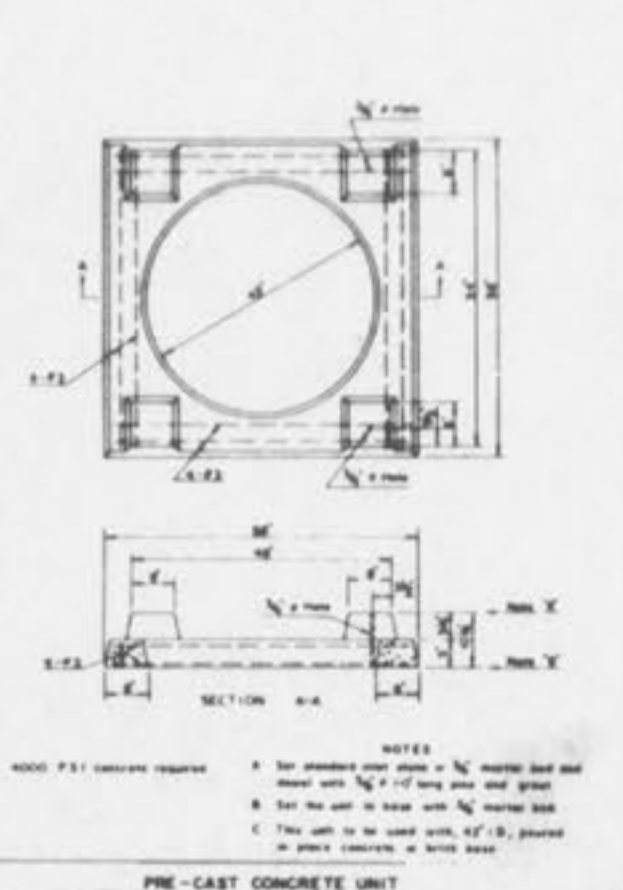
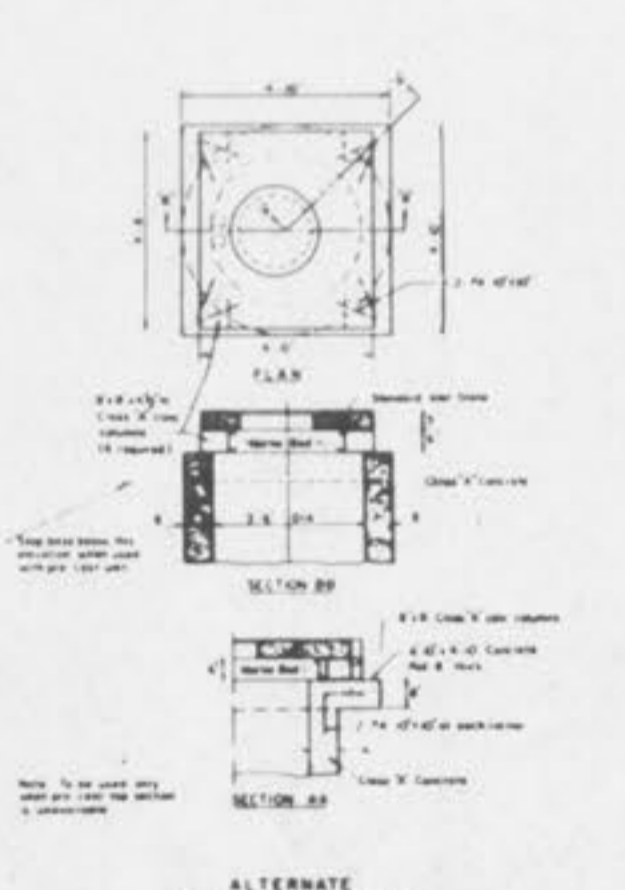
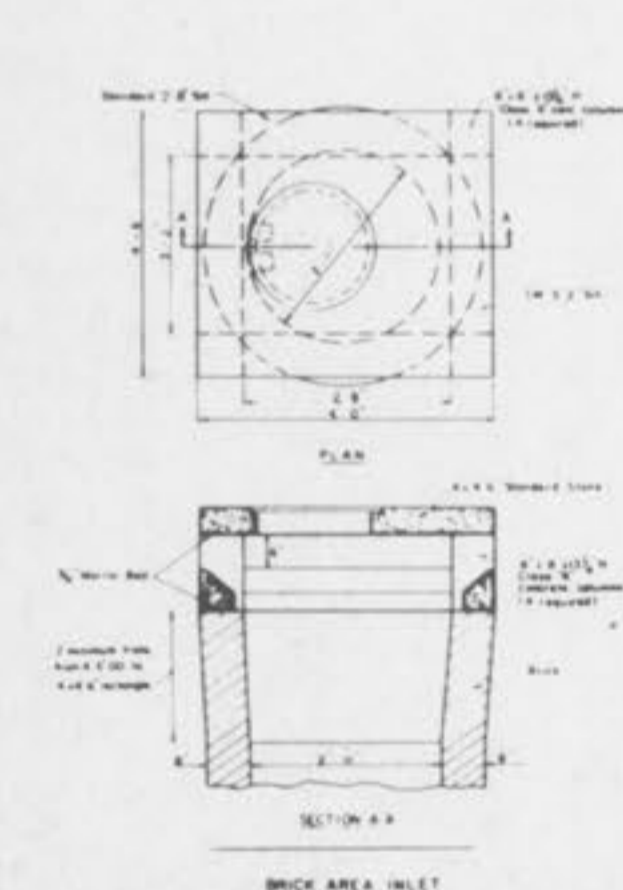
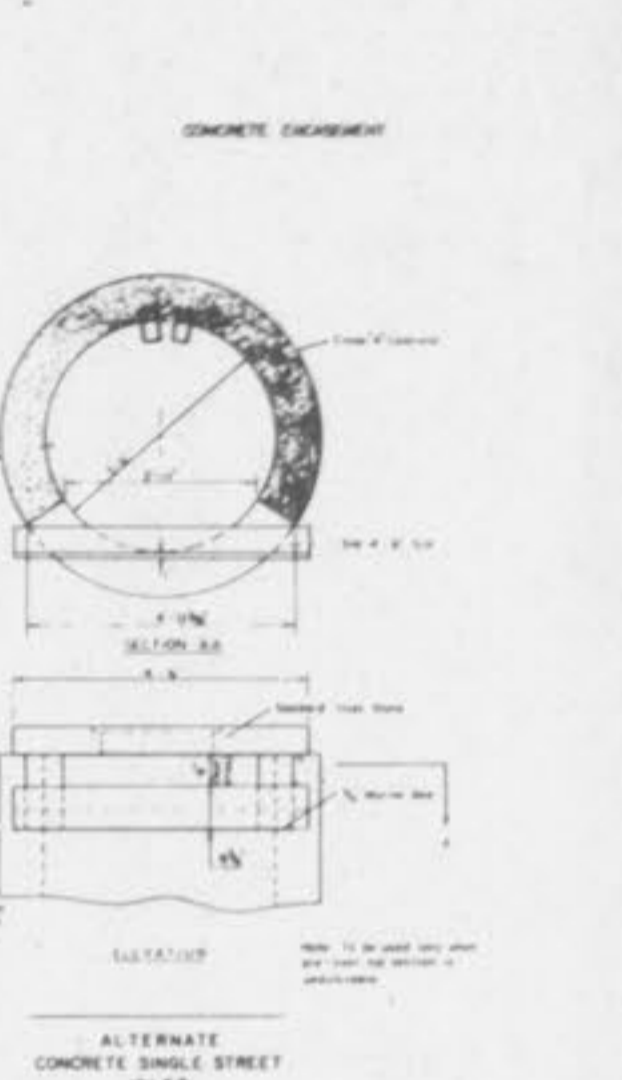
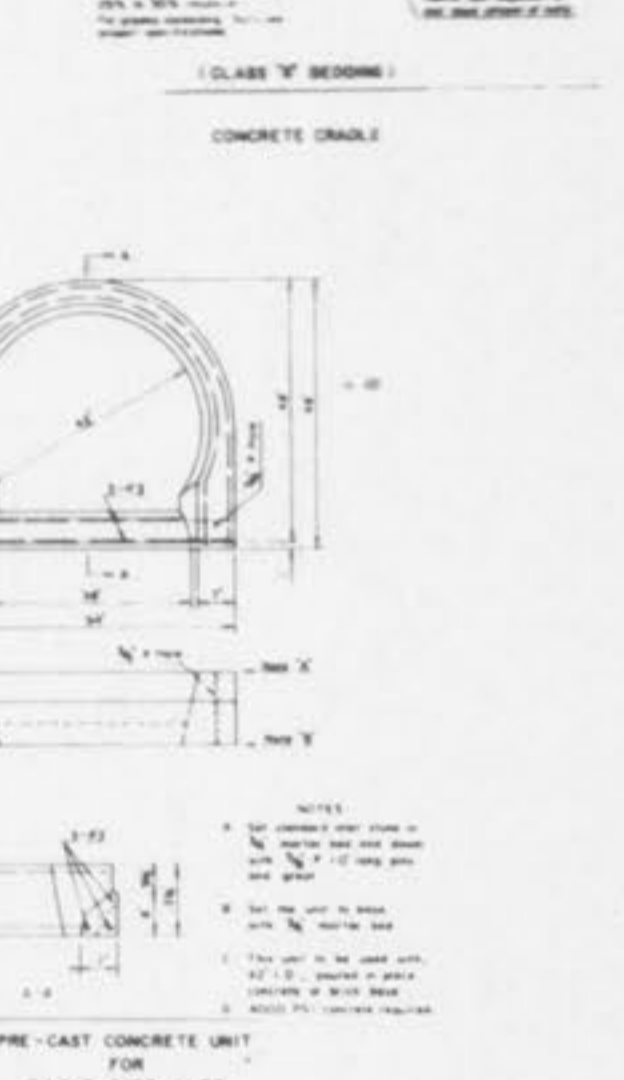
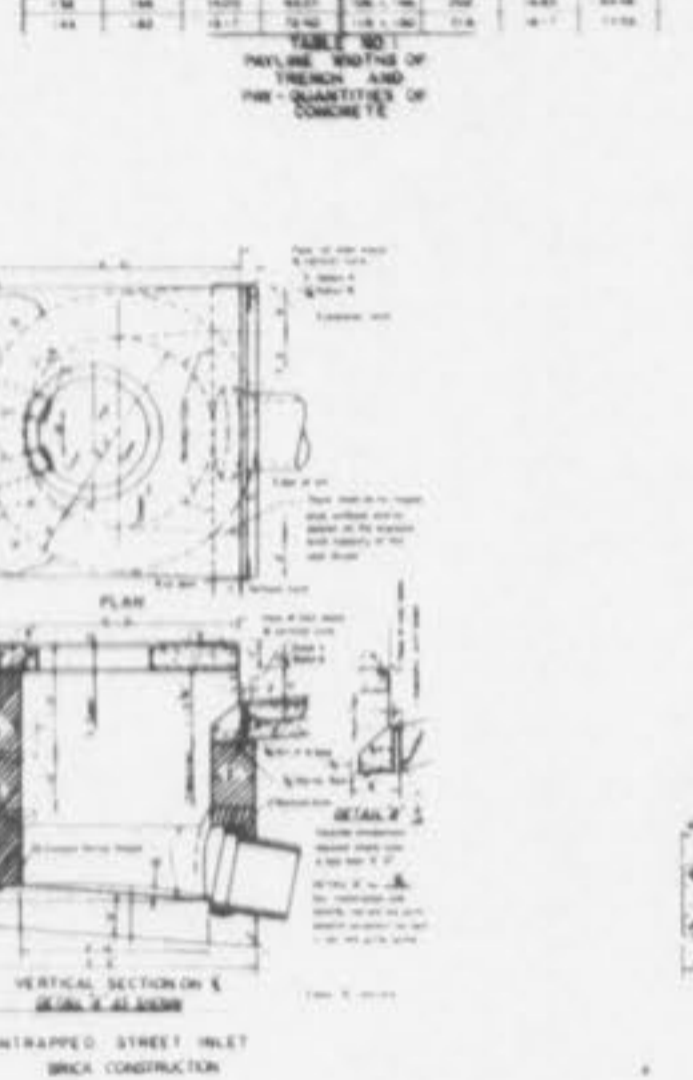
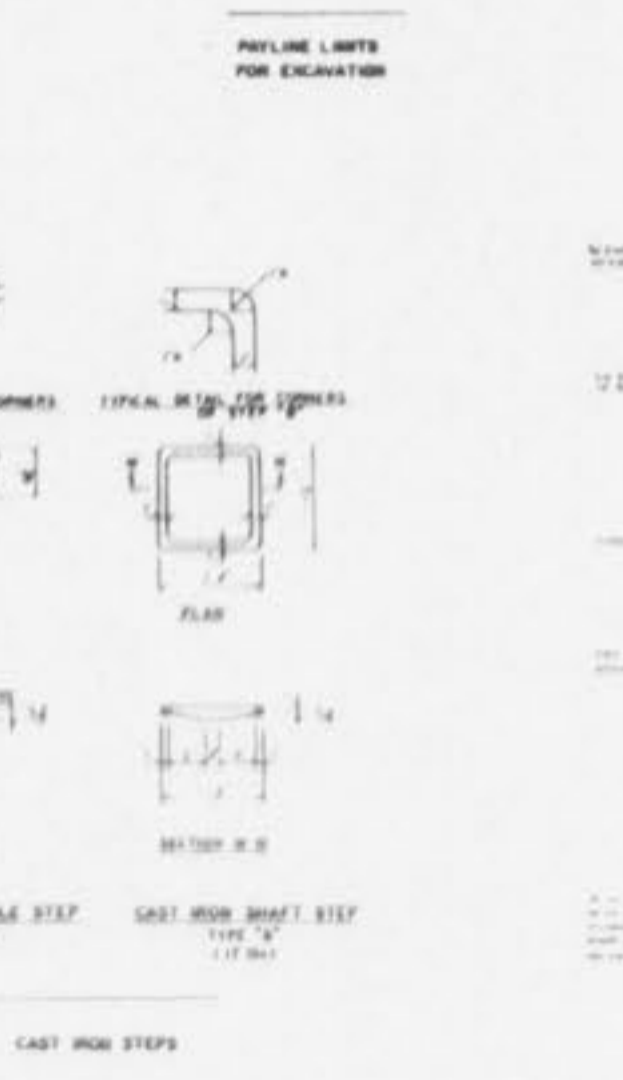
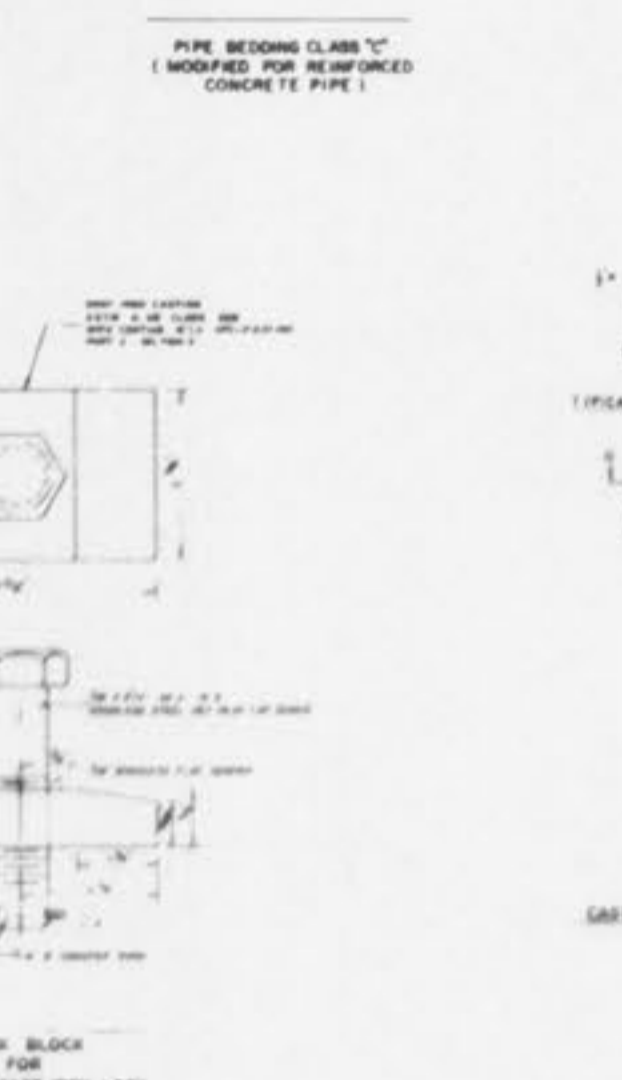
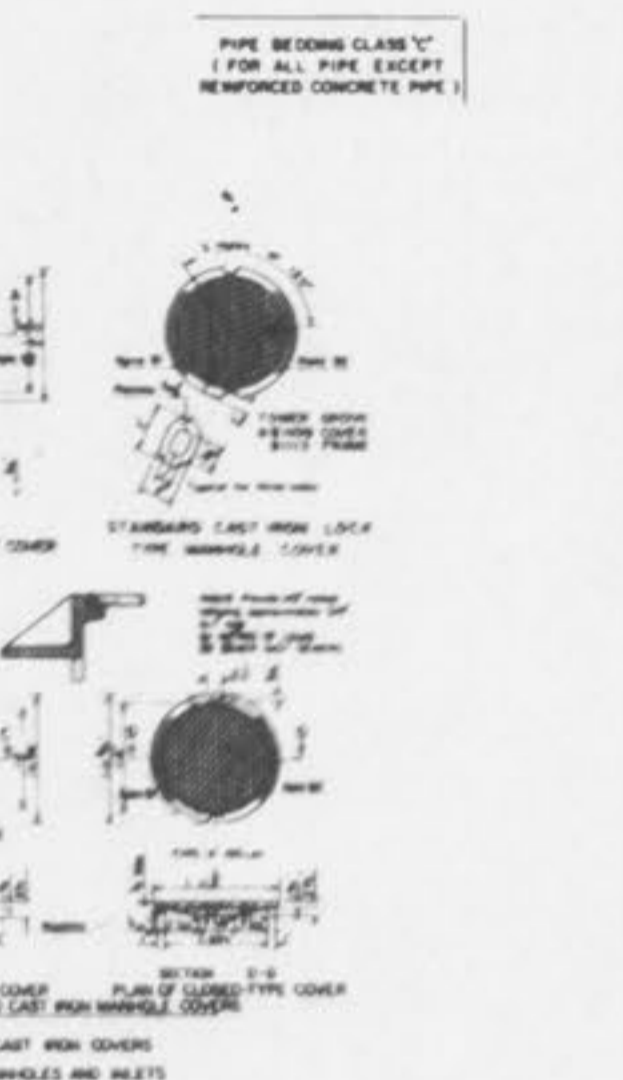
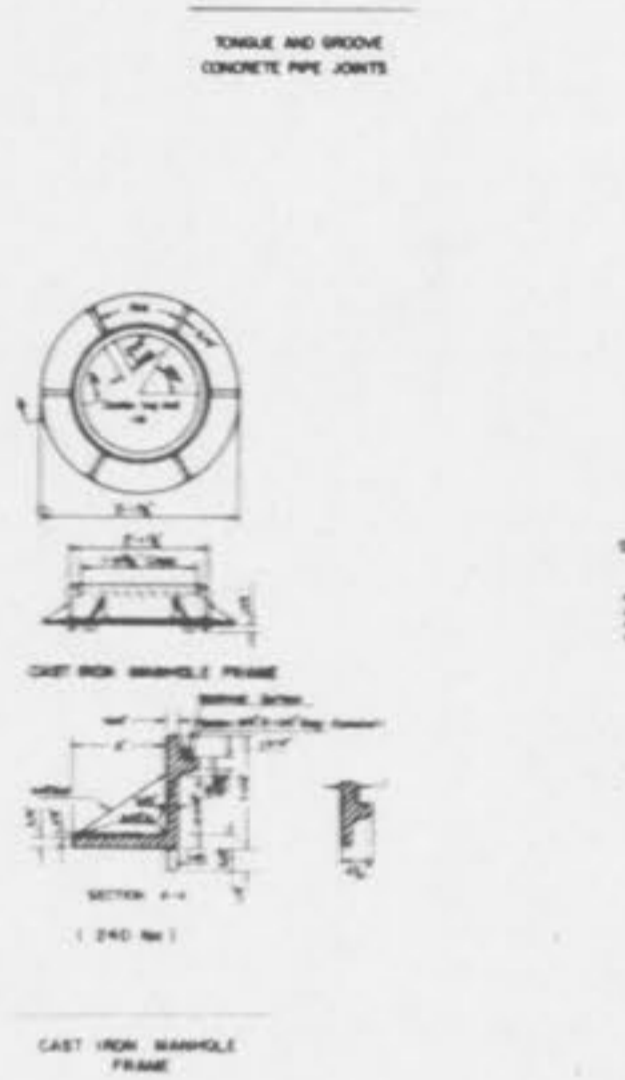
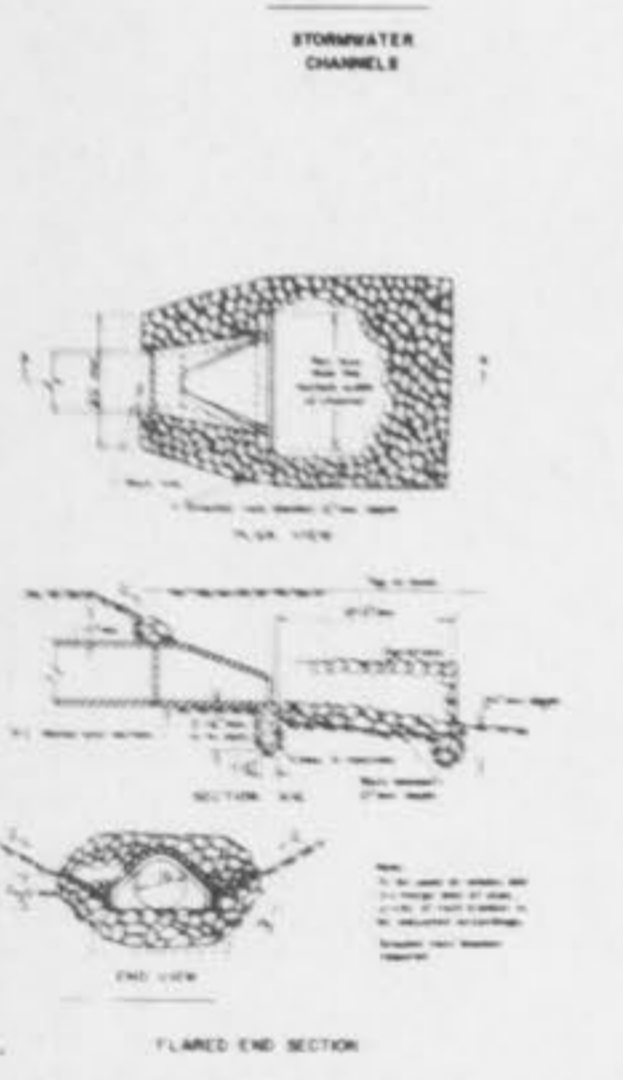
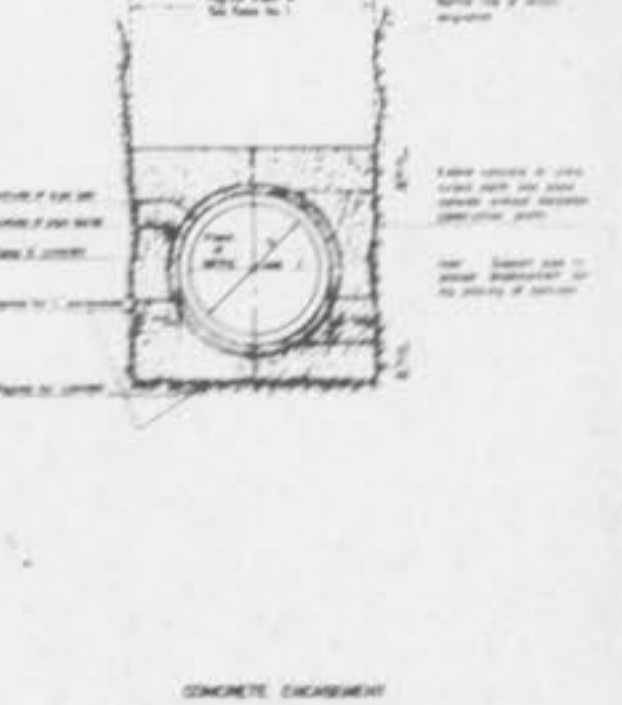
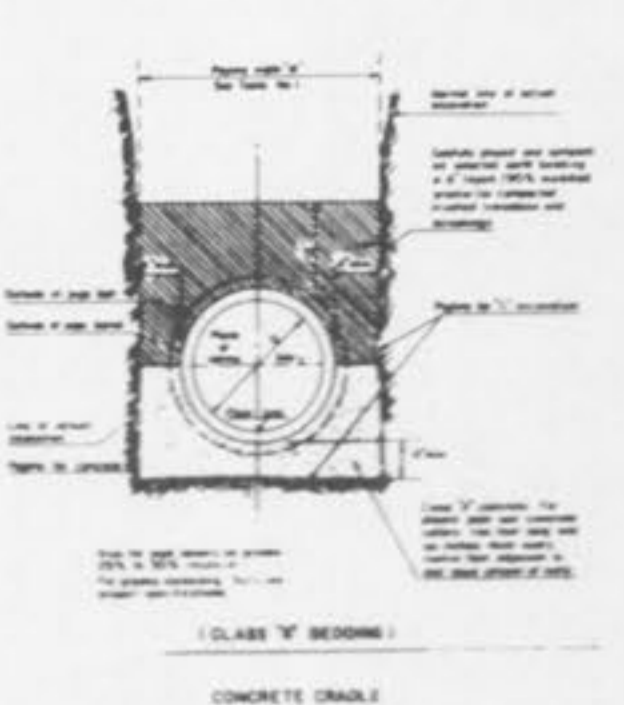
Note: Tops of all manholes to be set 0.20' above proposed grade. See cover sheet for general notes. See sheet 9 of 10 for M.S.D. sewer construction details.

| STATION | PIPE SIZE | APPROX. LENGTH OF PIPE | PROPOSED GRADE | EXIST. GRADE | MIN. COVER | SERVICE ELEV. | NOTES |
|---------|-----------|------------------------|----------------|--------------|------------|---------------|-------|
| 0+00 | 8" | 170.20 | 488.83 | 488.83 | 12" | 488.83 | |
| 1+70.20 | 8" | 1416.00 | 488.83 | 488.83 | 12" | 488.83 | |
| 3+57.53 | 8" | 220.00 | 490.57 | 490.57 | 12" | 490.57 | |
| 5+00.04 | 8" | 202.51 | 490.04 | 490.04 | 12" | 490.04 | |





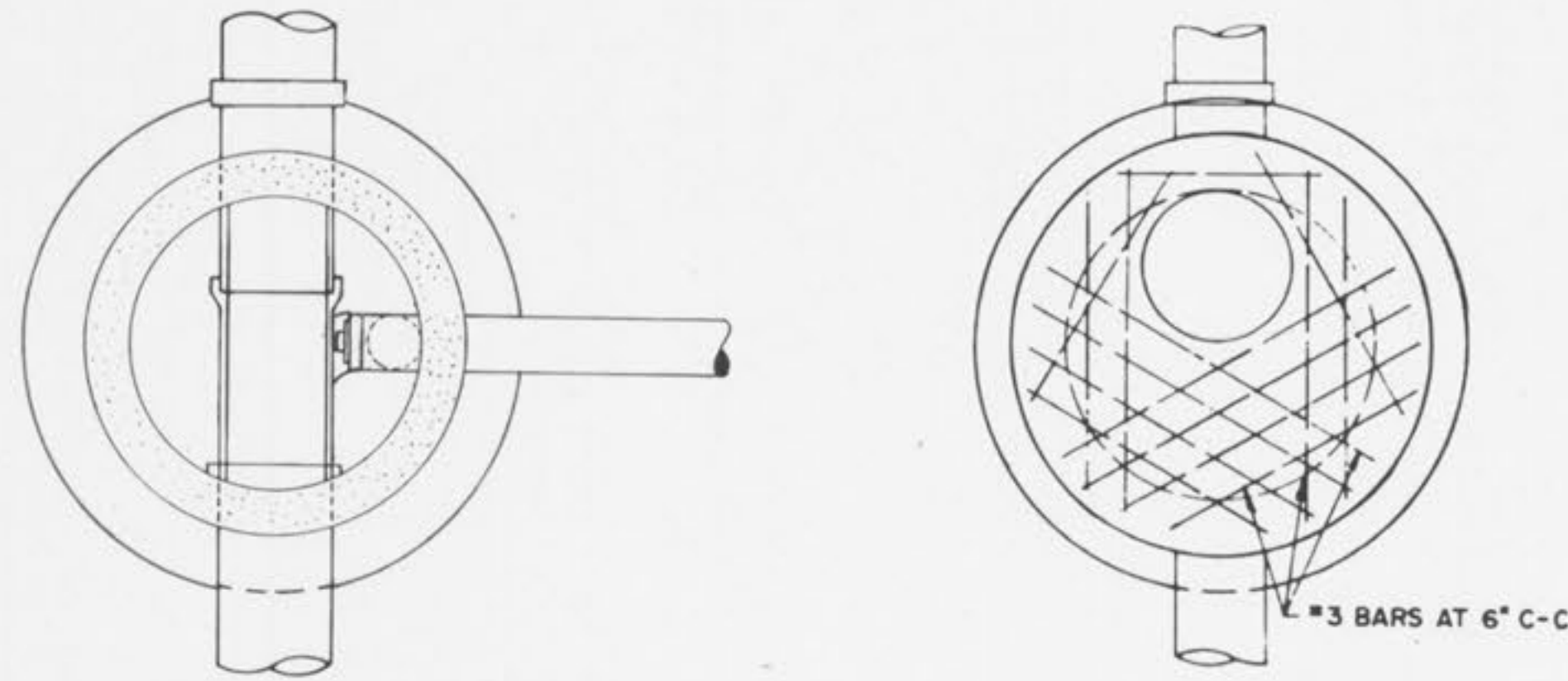
| Diameter of Pipe (Inches) | ROUND PIPE | | HORIZONTAL ELLIPTICAL PIPE | |
|---------------------------|------------|----------|----------------------------|----------|
| | Excavation | Backfill | Excavation | Backfill |
| 4 | 1.00 | 1.00 | 1.00 | 1.00 |
| 6 | 1.00 | 1.00 | 1.00 | 1.00 |
| 8 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10 | 1.00 | 1.00 | 1.00 | 1.00 |
| 12 | 1.00 | 1.00 | 1.00 | 1.00 |
| 15 | 1.00 | 1.00 | 1.00 | 1.00 |
| 18 | 1.00 | 1.00 | 1.00 | 1.00 |
| 21 | 1.00 | 1.00 | 1.00 | 1.00 |
| 24 | 1.00 | 1.00 | 1.00 | 1.00 |
| 27 | 1.00 | 1.00 | 1.00 | 1.00 |
| 30 | 1.00 | 1.00 | 1.00 | 1.00 |
| 36 | 1.00 | 1.00 | 1.00 | 1.00 |
| 42 | 1.00 | 1.00 | 1.00 | 1.00 |
| 48 | 1.00 | 1.00 | 1.00 | 1.00 |
| 54 | 1.00 | 1.00 | 1.00 | 1.00 |
| 60 | 1.00 | 1.00 | 1.00 | 1.00 |
| 66 | 1.00 | 1.00 | 1.00 | 1.00 |
| 72 | 1.00 | 1.00 | 1.00 | 1.00 |
| 78 | 1.00 | 1.00 | 1.00 | 1.00 |
| 84 | 1.00 | 1.00 | 1.00 | 1.00 |
| 90 | 1.00 | 1.00 | 1.00 | 1.00 |
| 96 | 1.00 | 1.00 | 1.00 | 1.00 |
| 102 | 1.00 | 1.00 | 1.00 | 1.00 |
| 108 | 1.00 | 1.00 | 1.00 | 1.00 |
| 114 | 1.00 | 1.00 | 1.00 | 1.00 |
| 120 | 1.00 | 1.00 | 1.00 | 1.00 |
| 126 | 1.00 | 1.00 | 1.00 | 1.00 |
| 132 | 1.00 | 1.00 | 1.00 | 1.00 |
| 138 | 1.00 | 1.00 | 1.00 | 1.00 |
| 144 | 1.00 | 1.00 | 1.00 | 1.00 |
| 150 | 1.00 | 1.00 | 1.00 | 1.00 |
| 156 | 1.00 | 1.00 | 1.00 | 1.00 |
| 162 | 1.00 | 1.00 | 1.00 | 1.00 |
| 168 | 1.00 | 1.00 | 1.00 | 1.00 |
| 174 | 1.00 | 1.00 | 1.00 | 1.00 |
| 180 | 1.00 | 1.00 | 1.00 | 1.00 |
| 186 | 1.00 | 1.00 | 1.00 | 1.00 |
| 192 | 1.00 | 1.00 | 1.00 | 1.00 |
| 198 | 1.00 | 1.00 | 1.00 | 1.00 |
| 204 | 1.00 | 1.00 | 1.00 | 1.00 |
| 210 | 1.00 | 1.00 | 1.00 | 1.00 |
| 216 | 1.00 | 1.00 | 1.00 | 1.00 |
| 222 | 1.00 | 1.00 | 1.00 | 1.00 |
| 228 | 1.00 | 1.00 | 1.00 | 1.00 |
| 234 | 1.00 | 1.00 | 1.00 | 1.00 |
| 240 | 1.00 | 1.00 | 1.00 | 1.00 |
| 246 | 1.00 | 1.00 | 1.00 | 1.00 |
| 252 | 1.00 | 1.00 | 1.00 | 1.00 |
| 258 | 1.00 | 1.00 | 1.00 | 1.00 |
| 264 | 1.00 | 1.00 | 1.00 | 1.00 |
| 270 | 1.00 | 1.00 | 1.00 | 1.00 |
| 276 | 1.00 | 1.00 | 1.00 | 1.00 |
| 282 | 1.00 | 1.00 | 1.00 | 1.00 |
| 288 | 1.00 | 1.00 | 1.00 | 1.00 |
| 294 | 1.00 | 1.00 | 1.00 | 1.00 |
| 300 | 1.00 | 1.00 | 1.00 | 1.00 |



STATE OF MISSOURI
REGISTERED PROFESSIONAL ENGINEER
MARCUS JOHN HACKSTADT
NUMBER 8-22029

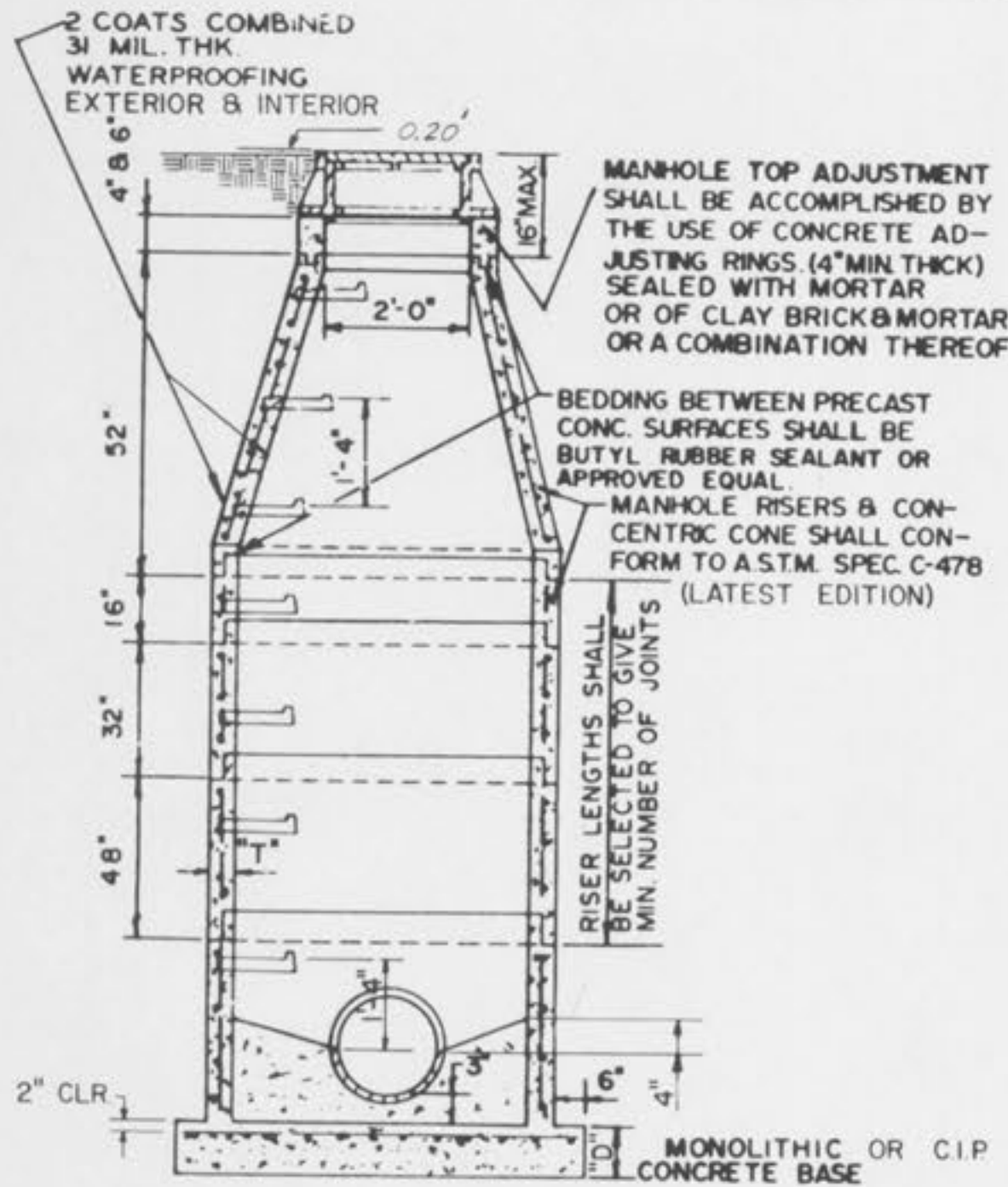
| WALL THICKNESS | |
|----------------|------------------|
| DIA. M.H. | "T" DIM PRE CAST |
| 42" & 48" | 5" |
| 60" | 6" |
| 72" | 7" |

| MANHOLE BASE THICKNESS | |
|------------------------|-----------------------------------|
| DEPTH (FEET) | "D" DIM. |
| 0-20 | 8" w/ 4 BARS @ 12" CTRS EACH WAY |
| 20-30 | 8" w/ 4 BARS @ 9" CTRS EACH WAY |
| 30-40 | 10" w/ 5 BARS @ 10" CTRS EACH WAY |

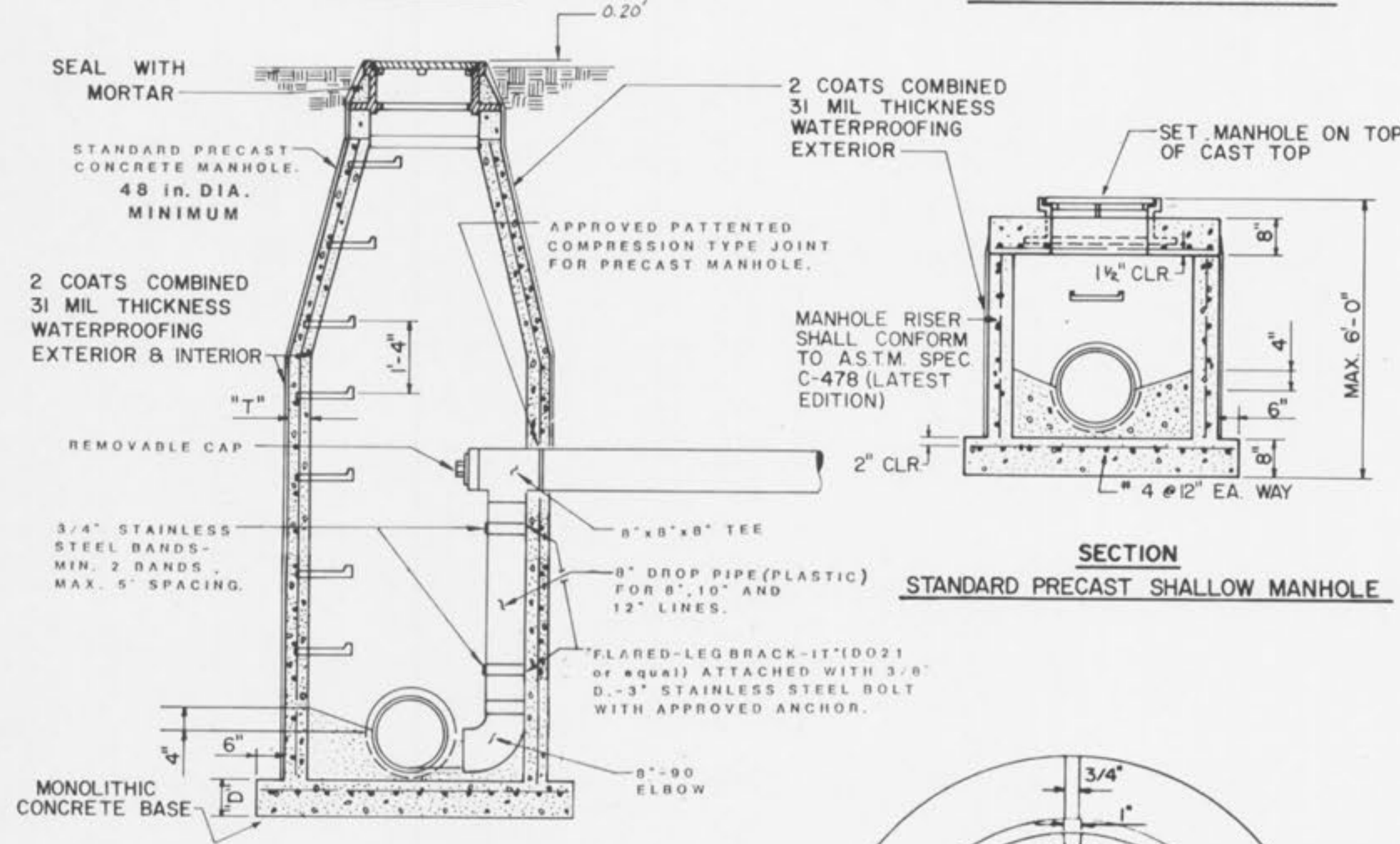


PLAN
DROP MANHOLE

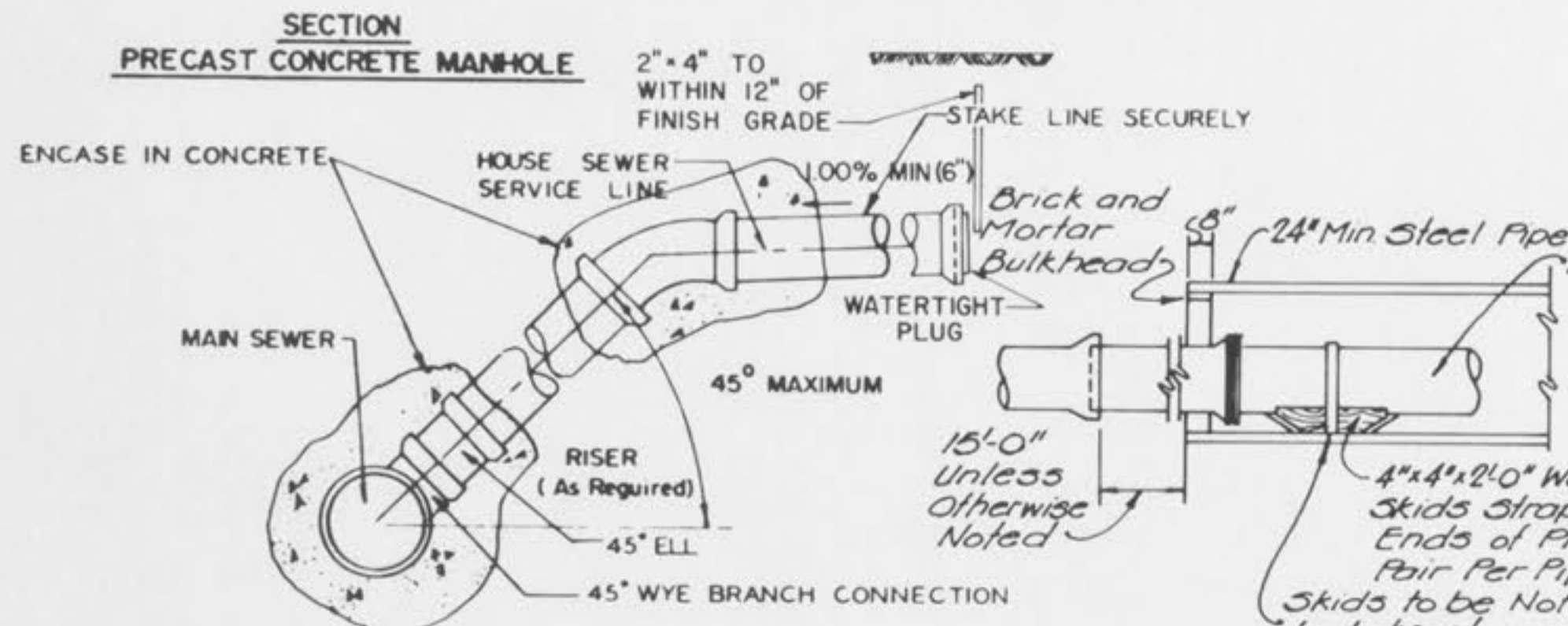
PLAN
STANDARD SHALLOW MANHOLE



SECTION
PRECAST CONCRETE MANHOLE



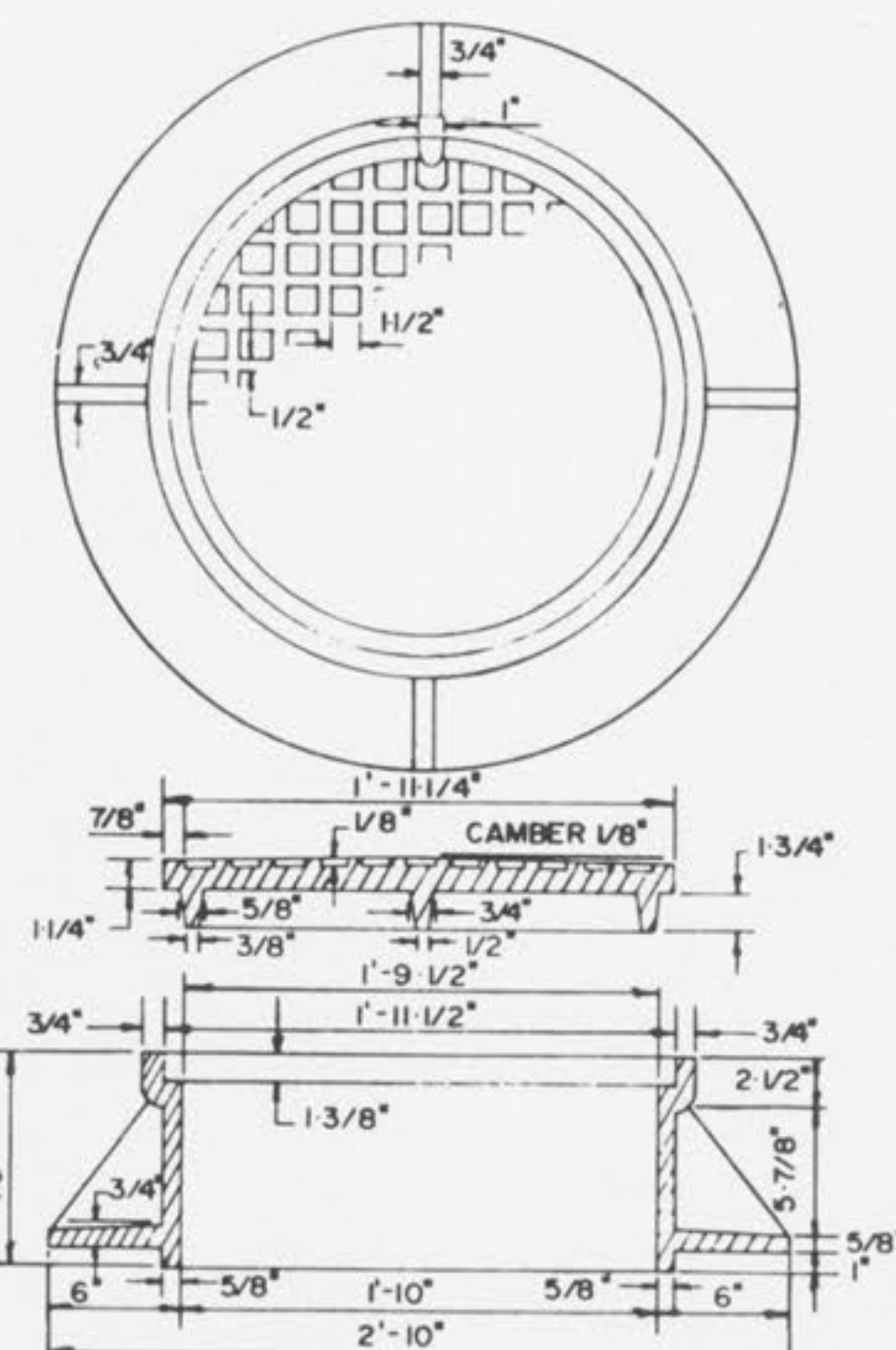
SECTION
STANDARD PRECAST SHALLOW MANHOLE



SEWER SERVICE CONNECTION

NOTES:

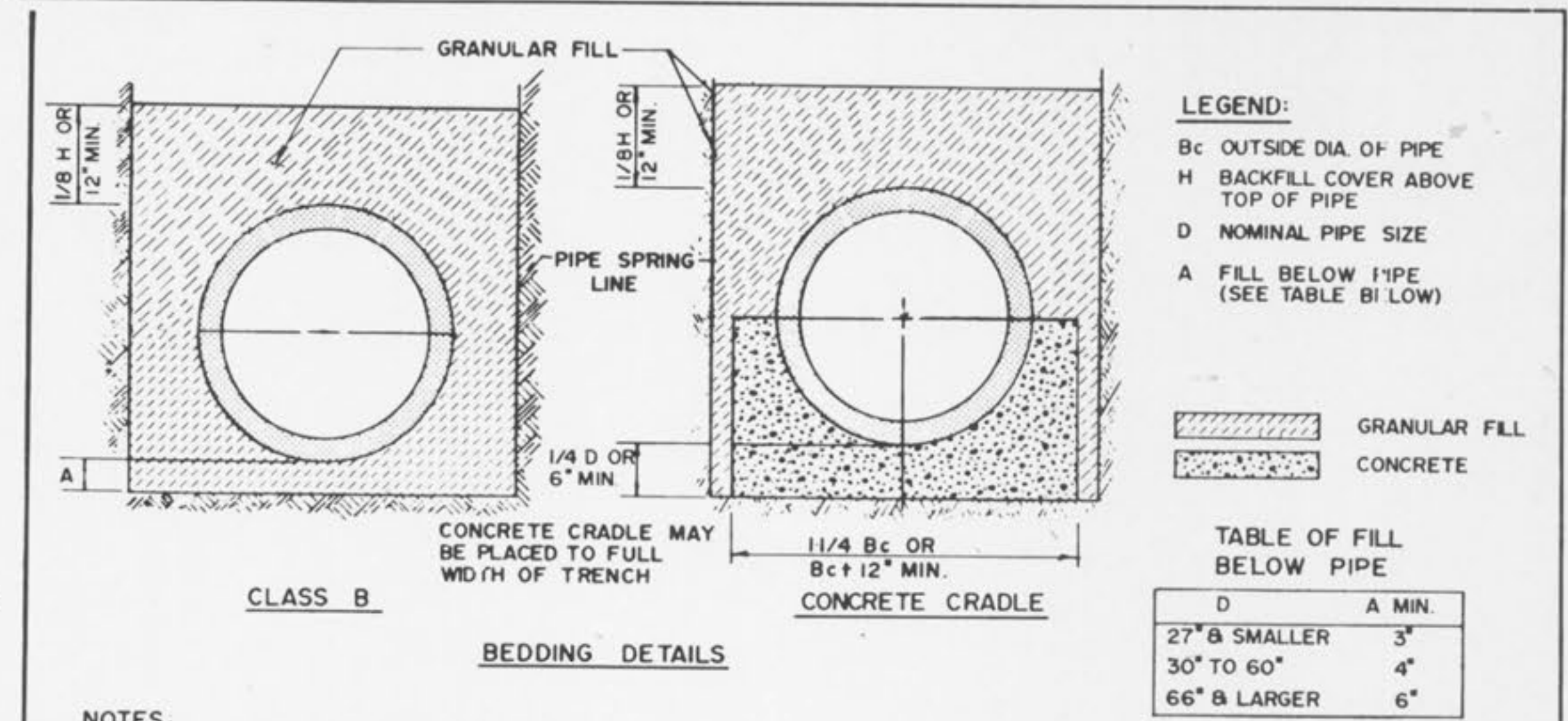
1. ANY MATERIAL EXCAVATED BENEATH PIPE ENTERING OR LEAVING MANHOLES SHALL BE REPLACED WITH CONCRETE.
2. ALL MANHOLE RINGS AND ADJUSTING RINGS SHALL BE SET IN MORTAR.
3. INSIDE DIAMETER OF MANHOLES TO BE 4'-0" FOR PIPE 21" & SMALLER, 5'-0" FOR PIPE 24" THRU 30", 6'-0" FOR PIPE OVER 30"
4. PLASTERING OF INSIDE OF MANHOLES SHALL BE THE OPTION OF THE CONTRACTOR.
5. ALL SEWERS EXTENDING FROM MANHOLES SHALL BE SUPPORTED WITH CONCRETE TO FIRST JOINT.
6. CONTRACTOR SHALL BE PAID FOR 6" CONCRETE ENCASUREMENT AROUND PIPE AS SHOWN IN DETAIL.
7. LAMP LINES BEFORE AND AFTER INSTALLATION OF CONCRETE ENCASUREMENT.
8. PRECAST MANHOLE SHALL BE WATERPROOFED OUTSIDE.
9. ALL CONC. MANHOLES TO HAVE RUBBER GASKET ON ALL PIPE OPENINGS.
10. ALL PVC PIPE TO BE SDR-35.



STANDARD MANHOLE RING AND COVER

CLAY & BAILEY - NO. 2008 (NO. 2014 OR) *
NEENAH - R-1736 (SPECIAL R-1736) *
DEETER - 1315 (NO. 1313 O-RING) *
OR EQUAL

* INDICATES OPTIONAL BOLT DOWN LID



BEDDING DETAILS

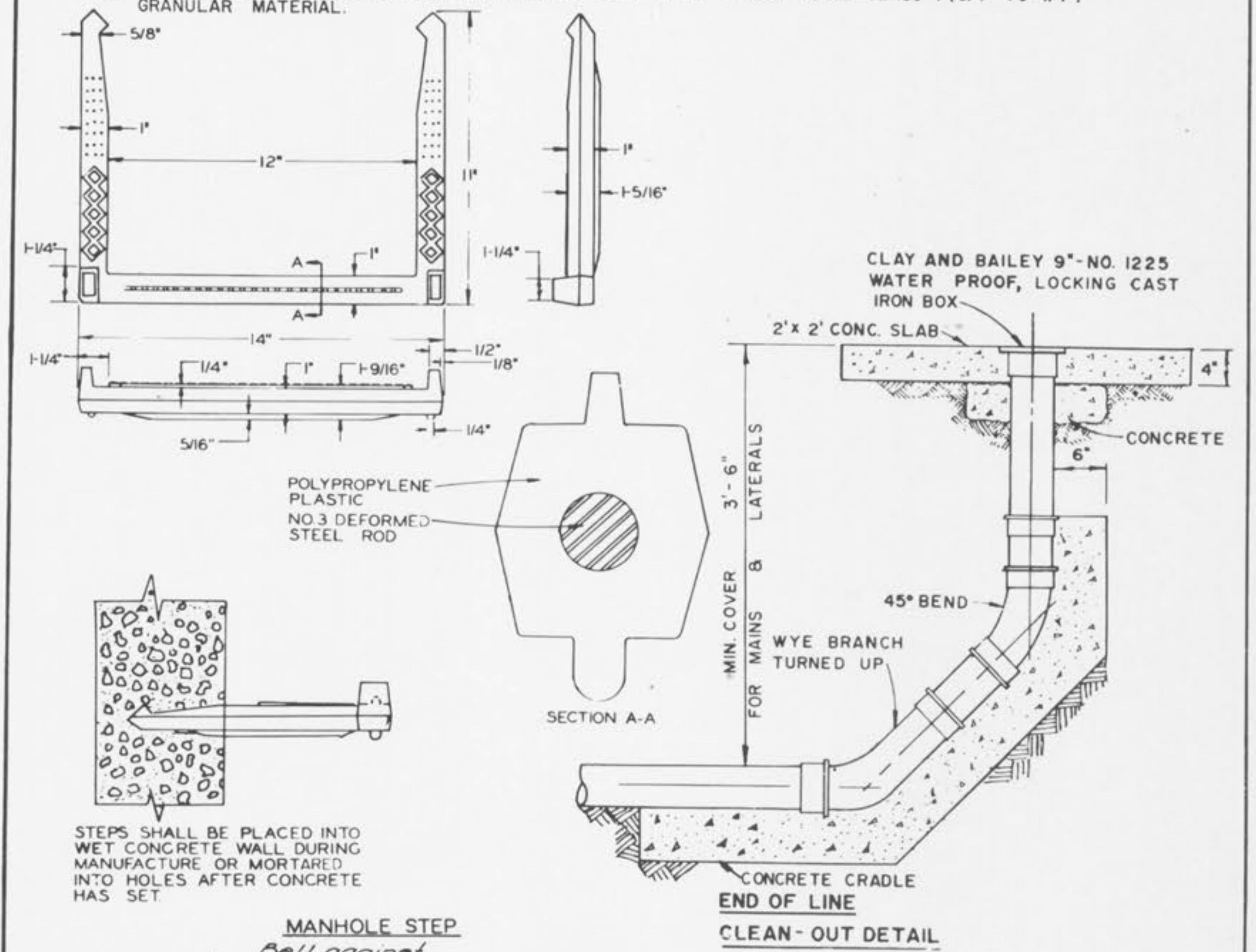
LEGEND:
Bc OUTSIDE DIA. OF PIPE
H BACKFILL COVER ABOVE TOP OF PIPE
D NOMINAL PIPE SIZE
A FILL BELOW PIPE (SEE TABLE BI LOW)

GRANULAR FILL
CONCRETE

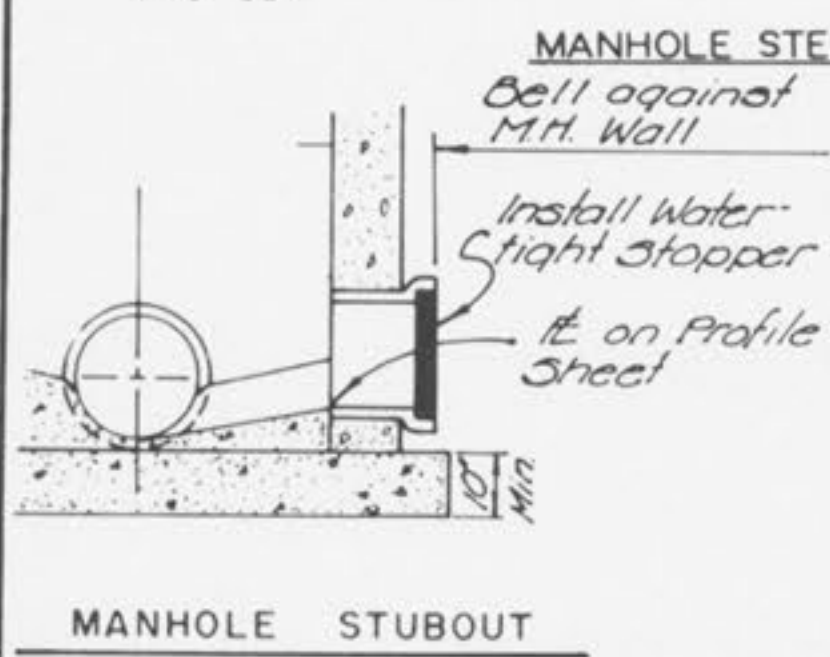
| TABLE OF FILL BELOW PIPE | |
|--------------------------|--------|
| D | A MIN. |
| 27" & SMALLER | 3" |
| 30" TO 60" | 4" |
| 66" & LARGER | 6" |

NOTES:

1. GRANULAR FILL TO BE CRUSHED STONE OR PEA GRAVEL WITH NOT LESS 95% PASSING 1/2" AND NOT LESS THAN 95% TO BE RETAINED ON A #4, TO BE PLACED IN NOT MORE THAN 6" LAYERS AND COMPACTED BY SLICING WITH A SHOVEL (1/2" & #4 REFERS TO SIEVE SIZE)
2. ALL BEDDING DETAILS APPLY TO BUILDING SEWER SERVICE LINES AS WELL AS OTHER SEWERS.
3. CONCRETE CRADLE SHALL BE USED WHEN TRENCH WIDTH EXCEEDS 24" PLUS THE PIPE DIAMETER.
4. PVC PIPE SHALL BE BEDDED IN ACCORDANCE WITH ASTM D 2321 USING CLASS I (3/4" TO 1/4") GRANULAR MATERIAL.



STEPS SHALL BE PLACED INTO WET CONCRETE WALL DURING MANUFACTURE OR MORTARED INTO HOLES AFTER CONCRETE HAS SET



MANHOLE STUBOUT

GBA
GEORGE BUTLER ASSOCIATES
CONSULTING ENGINEERS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS

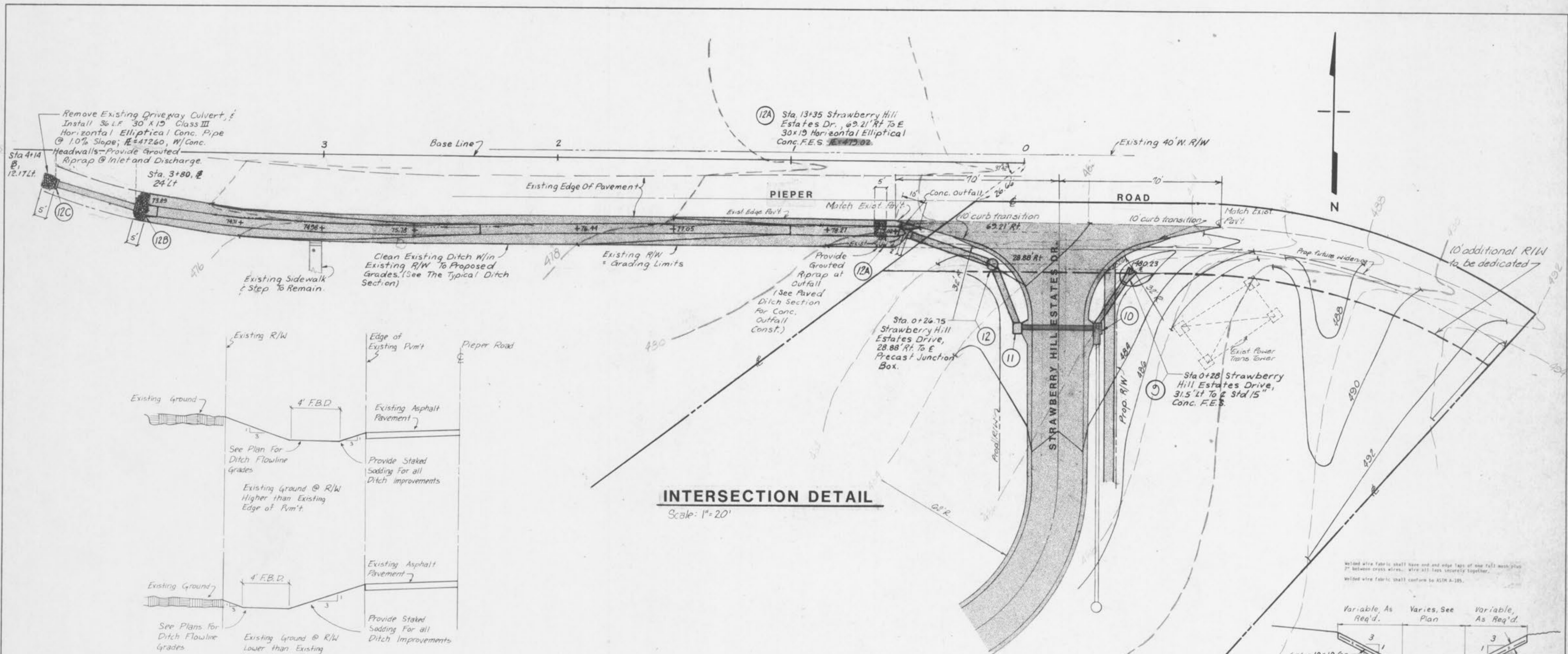
OFFICES:
SUITE 300 A FAIRWAY OFFICE CENTER
4210 JOHNSON DRIVE, SHAWNEE MISSOURI, KANSAS 66209
1100 CITY CENTER SQUARE
1100 MAIN / KANSAS CITY / MISSOURI 64105
SUITE 134 EAST SIDE PLAZA II
6700 CORPORATE DRIVE, KANSAS CITY, MISSOURI 64120

**SANITARY SEWER EXTENSIONS
STRAWBERRY HILL ESTATES
CONSTRUCTION DETAILS
FOR THE
CITY OF O'FALLON, MISSOURI**

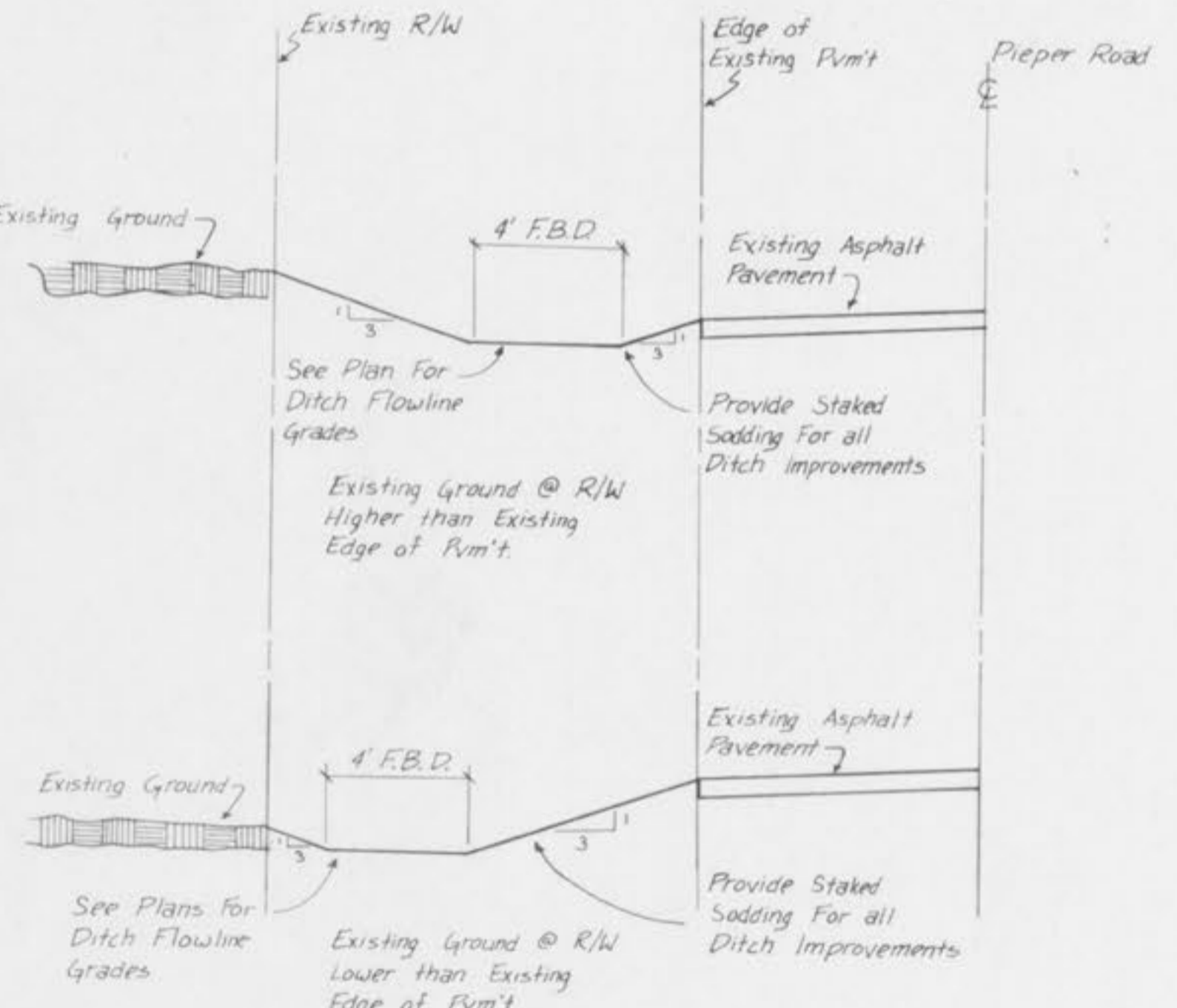
DESIGNED BY Std DRAWN BY Std CHECKED BY Std

JOB NO. _____
DATE _____
SCALE *As Shown*
SHEET NO. **9** OF 12

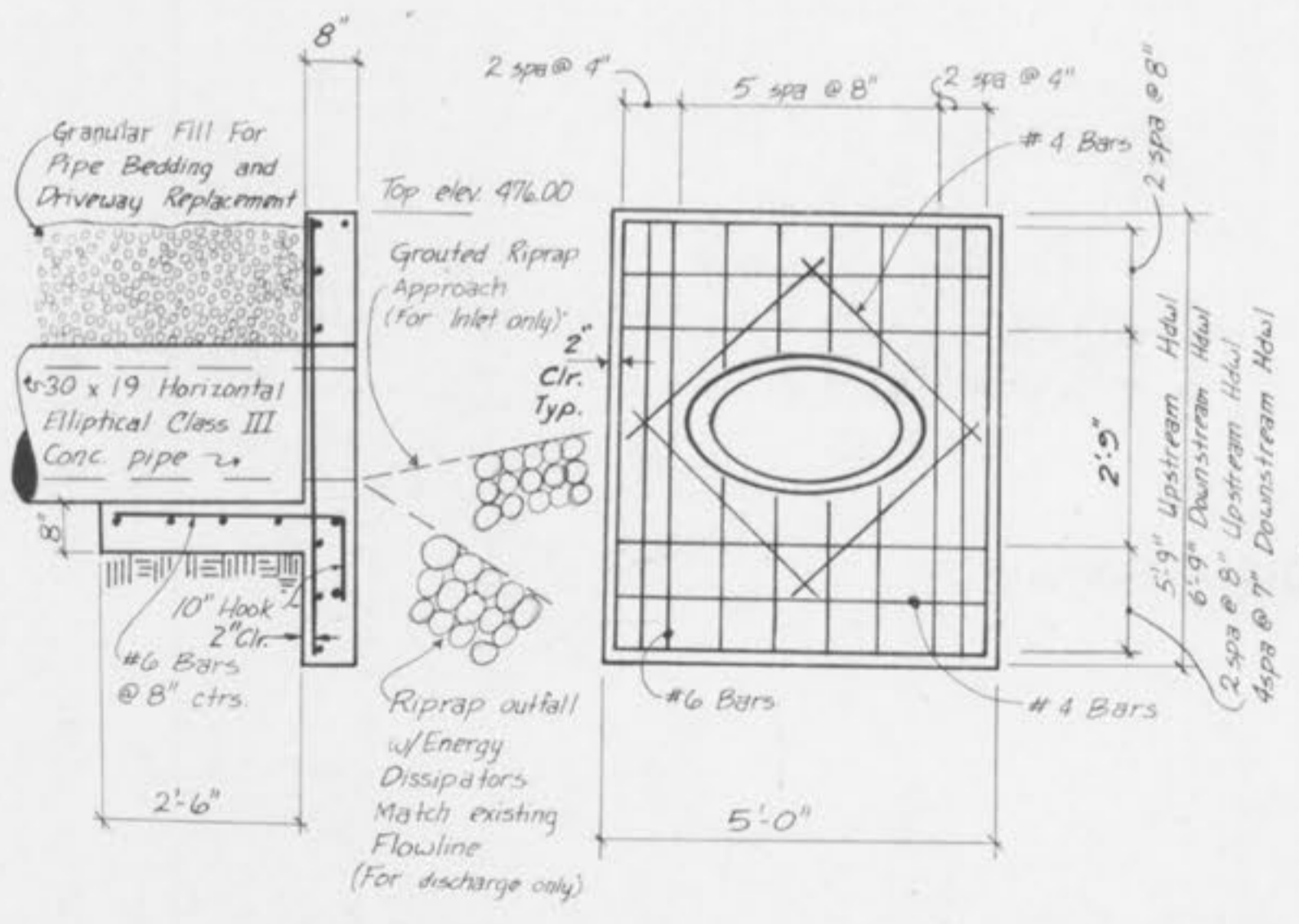
Revised Aug. 6, 1987, By M.J.H. & F.L.K.



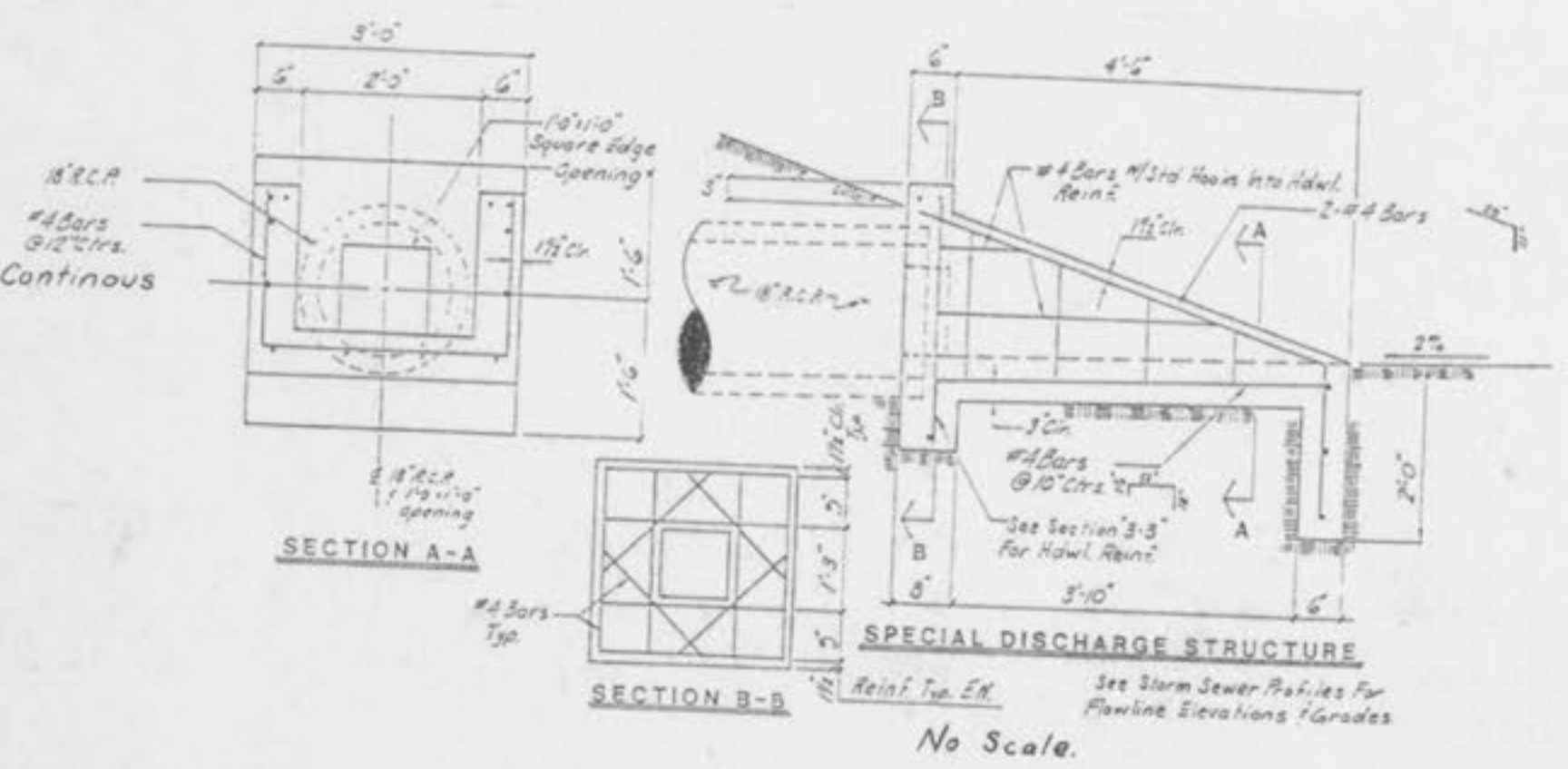
INTERSECTION DETAIL
Scale: 1" = 20'



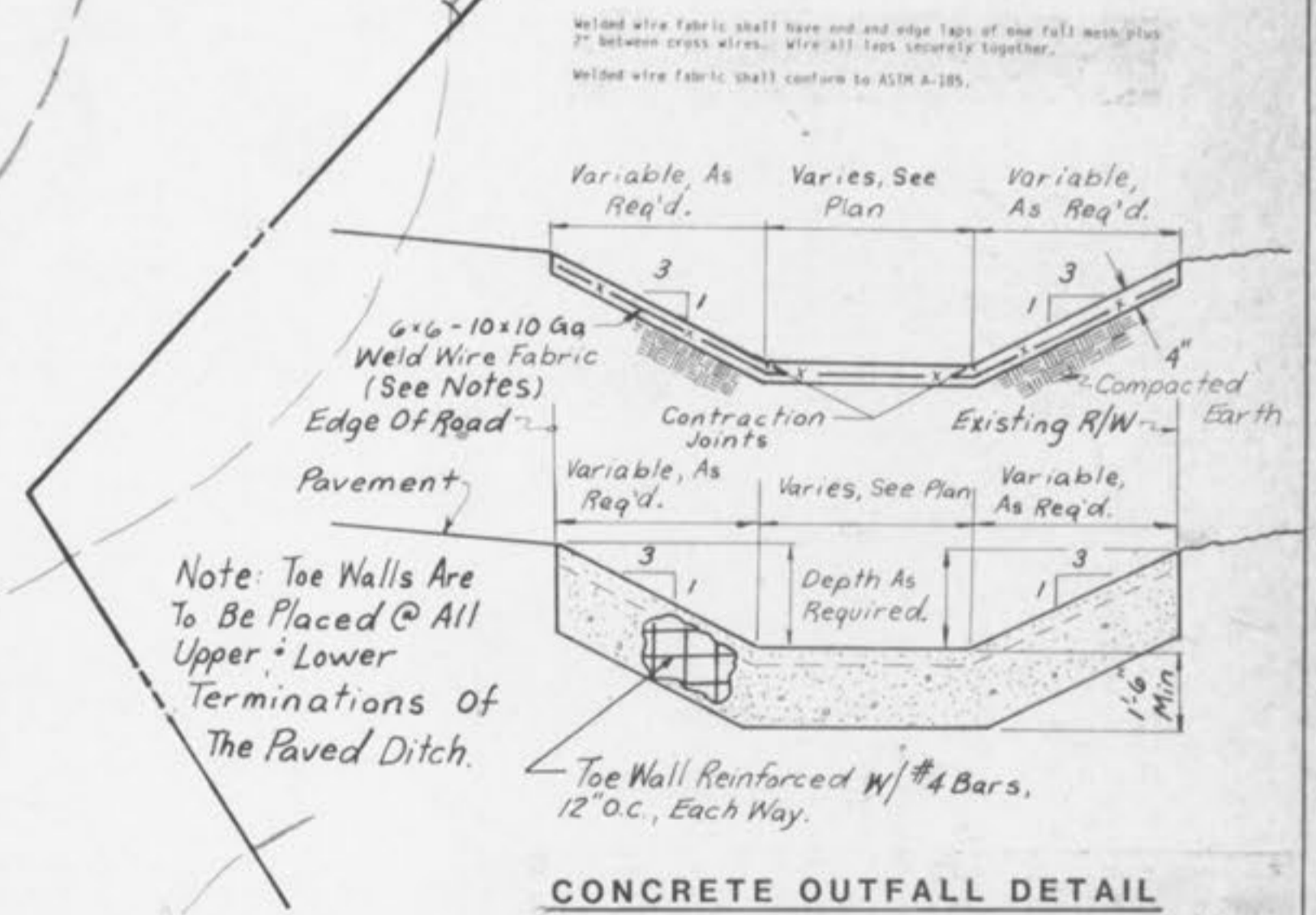
TYPICAL DITCH SECTIONS
No Scale.



HEAD WALL DETAIL
No Scale.



SPECIAL DISCHARGE STRUCTURE
No Scale.



CONCRETE OUTFALL DETAIL
No Scale.

CONCRETE AND REINFORCING STEEL

- Concrete shall develop a minimum compressive strength of 3500 psi at 28 day test. The concrete shall have a minimum of 500 pounds of cement per cubic yard regardless of strength obtained, a maximum of 5.5 gallons of water per 100 pounds of cement and a slump not to exceed 4".
- Concrete shall be air-entrained with 6% air entrainment.
- All concrete is reinforced unless specifically noted as unreinforced.
- No slanting lines shall be indicated in any concrete.
- Reinforcing bars #6 and larger (except ties and stirrups) shall meet ASTM A615 with Supplementary Requirements (S1). Grade 60, smaller bars shall be Grade 65.
- Concrete coverage of reinforcement shall be not less than the following minimum clear distance unless noted otherwise on the drawings:
Cast against earth 3"
Formed concrete exposed to earth or weather 1 1/2"
- Bars must be continuous and vertical reinforcement, unless otherwise noted, shall be lapped 30 bar diameters at splices.
- All bars are to be supported in form and spaced with wire bar supports per ACI "Manual of Standard Practice for Detailing Concrete Structures" (latest edition). Bars shall be securely wired per latest edition of (CSI) Recommended Practice for Placing Reinforcing Bars. Accessories for exposed concrete shall be plastic or have plastic-tipped feet.

GBA
GEORGE BUTLER ASSOCIATES, INC.
CONSULTING ENGINEERS/ARCHITECTS
LANDSCAPE ARCHITECTS/PLANNERS

OFFICES:
ONE PINE RIDGE PLAZA
SUITE 200
807 W. ROSS DRIVE
LENEXA, KANSAS 66242
100 CITY CENTER SQUARE
SUITE 200 / 225 S. MAIN ST.
100 SOUTH
KANSAS CITY, MISSOURI 64105
OTAWA, MISSOURI 63366

THE ENTERPRISE BUILDING
4300 ENTERPRISE ROAD
KANSAS CITY, MISSOURI 64111

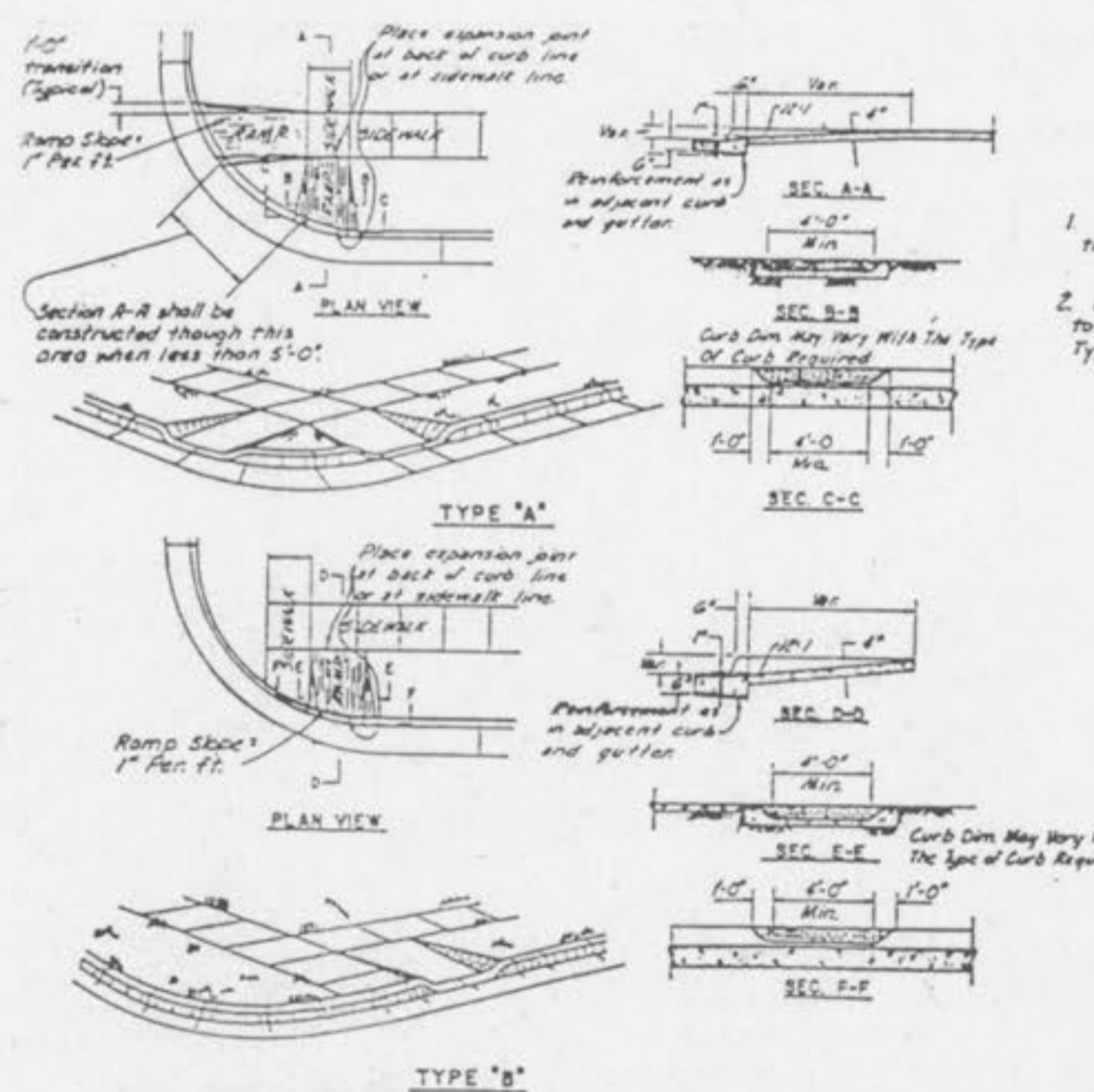
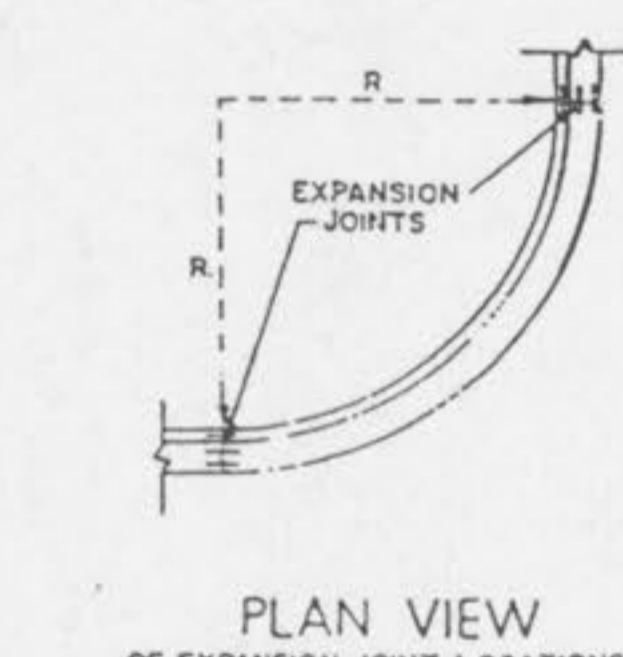
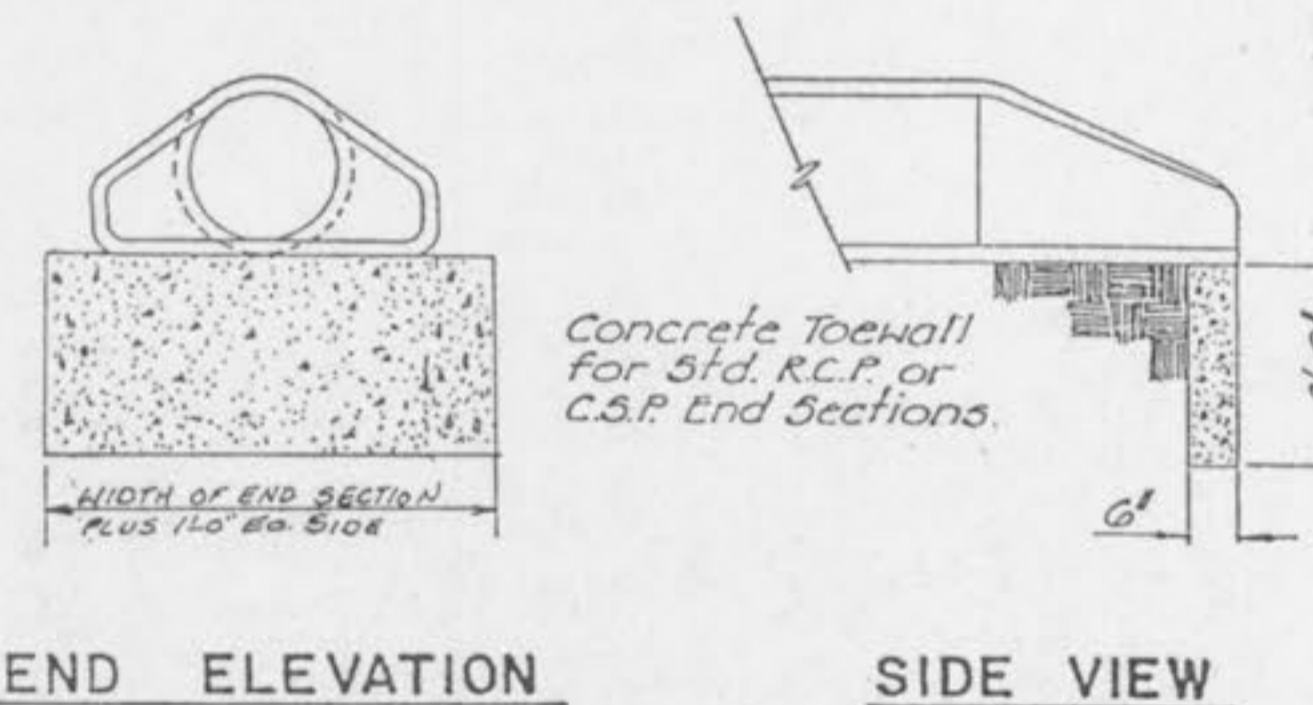
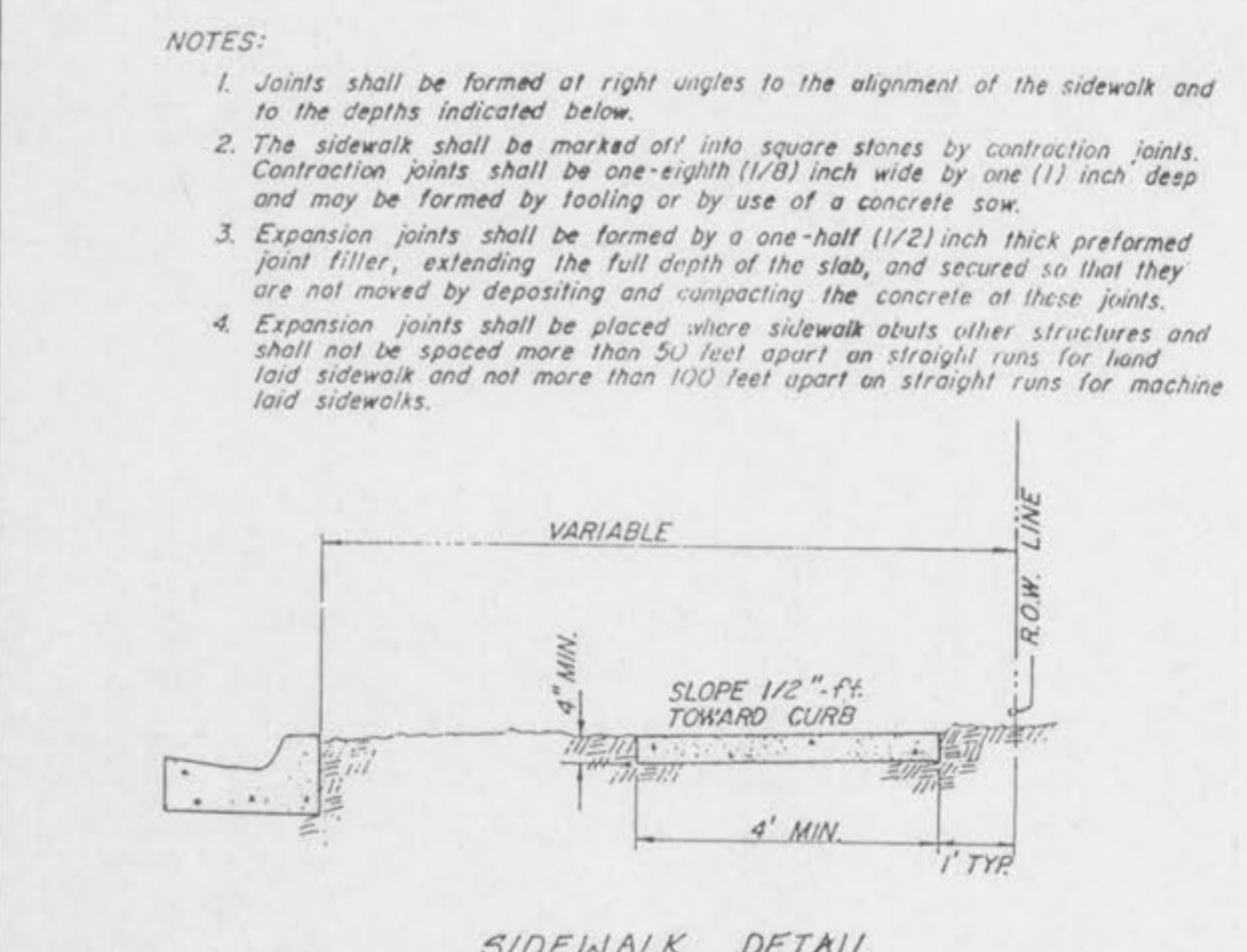
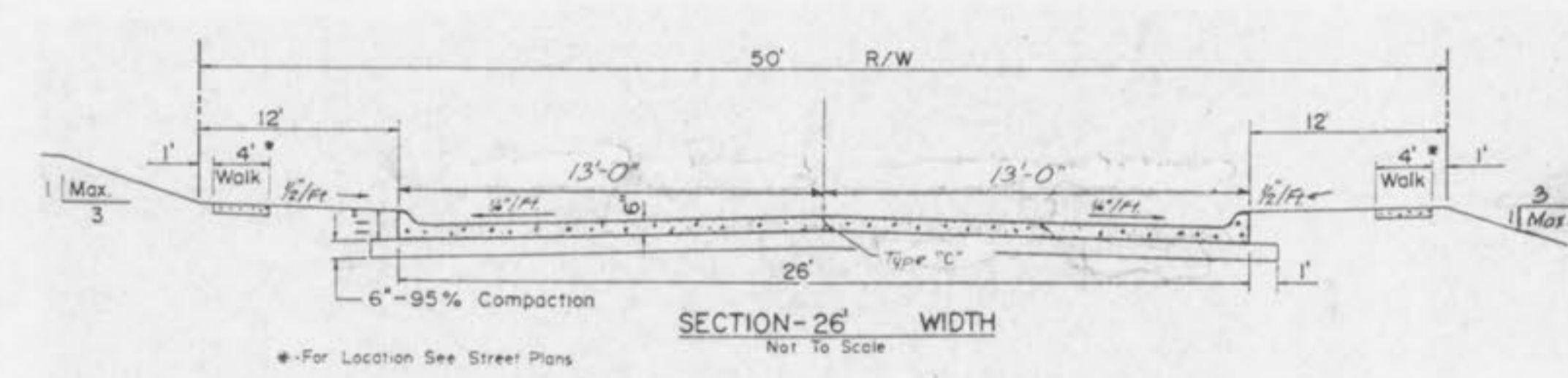
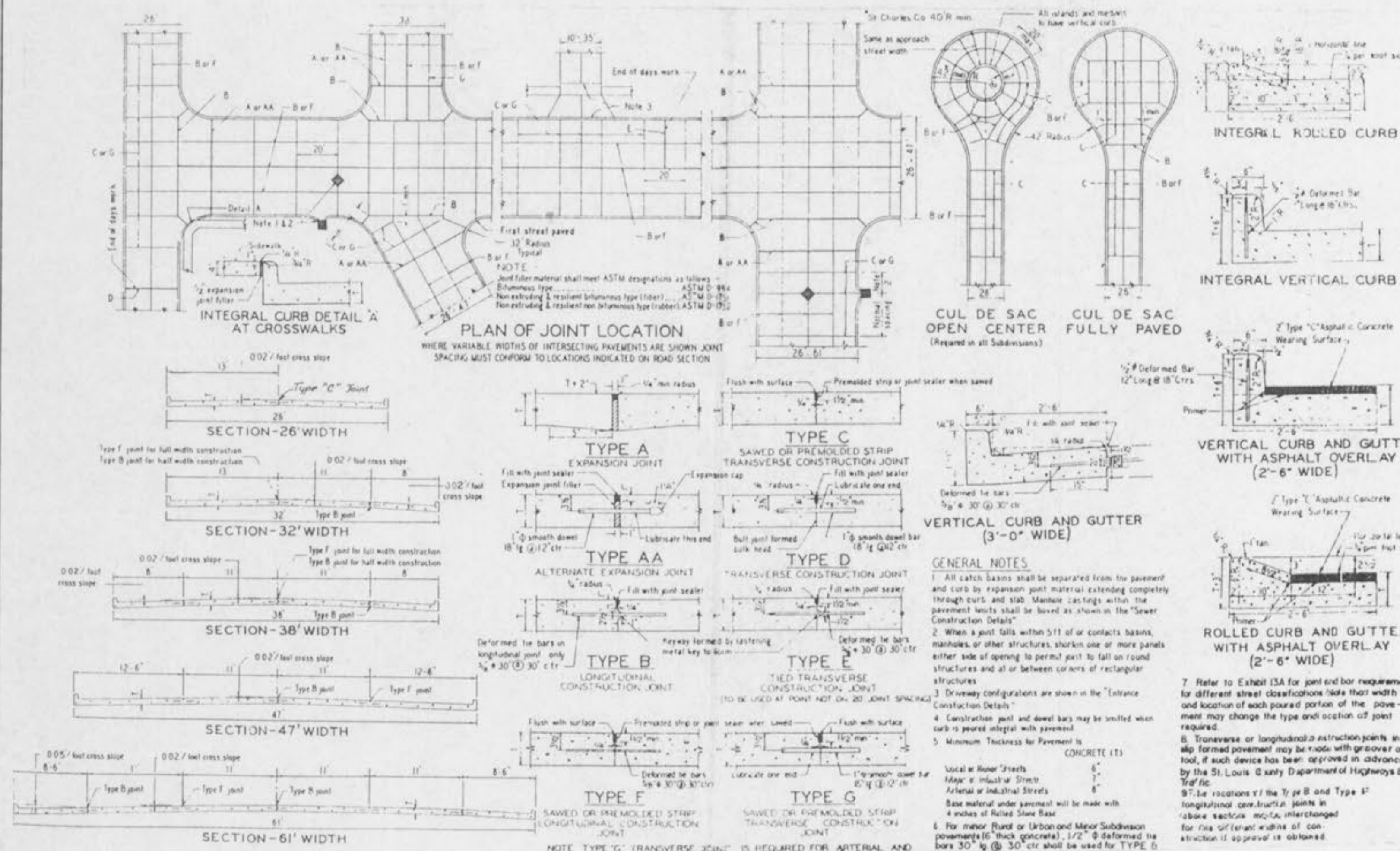
REGISTERED PROFESSIONAL ENGINEER
MARCUS JOHN HACKSTADT
NUMBER E-22009

**STRAWBERRY HILL ESTATES
PIEPER INTERSECTION
DETAIL**

DESIGNED BY M.J.H. DRAWN BY R.E.B. CHECKED BY M.J.H.

JOB NO 87-4788
DATE June 1987
SCALE As shown
SHEET NO 10 OF 12

INTEGRAL CURB PAVEMENT TYPICAL SECTIONS AND DETAILS



CONCRETE TOEWALL DETAILS
N.T.S.

GBA
GEORGE BUTLER ASSOCIATES, INC.
CONSULTING ENGINEERS/ARCHITECTS
LANDSCAPE ARCHITECTS/PLANNERS

OFFICES:
ONE FINE WOOD PLAZA
SUITE 300
807 MELROSE DRIVE
LENEXA - KANSAS 66157
THE CITY CENTER SQUARE
100 SOUTH
KANSAS CITY - MISSOURI 64101

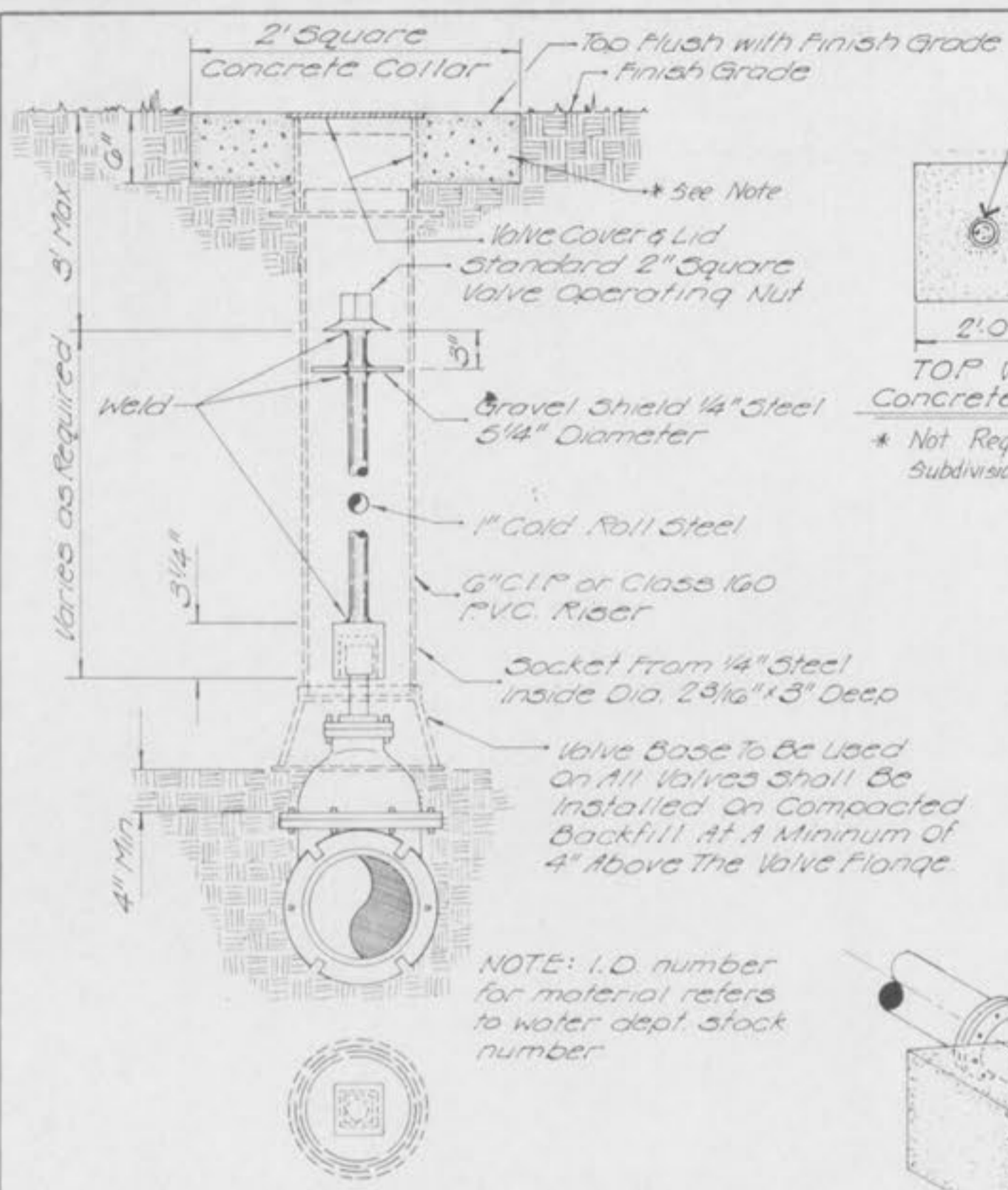
THE ENTERPRISE BUILDING
800 ENTERPRISE ROAD
KANSAS CITY - MISSOURI 64108
COLONIAL PLAZA
SUITE 4
118 E. 51st
O'FALLON - MISSOURI 63366

STRAWBERRY HILL ESTATES

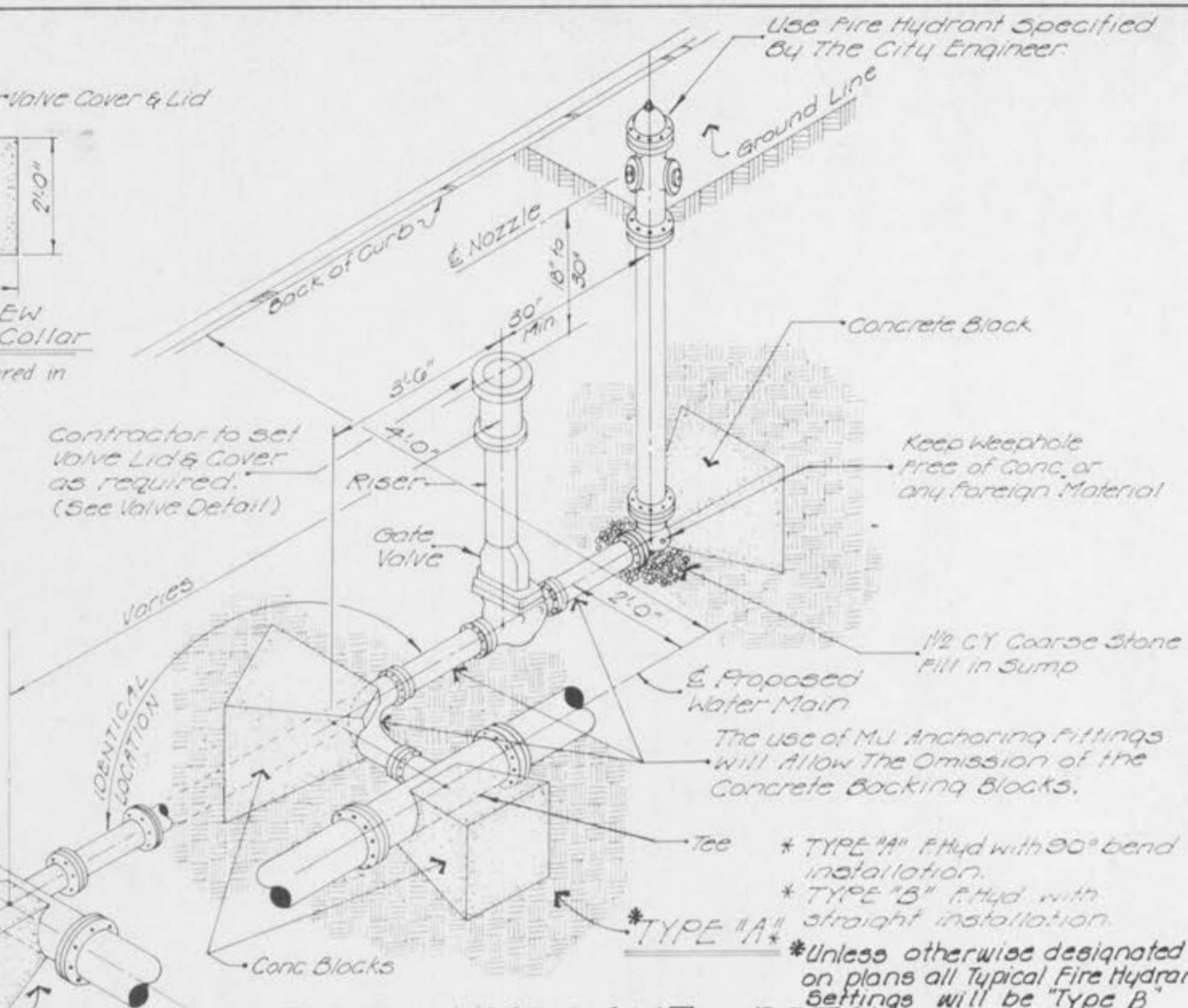
MISC. DETAILS

DESIGNED BY N.U.H. DRAWN BY R.E.B. CHECKED BY G.R.H.

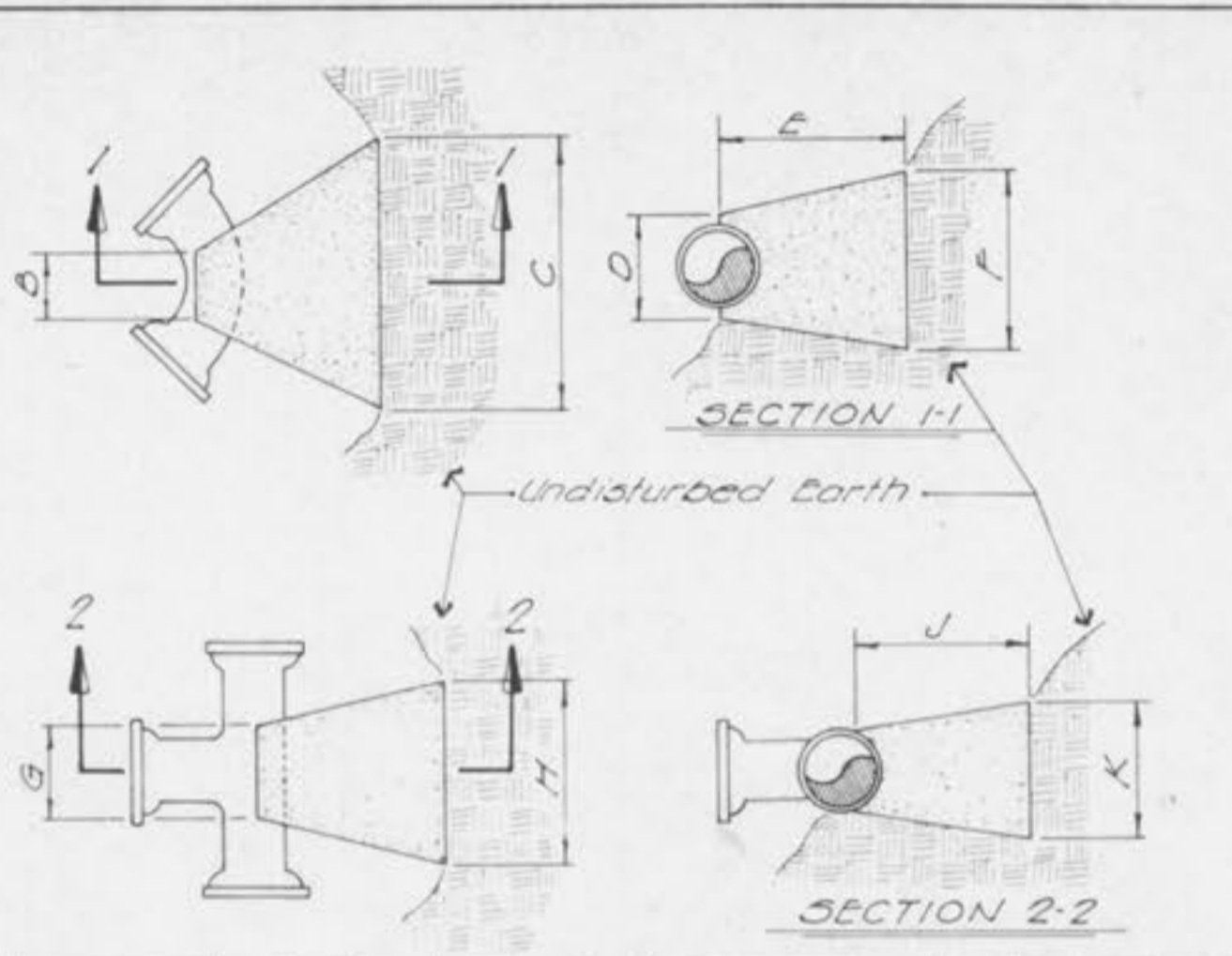
JOB NO. 87-4780
DATE June, 1987
SCALE No Scale
SHEET NO. 11 of 12



WATER VALVE DETAIL



FIRE HYDRANT DETAIL



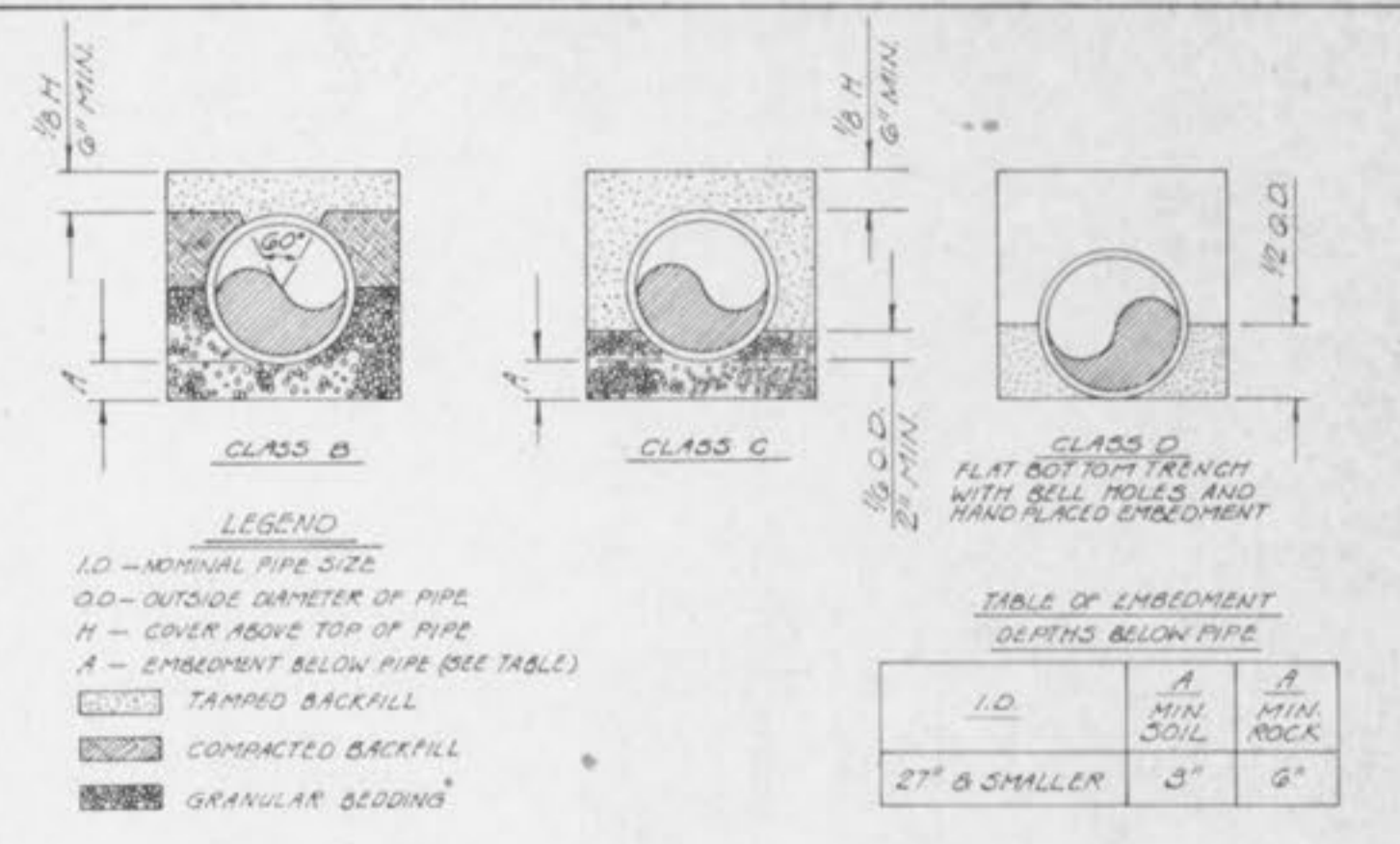
| BENDS | B | C | D | E | F |
|------------|----|-----|-----|-----|-----|
| 6" 11/4" | 8" | 15" | 12" | 24" | 10" |
| 6" 2 1/2" | 6" | 13" | 12" | 24" | 13" |
| 6" 4 1/2" | 8" | 30" | 12" | 24" | 14" |
| 6" 9 1/2" | 6" | 30" | 12" | 24" | 27" |
| 8" 1 1/4" | 8" | 20" | 12" | 24" | 10" |
| 8" 2 1/2" | 8" | 28" | 12" | 24" | 17" |
| 8" 4 1/2" | 8" | 30" | 12" | 24" | 24" |
| 8" 9 1/2" | 8" | 36" | 12" | 24" | 36" |
| 12" 1 1/4" | 8" | 30" | 12" | 24" | 15" |
| 12" 2 1/2" | 8" | 35" | 12" | 24" | 25" |
| 12" 4 1/2" | 8" | 40" | 12" | 24" | 40" |
| 12" 9 1/2" | 8" | 60" | 12" | 24" | 52" |

| TEES | G | H | J | K |
|-----------------|-----|-----|-----|-----|
| 6" x 6" x 6" | 12" | 24" | 24" | 18" |
| 8" x 8" x 8" | 12" | 24" | 24" | 18" |
| 8" x 8" x 6" | 12" | 24" | 24" | 24" |
| 12" x 12" x 6" | 12" | 24" | 24" | 18" |
| 12" x 12" x 12" | 12" | 36" | 24" | 36" |

| CUBIC FEET OF CONCRETE REQUIRED | BEND | 1 1/4" | 2 1/2" | 4 1/2" | 9 1/2" |
|---------------------------------|------|--------|--------|--------|--------|
| 6" | 1.7 | 2.4 | 3.5 | 5.5 | |
| 8" | 2.1 | 3.1 | 5.0 | 6.5 | |
| 12" | 3.7 | 5.3 | 9.7 | 17.5 | |

| TEE X | 6" | 8" | 12" | PLUG |
|-------|-----|-----|------|------|
| 6" | 4.0 | ~ | ~ | 4.0 |
| 8" | 4.0 | 5.0 | ~ | 5.0 |
| 12" | 4.5 | 5.5 | 10.5 | 10.5 |

BACKING BLOCKS



LEGEND

I.D. - NOMINAL PIPE SIZE
 O.D. - OUTSIDE DIAMETER OF PIPE
 H - COVER ABOVE TOP OF PIPE
 A - EMBEDMENT BELOW PIPE (SEE TABLE)

TABLE OF EMBEDMENT DEPTHS BELOW PIPE

| I.D. | A MIN. SOIL | A MIN. ROCK |
|--------------|-------------|-------------|
| 2" & SMALLER | 3" | 6" |

NOTES:

Granular Bedding shall be crushed rock or pea gravel with not less than 95% passing 1/2" (95% passing 3/4" for 30" and larger pipe) and not less than 95% retained on a #4; to be placed in not more than 6" layers and compacted by slicing with a shovel or vibrating.

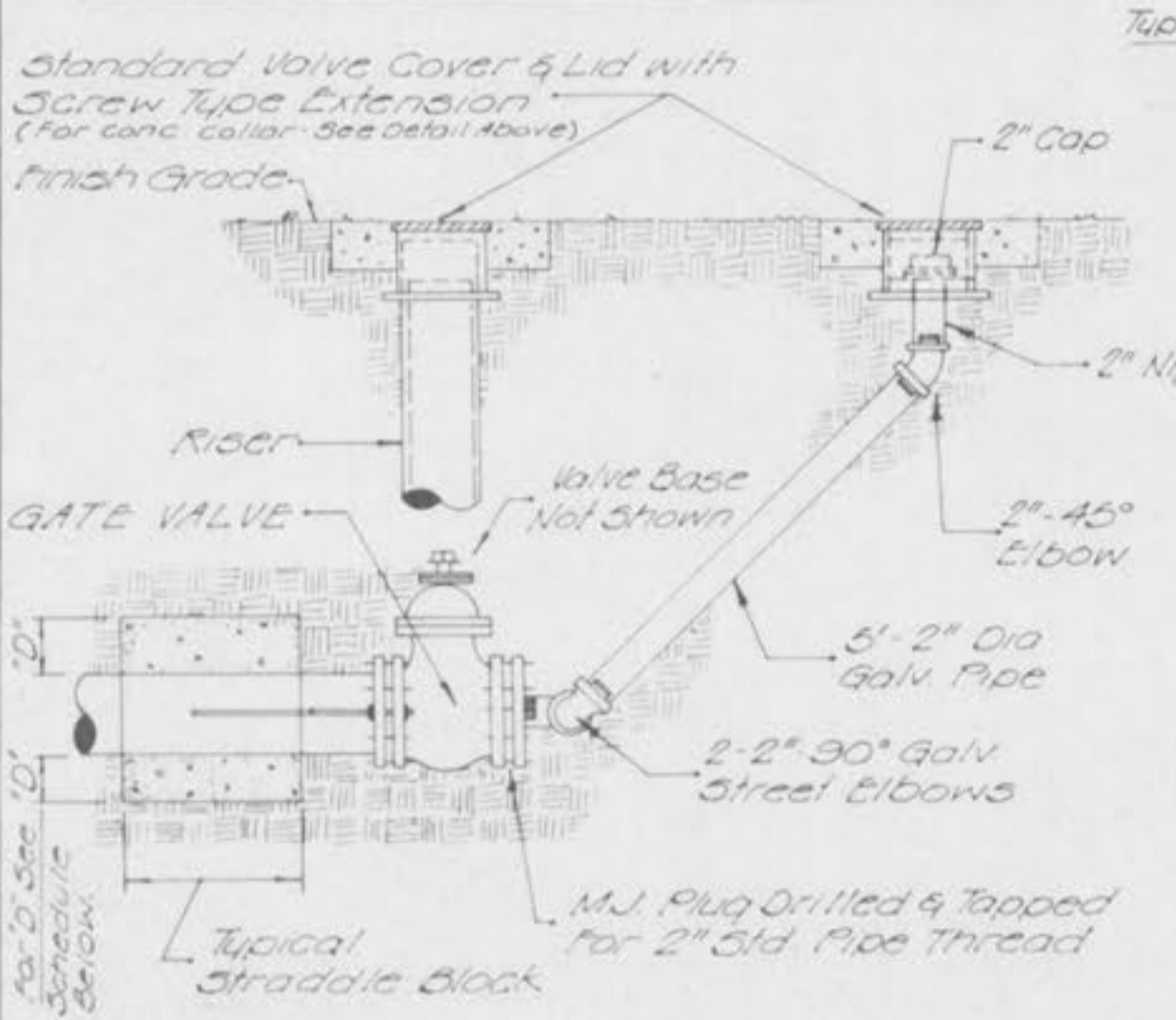
Compacted Backfill shall be finely divided job excavated material free from debris, organic material and stones, placed in uniform layers not more than 6" thick, compacted to 95% maximum density as determined by A.S.T. D698, or graded aggregate. Granular backfill material may be substituted for all or part of compacted backfill.

Tamped Backfill shall be finely divided job excavated material free from debris, organic material and stones, hand placed in uniform layers not more than 8" thick and tamped around conduit pipe. Granular backfill material may be substituted for all or part of tamped backfill.

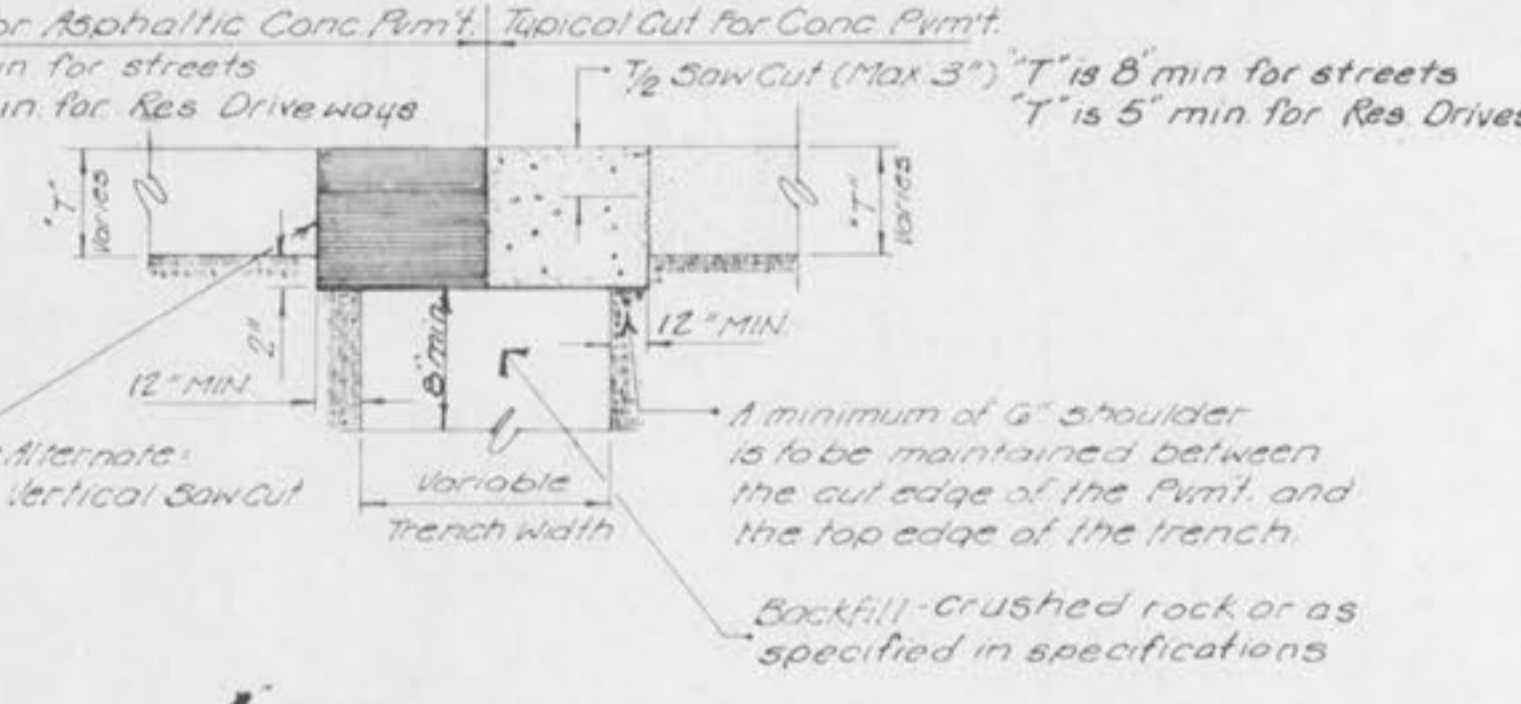
Trench Backfill shall be as required in the "Laying and Backfill" Section of the Detailed Specifications.

Embedment: Embedment shall be class C unless otherwise specified or shown on plans.

WATER MAIN EMBEDMENT

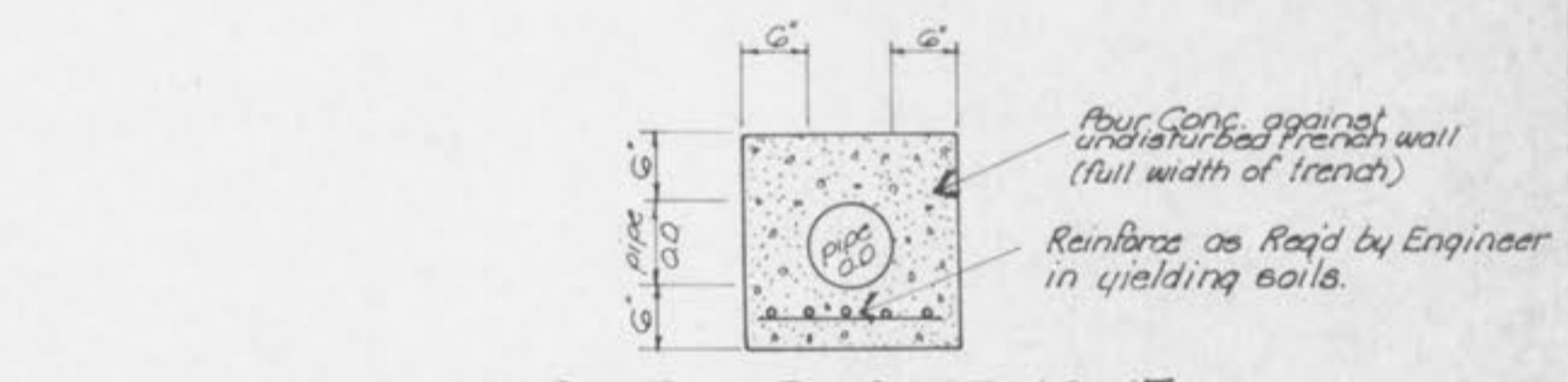


FLUSHING ASSEMBLY

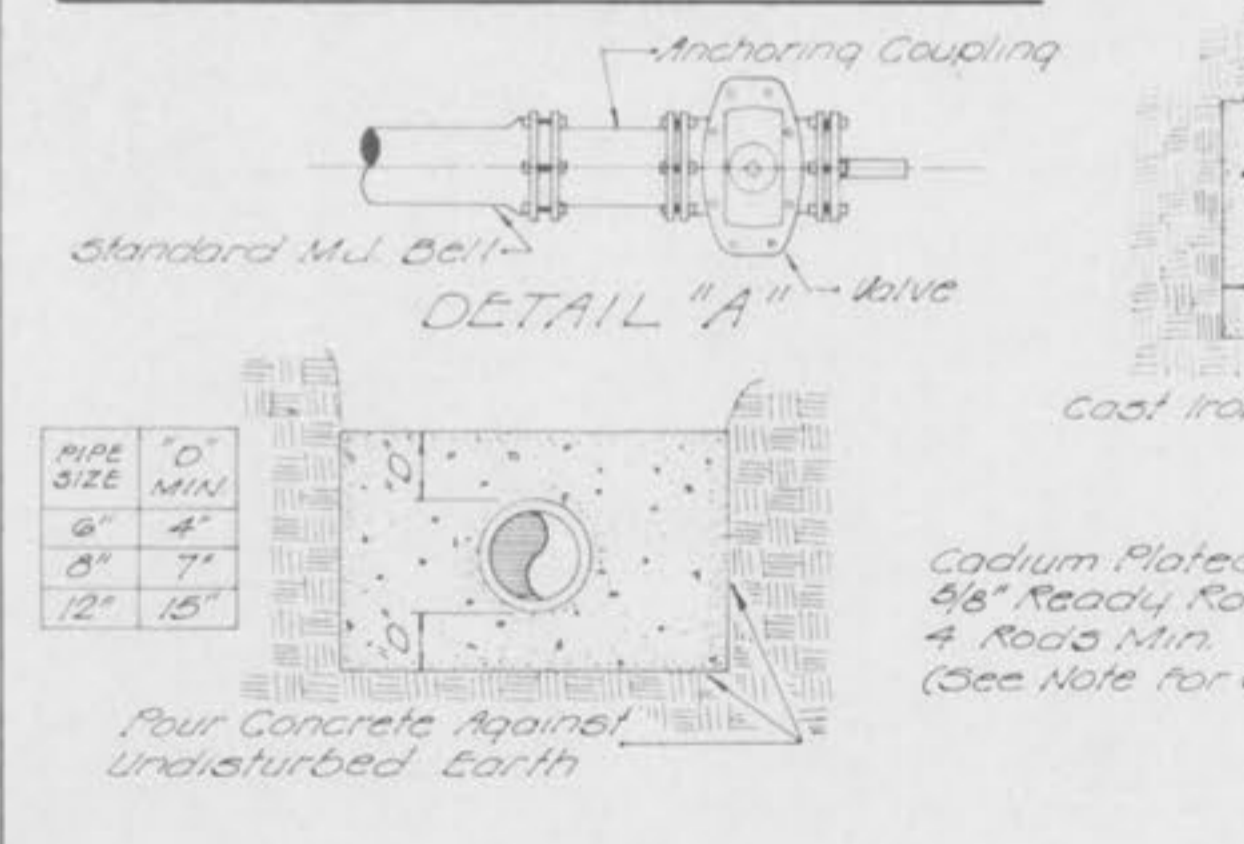


PAVEMENT REPAIR DETAIL

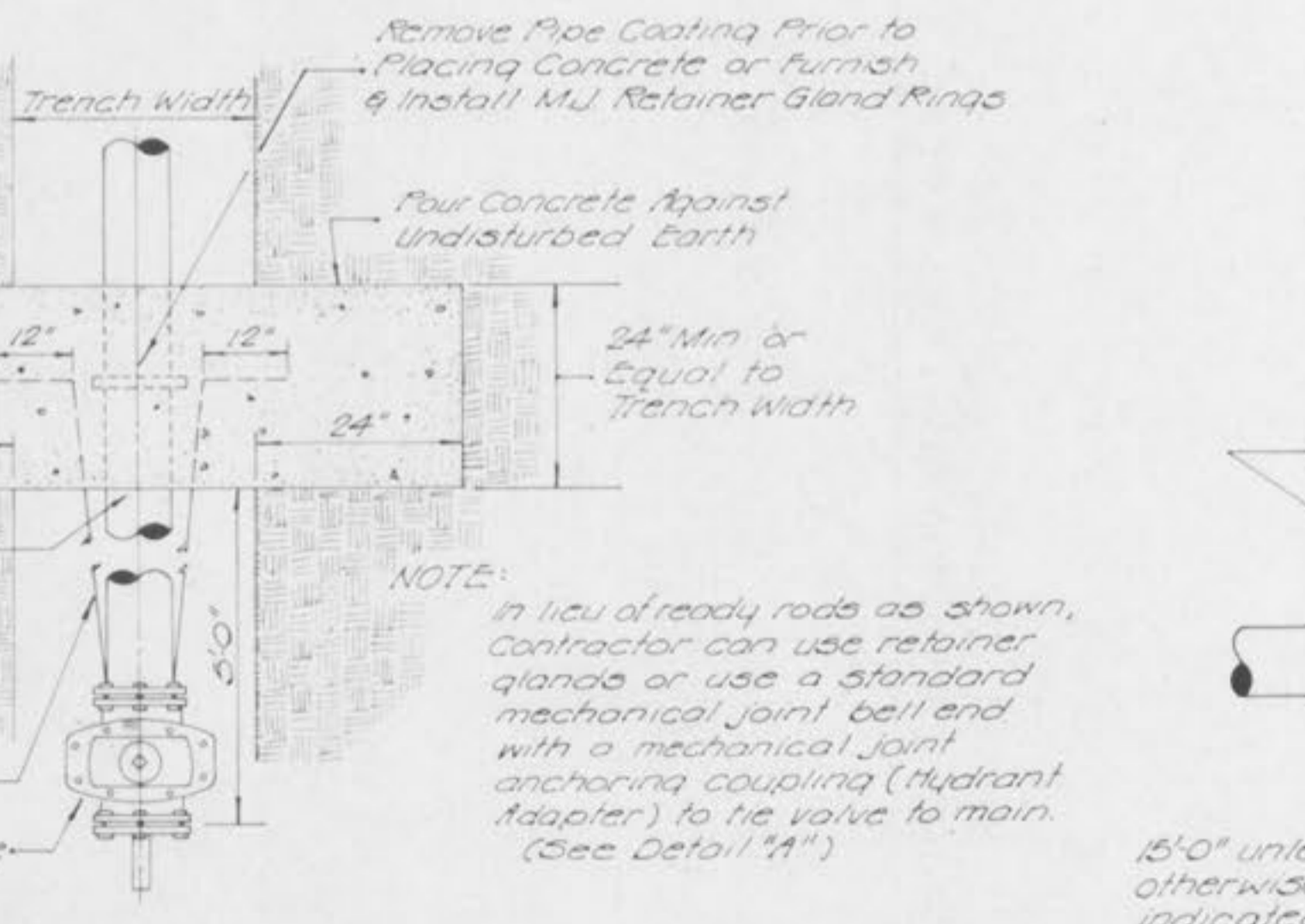
- GENERAL NOTES:**
- All construction shall be done in accordance with the standards set forth by the City and installation shall be done under the supervision of the City Engineer.
 - Water Main Pipe to be 6" Class 200 P.V.C.
 - All fittings shall be mechanical joint, cast iron.
 - All fire hydrants shall have 5-1/4" valve opening, pump nozzle and 2 hose nozzles with 6" inlet connection, as specified by City Engineer.
 - Bids for fire hydrants shall include 6" valve and box.
 - Water and sewer main crossings shall conform to the Missouri Clean Water Commission Standards.
 - Trench backfill shall be granular material through street crossings. All trench backfill to be compacted to 95% maximum density.
 - Testing, sterilization and flushing shall be performed to the satisfaction of the City Engineer.
 - All house service connections are to be done in a manner prescribed by the City Engineer.
 - The price for the construction items shall include the cost for labor and materials for installation.
 - All bends, tees and hydrants shall be blocked with concrete per the detail.



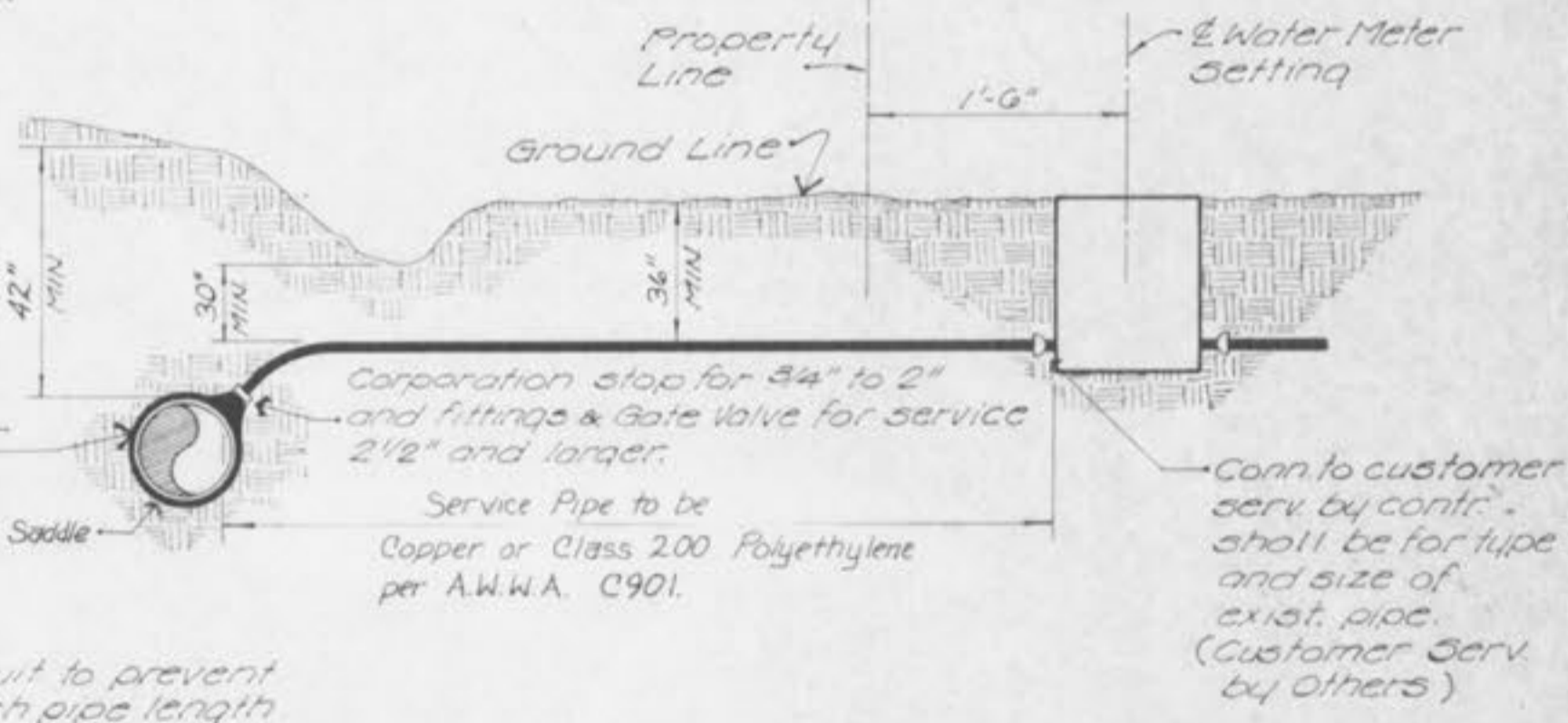
CONCRETE ENCASEMENT



STRADDLE BLOCK DETAIL



TUNNEL LINER DETAIL



TYPICAL SERVICE ASSEMBLY

GBA
 GEORGE BUTLER ASSOCIATES
 CONSULTING ENGINEERS, ARCHITECTS
 LANDSCAPE ARCHITECTS, PLANNERS

200 / 225 S. Main St.
 Oxford, Missouri 63096

STRAWBERRY HILL ESTATES

WATER MAIN DETAILS

DESIGNED BY: _____ DRAWN BY: T.R. BIRD CHECKED BY: G.R.H.

JOB NO: 87-4188
 DATE: June, 1987
 SCALE: As shown
 SHEET NO: 12 of 12

REGISTERED PROFESSIONAL ENGINEER
 STATE OF MISSOURI
 MARCUS JOHN HANSTADT
 NUMBER E-22003