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S-1  Standard Bedding for RCP
S-2  Standard Concrete Pavement Patch
S-3  Standard Asphalt Pavement Patch
S-4  Trench Bottom Dimensions & Backfilling Requirements for DIP and RCP
S-5  Trench Bottom Dimensions and Backfilling Requirements for PVC Gravity Sewer Main
S-6  Thrust Blocking Design Data for Sewer Force Main
S-6a Thrust Blocking Design Data for PVC Sewer Force Main
S-7  Standard Thrust Blocking Views
S-8  Standard Main Marker for Sewer Force Mains In Easements
S-9  Standard Sewer Force Main Air Release Valve
S-10 Aerial Pipe Crossing General Notes
S-11 Aerial Pipe Crossing Typical Plans
S-12 Aerial Pipe Crossing Steel Casing Pipe Elevation
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S-16 Aerial Pipe Crossing Pile Supported Pier
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S-20 Standard Pre-cast Sanitary Sewer Manhole
S-21 Extended Bases or Cast-in-Place Reinforced Concrete Base
S-22 Standard Manhole Installation over Existing Sewer Main
S-23 Standard High Velocity Manhole Invert
S-24 Standard Seal Tight Manhole w/ Vented Stack
Standard Sewer Detail Drawings

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S-30  Typical Sanitary Sewer Lateral Connection
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S-33  Main Extension to Tie into Tee Manhole
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S-44  Standard Odor Control Building Front Elevation
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S-47  Standard Odor Control Building Mechanical, Electrical
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S-50  Standard Vertical Bend
S-51  Aerial Sewer Service
S-52  Wooden Fence Gate
S-53  Inside Drop Manhole
PIPE SPRINGLINE

G" MIN. / 12" MAX. WHEN NO TRENCH BOX REQUIRED (TYPICAL)

UNDISTURBED SOIL

CLASS I, II, OR III MATERIAL DENSELY COMPACTED BACKFILL, TAMPERED IN 6" LIFTS

CLASS I MATERIAL

G" MIN.
NEW CONC. TO BE 3000 PSI
EXISTING CONC.

SAW CUT AND REMOVE
EXISTING PAVEMENT

1'-0"

UNDISTURBED SOIL

EXISTING PAVEMENT

SAW CUT AND REMOVE

TYP.

TYP.

BACKFILL, TAMPERED
IN 6" LIFTS

Pavement Patch Detail

6" COMPACTED
NO. 67 STONE

PIPE

Bore 1 1/8" dia., 1'-0"
On Center along Cut
# Dowel w/ #4 Bar

NOTES:

1. See City of Raleigh standards for trenches and pipe bedding (S-4 & S-5) for additional details.
2. Pavement cuts over 5'-0" in width shall be reinforced to N.C.D.O.T. standards.
3. Pavement cuts shall be made with an appropriate saw cut machine.
4. Pavement cuts within NCDOT ROW shall conform to the approved on site encroachment permit.

### Standard Concrete Pavement Patch Detail

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<th>DATE</th>
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<td>3-30-00</td>
<td>J.P.5</td>
<td>10-8-10</td>
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NOTES:
1. IN NCDOT MAINTAINED ROADWAYS ENCROACHMENT PAVEMENT PATCH REQUIREMENTS SHALL TAKE PRECEDENCE.
2. THE PAVEMENT CUT SHALL BE DEFINED BY A STRAIGHT EDGE AND CUT WITH AN APPROPRIATE SAWCUT MACHINE.
3. THE TRENCH SUBGRADE MATERIAL SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED TO A DENSITY OF AT LEAST 95% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-99 AS MODIFIED BY NCDOT.
4. THE FINAL 1' OF FILL SHALL CONSIST OF ABC MATERIAL COMPACTED TO A DENSITY EQUAL TO 100% OF THAT OBTAINED BY COMPACTING A SAMPLE OF THE MATERIAL IN ACCORDANCE WITH AASHTO T-80 AS MODIFIED BY NCDOT.
5. THE ENTIRE THICKNESS AND VERTICAL EDGE OF CUT SHALL BE TACKED.
6. THE SAME DEPTH OF PAVEMENT MATERIAL WHICH EXISTS SHALL BE REINSTALLED, BUT IN NO CASE SHALL THE ASPHALT BE LESS THAN 2" THICK.
7. THE ASPHALT PAVEMENT MATERIAL SHALL BE INSTALLED AND COMPACTED THOROUGHLY WITH A SMOOTH DRUM ROLLER TO ACHIEVE A SMOOTH LEVEL PATCH.
8. REFER TO CITY OF RALEIGH STANDARDS FOR TRENCHES AND PIPE BEDDING (S-4 & S-5) FOR ADDITIONAL DETAILS.
9. NO HAND PATCHING ALLOWED.
10. PAVEMENT CUTS WITHIN NCDOT ROW SHALL CONFORM TO THE APPROVED ON SITE ENCROACHMENT PERMIT.
NOTES:
1. TRENCHES REQUIRING SHORING AND BRACING, DIMENSIONS SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING AND BRACING.
2. NO ROCKS OR BOULDERS 4" OR LARGER TO BE USED IN INITIAL BACKFILL.
3. ALL BACKFILL MATERIAL SHALL BE SUITABLE NATIVE MATERIAL.
4. BACKFILL SHALL BE TAMBED IN 6" LIFTS IN TRAFFIC AREAS, 12" IN NON-TRAFFIC AREAS.
5. ACHIEVE 80% COMPACTION IN NON-TRAFFIC AREAS, AND 95% COMPACTION IN TRAFFIC AREAS.
6. IF IN EASEMENT 4" TOPSOIL, AND 12" CLEAN SELECT FILL MAY BE REQUIRED.
7. NO BOULDERS 8" IN DIAMETER OR GREATER ALLOWED IN FINAL BACKFILL.
NOTES:
1. FOR TRENCHES REQUIRING SHORING AND BRACING, DIMENSIONS SHALL BE TAKEN FROM THE INSIDE FACE OF THE SHORING AND BRACING.
2. NO ROCKS OR BOULDERS 4" OR LARGER TO BE USED IN INITIAL BACKFILL.
3. ALL BACKFILL MATERIAL SHALL BE SUITABLE NATIVE MATERIAL.
4. BACKFILL SHALL BE TAMPPED IN 6" LIFTS IN TRAFFIC AREAS, 12" IN NON-TRAFFIC AREAS.
**NOTES:**

1. CONCRETE SHALL BE 3000 PSI AND TRANSIT MIXED.
2. REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.
3. TRENCH BOTTOM WIDTH IN VICINITY OF THRUST BLOCK INSTALLATION SHALL BE THE MINIMUM WIDTH AS SHOWN ON STANDARD DETAIL W-3.
4. BACKFILL TAMPERED IN 6" LIFTS PER STANDARD DETAIL W-3.
5. THRUST COLLAR MUST BE FACTORY WELDED ON BOTH SIDES ALONG BOTH EDGES OF COLLAR AROUND CIRCUMFERENCE.
NOTES:
1. CONCRETE SHALL BE 3000 PSI AND TRANSIT MIXED.
2. REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.
3. TRENCH BOTTOM WIDTH IN VICINITY OF THRUST BLOCK INSTALLATION SHALL BE THE MINIMUM WIDTH AS SHOWN ON STANDARD DETAIL S-4, S-5.
4. BACKFILL TAMPERED IN 6" LIFTS PER STANDARD DETAIL S-4, S-5.
5. MECHANICAL RESTAINING COLLAR SHALL BE AS MANUFACTURED BY MEGA-LUG OR EQUAL.
NOTES:
1. CONCRETE SHALL BE 3000 PSI
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS.
3. TRENCHES SHALL CONFORM TO STANDARD DETAIL W-3.
4. SEE STANDARD THRUST BLOCK TABLES, W-10 THRU W-11, FOR AREA OF CONCRETE REQUIRED.
5. ALL BENDS AND INTERSECTIONS SHALL HAVE CONCRETE THRUST BLOCKING.
NOTES:
1. PLASTIC MARKER SHALL BE GREEN IN COLOR.
2. MARKERS SHALL BE LABELED "RALEIGH SEWER"
3. TO BE SPACED EVERY 300 FEET ON EACH SIDE OF ANY ROADWAY OR JUNCTION.
4. MARKERS SHALL BE ROUND 4" IN DIAMETER.
**SEWER FORCE MAIN**

**BILL OF MATERIALS**

1. PRECAST MANHOLE W/ FLAT TOP
2. BLOW OFF PIPE SCD 80 PVC
3. 2" AIR RELEASE VALVE
4. 2"-SS BALL VALVE
5. PIPE STAND SUPPORT SS
6. 2" UNION SCD 80 PVC
7. 2" TYPE "K", SOFT COPPER WITH FLARED ELBOW
8. CORPORATION COCK
9. 6" DIAMETER DRAIN
10. GROUT, 1/8" TO 1'-0" MIN. SLOPE TO DRAIN
11. 36" x 30" HALLIDAY HATCH, ALUM.
12. 2"-GATE VALVE

**NOTE:**

1. AIR RELEASE/VACUUM VALVE TO BE A.R.I.
2. Flow Control Model SAAR, Short Version D-025 SS (Stainless Steel)
3. The Air Release Manhole shall be installed in the shoulder or as directed by the engineer.
4. For mains located outside of street right-of-ways the maximum distance between the manhole and the valve box should be three (3) feet.
5. Main shall be deep enough to accommodate installation as shown.

See Standard Detail S-4 & S-5 to insure proper backfill.
AERIAL PIPE CROSSING

GENERAL NOTES:

1. ALL MATERIALS UTILIZED ON THESE DETAIL SHEETS SHALL CONFORM TO THE APPROPRIATE SECTIONS OF THE CITY OF RALEIGH PUBLIC UTILITIES HANDBOOK UNLESS NOTED OTHERWISE HEREIN.

2. RESTRAINED JOINT PIPE AND FITTINGS SHALL CONSIST OF BOLTED RETAINER RINGS AND WELDED RETAINER BARS OR BOLTLESS TYPE WHICH INCLUDE DUCTILE IRON LOCKING SEGMENTS AND RUBBER RETAINERS. BOLTS FOR RESTRAINED JOINTS (IF APPLICABLE) SHALL CONFORM TO ANSI B 18.2. RESTRAINED PIPE AND FITTINGS SHALL BE FLEX-RING OR LOK-RING TYPE JOINTS AS MANUFACTURED BY AMERICAN CAST IRON PIPE CO.; TR FLEX AS MANUFACTURED BY US PIPE, SUPER-LOCK AS MANUFACTURED BY CLOW, BOLT-LOK OR SNAP-LOK AS MANUFACTURED BY GRIFFIN PIPE PRODUCTS, OR EQUAL.

3. CONCRETE PROPERTIES SHALL BE AS FOLLOWS:
   - CONCRETE COMPRESSIVE STRENGTH = 4000 PSI
   - NOMINAL SLUMP = 4 INCHES
   - WATER/CEMENTOUS MATERIALS RATIO = 0.45 (MAX)
   - AIR CONTENT = 6% * 1.5%
   CONCRETE SHALL BE COMPOSED OF CEMENT, WATER, COARSE AGGREGATES, FINE AGGREGATES AND AIR. CEMENT SHALL BE TYPE VII OR II IN ACCORDANCE WITH ASTM C-150. MATERIAL REQUIREMENTS FOR ALL FINE AND COARSE AGGREGATES SHALL CONFORM TO ASTM C-33. COARSE AGGREGATE SHALL BE SIZE No. 57 OR 67. AN APPROVED CLASS "F" FLYASH MAY BE SUBSTITUTED FOR AN EQUAL AMOUNT OF CEMENT BY WEIGHT UP TO 25%.

4. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4".

5. CONVENTIONAL REINFORCING STEEL SHALL CONFORM TO ASTM A615 GRADE 60 AND SHALL BE PLACED IN ACCORDANCE WITH "RECOMMENDED PRACTICE FOR PLACING REINFORCING BARS" (LATEST EDITION) AS PUBLISHED BY THE CONCRETE REINFORCING INSTITUTE. SPLICES SHALL BE CLASS 'B' CONFORMING TO THE PROVISIONS OF ACI 318 - "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE".

6. NEOPRENE BEARING PADS SHALL BE FORMED FROM PREVIOUSLY UNVULCANIZED, 100% VIRGIN NEOPRENE, WITH DUROMETER HARDNESS = 50.

7. PILES SHALL BE STRUCTURAL STEEL HP 12x53 PILES AND SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36. PILES SHALL BE DRIVEN TO DEPTHS REQUIRED TO OBTAIN AN ULTIMATE BEARING CAPACITY OF NOT LESS THAN TWO TIMES THE DESIGN LOADING OF 30 TONS. PILES SHALL PENETRATE A MINIMUM OF FIFTEEN FEET INTO UNDISTURBED SOIL. IN DRIVING PILE, A METHOD APPROVED BY THE ENGINEER SHALL BE USED WHEREBY THE HEAD OF THE PILE IS NOT DAMAGED. IF REQUESTED BY THE ENGINEER, PILES SHALL BE TESTED TO DETERMINE THE ULTIMATE CAPACITY OF THE PILES. THE METHOD OF LOAD TESTING SHALL CONFORM TO ASTM D 1143 AND THE NORTH CAROLINA STATE BUILDING CODE. WHERE PILES ARE EXPOSED, PILES SHALL BE PAINTED AND/OR COATED IN ACCORDANCE WITH THE CITY SPECIFICATIONS.
NOTES:

1. RIP RAP FOR SLOPE PROTECTION SHALL BE CLASS I RIP RAP IN ACCORDANCE WITH SECTION 868 OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES".

2. RIP RAP SHALL BE PLACED IN ACCORDANCE WITH DRAWING 868.01 OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION'S "ROADWAY STANDARD DRAWINGS".

3. SUPPORT TYPE FOR PIERS SHALL BE DETERMINED BY ENGINEER BASED ON SUBGRADE CONDITIONS AT SITE. SEE DRAWING S-14

4. WHERE DUCTILE IRON PIPE IS USED FOR CARRIER PIPE, DUCTILE IRON CARRIER PIPE SHALL BE INSTALLED UTILIZING 2 PIPE ALIGNMENT GUIDES PER JOINT ONE FOURTH OF THE PIPE JOINT LENGTH IN FROM BOTH THE BELL AND SPIGOT ENDS.
### ALLOWABLE SPANS FOR STEEL CASING PIPE

<table>
<thead>
<tr>
<th>Carrier Pipe, Dip Diameter (in.)</th>
<th>Casing Pipe, Steel Diameter (in.)</th>
<th>Minimum Casing Pipe Wall Thickness (in.)</th>
<th>Allowable Span (ft.)</th>
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<tbody>
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<tr>
<td>42</td>
<td>56</td>
<td>0.5000</td>
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### NOTES:

1. STEEL PIPE SHALL BE EITHER SPIRAL WELDED OR SMOOTH WALL SEAMLESS WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI. PAINTING AND LINING SHALL BE AS REQUIRED BY THE CITY OF RALEIGH PUBLIC UTILITIES HANDBOOK.

2. DUCTILE IRON PIPE SHALL BE SUPPORTED WITH TWO SPIDERS AT EVERY JOINT WITHIN THE CASING PIPE USING APPROVED PIPE ALIGNMENT GUIDE. SEE DRAWING S-39. ALL JOINTS SHALL BE RESTRAINED JOINT. SEE NOTE 2, DWG S-10.

3. SUPPORT TYPE FOR PIERS SHALL BE DETERMINED BY ENGINEER BASED ON SUBGRADE CONDITIONS AT SITE. SEE DRAWING S-14 FOR SUBGRADE PARAMETERS FOR EACH TYPE OF FOUNDATION.

4. BOTTOM OF PIPE TO BE AT A MINIMUM OF 1' ABOVE THE 25 YEAR FLOOD ELEVATION.
**NOTES:**

1. **PILE SUPPORTED FOUNDATION DESIGN SHOWN ON THIS DETAIL IS BASED UPON THE FOLLOWING PARAMETERS:**
   - Minimum capacity of HP 12x53 pile = 30 tons
   - Concrete compressive strength = 4000 PSI
   - Grade 60 reinforcing steel
   - Maximum stream velocity = 10 ft/sec
   
   If field conditions require any deviation from these parameters, foundation design shall be reviewed by the project engineer.

2. **LENGTH OF PILES SHALL BE AS REQUIRED TO DEVELOP 30 TON CAPACITY BY EITHER END BEARING, FRICTION OR A COMBINATION OF END BEARING AND FRICTION. AS A MINIMUM, PILES SHALL BE DRIVEN AT LEAST 15 FEET INTO UNDISTURBED SOIL.**

3. **ANCHOR BOLTS AND STRAPS SHALL BE STAINLESS STEEL.**
NOTES:
1. PILE SUPPORTED PIER FOUNDATION DESIGN SHOWN ON THIS DETAIL IS BASED ON THE FOLLOWING PARAMETERS:
   MINIMUM CAPACITY OF HP 2x6 IN. PILE = 30 TONS
   CONCRETE COMpressive STRENGTH = 4000 PSI
   GRADE 60 REINFORCING STEEL
   MAXIMUM STREAM VELOCITY = 10 FT/SEC
   IF FIELD CONDITIONS REQUIRE ANY DEVIATION FROM THESE PARAMETERS, THE FOUNDATION DESIGN SHALL BE REVIEWED BY THE ENGINEER.

2. LENGTH OF PILES SHALL BE AS REQUIRED TO DEVELOP 30 TON CAPACITY BY EITHER END BEARING, FRICTION OR A COMBINATION OF END BEARING AND FRICTION. AS A MINIMUM, PILES SHALL BE DRIVEN AT LEAST 15 FEET INTO UNDISTURBED SOIL.

3. TWELVE-INCH AND FOURTEEN-INCH WIDE PIERS SHALL BE REINFORCED WITH #6 BARS AT 12 INCHES OC IN EACH DIRECTION ON EACH FACE. EIGHTEEN-INCH WIDE PIERS SHALL BE REINFORCED WITH #7 BARS AT 12 INCHES OC IN EACH DIRECTION ON EACH FACE. FOOTINGS SHALL BE REINFORCED TYPICALLY TO PIERS.

4. EIGHTEEN-INCH WIDE PIERS SHALL REQUIRE TWO STRAPS OVER THE PIPE INSTEAD OF ONE (AS SHOWN).

5. WHEN CONCRETE SUPPORTS ARE REQUIRED TO BE LOCATED WITHIN A STREAM AND ARE NOT COVERED WITH BACKFILL, SEE DRAWING S-19 FOR MODIFICATIONS TO UPSTREAM FACE OF SUPPORT.

<table>
<thead>
<tr>
<th>CASING PIPE DIA.</th>
<th>PIER THICKNESS</th>
<th>FOOTING THICKNESS</th>
<th>PIER WIDTH</th>
<th>FOOTING WIDTH</th>
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<td>6'-4&quot;</td>
<td>5'-0&quot;</td>
<td>9'-10&quot;</td>
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NOTES:

1. GEOMETRY OF FOOTING SHALL MATCH GEOMETRY OF CONCRETE PIERS WITH HEIGHT OF 6 FEET OR LESS AS PER DRAWING 5-14.

2. NON-SHRINK GROUT SHALL BE "EU-GO-N-S" BY THE EUCLID CHEMICAL COMPANY; "MASTERFLOW 713" BY MASTER BUILDERS, OR EQUAL.
NOTE:

STYROFOAM PLUG TO ASSIST GROUT PLACEMENT, ALL AROUND

STEEL CASING PIPE
DIP CARRIER PIPE

PROVIDE 2" Ø GALV STEEL DRAIN IN BULKHEAD AT LOW END OF CASING PIPE AND 1/3 CU YD OF CRUSHED STONE AT DRAIN, WRAP STONE WITH FILTER FABRIC

TOTAL CASING PIPE PLUG

TURN DOWN ELBOW WITH INSECT SCREEN

2" Ø GALV STEEL VENT, TWO PER CASING, ONE AT EACH END OF CASING PIPE

PROVIDE PLASTIC SHEET BOND-BREAKER BETWEEN CARRIER PIPE AND GROUT, ALL AROUND

NOTE:
NON-SHRINK GROUT SHALL BE "EUCO-N-5" BY THE EUCLID CHEMICAL COMPANY, "MASTERFLOW 713" BY MASTER BUILDERS, OR EQUAL.

CARRIER PIPE
3/8" STEEL PLATE, TYP
3/8"x4" STEEL PLATE, TYP
5/8" Ø A325 BOLT

CASING PIPE

NOTE:
USE A MINIMUM OF 2 SPIDERS PER JOINT PLACED ONE FOURTH OF THE PIPE JOINT LENGTH IN FROM BOTH THE BELL AND SPIGOT.

PIECE ALIGNMENT GUIDE

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
AERIAL PIPE CROSSING
CASING PIPE DETAILS

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CITY OF RALEIGH  
DEPARTMENT OF PUBLIC UTILITIES  
AERIAL PIPE CROSSING  
CONCRETE SUPPORT DETAILS  

PLAN - CONCRETE SUPPORT NOSING  
(WHEN EXPOSED TO STREAM FLOW)
NEW MANHOLES USE A BUTYL SEALANT BETWEEN FRAME AND MANHOLE TOP SECTION WHEN SECURING FRAME TO MANHOLE TO PROVIDE A WATER TIGHT SEAL.

ECCENTRIC M.H. CONE MAY BE USED ON 8", 10" AND 12" SEWER MAINS. MANHOLE CONE AND BARREL SECTIONS SHALL BE AS PER ASTM. STANDARDS

"O" RING SEAL OR RAM-NECK

LATERAL INVERT SHALL NOT BE LOWER THAN MAIN SPRING-LINE. MANHOLE SHALL BE 2' ABOVE 100 YEAR FLOOD PLAIN OR SEALED AND VENT TO BE 2' ABOVE 100 YEAR FLOOD PLAIN. WHEN MANHOLE TOPS ARE IN EXCESS OF 3' ABOVE GRADE, OUTSIDE STEPS MUST BE PROVIDED. SEE STANDARD 5-28 FOR STEP DETAIL. IN NON TRAFFIC AREAS, TOP OF FRAME AND COVER SHALL BE INSTALLED A MIN. OF 1' ABOVE FINISHED GROUND SURFACE.

MIN. 9" COMPACTED #67 STONE BASE TO BE INSTALLED UNDER NEW MANHOLE.
* ALL BASES ARE MINIMUM 9" THICK

BILL OF MATERIAL FOR 4' MANHOLE

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CL. "A" CONCRETE TOTAL CU. YDS. 0.000

BILL OF MATERIAL FOR 5' MANHOLE

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CL. "A" CONCRETE TOTAL CU. YDS. 0.361

BILL OF MATERIAL FOR 6' MANHOLE

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<tr>
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CL. "A" CONCRETE TOTAL CU. YDS. 0.778

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES
EXTENDED BASE OR CAST-IN-PLACE
REINFORCED CONCRETE BASE

DWG. NO. REVISIONS DATE REVISIONS DATE
5-21 3-1-87 ABB 2-9-05
RRM 3-30-00
NOTES:

1. FLOW SHALL BE MAINTAINED DURING CONSTRUCTION.

2. THIS DETAIL TO BE USED WHEN A 6" OR LARGER LATERAL NECESSITATES CONSTRUCTION OF A NEW MANHOLE.

3. SEE STANDARD DETAIL S-20, FOR PRECAST MANHOLES.

4. THE CONTRACTOR SHALL PROVIDE A MINIMUM 9" COMPACTED # 67 STONE BASE.

5. FOR USE ON DIP, CONCRETE, AND PVC ONLY. (NOT ALLOWED ON VCP)

6. SEE DETAIL S-21 FOR REINFORCING OF POURED IN-PLACE BASE
8" D.I. HALF-ROUND THRU MANHOLE

PRECAST MANHOLE

SECTION AT RIGHT ANGLE TO CENTER LINE OF PIPE

DUCTILE IRON PIPE AND DUCTILE IRON BENDS AS NEEDED, WITH NO MORE THAN THREE JOINTS OF HALF PIPE.

DUCTILE IRON OR PVC TO DOWNSTREAM MANHOLE

PRECAST MANHOLE

SECTION ALONG CENTER LINE OF PIPE

NOTE:
NO HORIZONTAL ALIGNMENT CHANGE CAN BE MADE WITH IN THIS MANHOLE TYPE. USE ON GRADES 10% OR GREATER.
VENT OPENING TO BE TWO FOOT ABOVE HUNDRED YEAR FLOOD ELEVATION

CAM-LOK WATER TIGHT MANHOLE FRAME AND COVER CENTERED IN TOP
MIN. 12" PRE-CAST TOP SLAB

SLOPE FINISHED GRADE AWAY FROM MANHOLE ALL SIDES.

VENT DETAIL
* OTHER ACCEPTABLE COVERS

SEAL AROUND VENT PIPE THROUGH MANHOLE

FACTORY CAST IN PLACE GALVANIZED PIPE FLANGE 12" ABOVE MH TOP

FLANGE
GASKET
STAINLESS STEEL BOLTS

NOTES:
1. VENT MUST BE FACTORY WELDED FABRICATED AND "HOT DIPPED" GALVANIZED.
2. HYFE- Hundred Year Flood elevation

* SEE VENT DETAIL

VENT OPENING TO BE SCREENED
4" "HOT DIPPED" GALV. PIPE

STANDARD SEAL TIGHT MANHOLE WITH VENTED STACK

SLOPE FINISHED GRADE AWAY FROM MANHOLE ALL SIDES.

MANHOLE TO HAVE CAST IN RISER OPPOSITE STEPS TO ACCOMODATE 4" "HOT DIPPED" GALVANIZED PIPE.

WALL COLLAR

9" STONE

1. VENT MUST BE FACTORY WELDED FABRICATED AND "HOT DIPPED" GALVANIZED.
2. HYFE- Hundred Year Flood elevation
COVER 120 LBS. MINIMUM

MANHOLE FRAME AND COVER

BUTYL-NEK OR APPROVED SEALANT BETWEEN FRAME AND COVER

1" VENT HOLE

5/8"X3" LAGSHIELD IN HOLE DRILLED INTO CONE OR RING WITH ANCHOR SUNK TO DESIGN DEPTH, AND 3/8"X3" HOT DIPPED GALVANIZED LAG BOLT AND WASHER.

NOTES:
1) ALL MANHOLE FRAMES SHALL BE DOMESTICALLY CAST.
2) FRAME SHALL BE A MINIMUM WEIGHT OF 162 LBS. WITHIN PUBLIC ROW AND 160 LBS. WITHIN EASEMENTS.
3) COVER SHALL WEIGH A MIN. OF 120 LBS.
4) ALL MANHOLE FRAMES OUTSIDE OF PAVED SURFACES SHALL BE BOLTED TO THE CONE SECTION OR RING WITH A MINIMUM OF 4 BOLTS PER FRAME.
Note: solid cover required when watertight manhole specified.
NOTE: WHEN WATERTIGHT NOT SPECIFIED, TOP SHALL HAVE ONE 1" VENT HOLE.

RING MUST BE ANCHORED IN ACCORDANCE WITH S-25

RND HTG SSS HEX HEAD BOLT

STANDARD - PENTAGON HEAD S.S.
OPTIONAL - S.S. HEX HEAD BOLT

TYPICAL LOCKING DEVICE

TOP OF FRAME

OPEN POSITION

BOTTOM OF FRAME

CLOSED POSITION

BOTTOM OF COVER

TYPICAL CAM LOCK MANHOLE

FINNED GASKET IN VERTICAL FACE OF COVER TO MAKE WATERTIGHT.

FRAME SECTION

WIPER GASKET

(2) SS ROLL PINS
1/2" DIA x 1 3/4"

(2) CAM LOCKS

WATER-TIGHT MANHOLE FRAME
WITH CAM LOCK COVER

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

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</table>
#3 OR #4 REBAR
CORROSION RESISTANT MATERIAL
RUBBER, PLASTIC

PLAN

SIDE ELEVATION

ELEVATION

SECTION A - A

SLIP RESISTANT CLEATS

MANHOLE STEP DETAIL
WITH FINAL GRADE
ADJUST FLUSH
WITH FINAL GRADE
PRECAST CONCRETE SPACER
(DONUT RINGS) IN TRAFFIC
AREAS ONLY. DONUT RINGS
NOT ALLOWED IN
EASEMENTS.

PLAN
STANDARD MANHOLE
FRAME AND COVER

SECTION
STANDARD MANHOLE

COMPACTED
BACKFILL
TOTAL
CHIMNEY NOT
TO EXCEED 11"

2"

ADJUST FLUSH
WITH FINAL GRADE

3000 P.S.I. CONCRETE
ENCASMENT

Y.C.A.
12-31-91
ABB
9-20-04

RRH
3-30-00
DHL
11-29-07

STANDARD MANHOLE FRAME AND COVER
DETAIL WITHIN PAVED SURFACES
WHEN SEWER CLEAN OUT IS IN PAVEMENT OR IMPERVIOUS SURFACE, IT MUST BE INSTALLED INSIDE A VALVE BOX (OR MINI-MANHOLE) WITH COVER LABELED "SEWER".

*SERVICE LATERAL MATERIAL AS REQUIRED

NOTE:
THE FULL LENGTH OF THE SERVICE DITCH SHALL BE COMPACTED IN 6" LIFTS WITH MECHANICAL TAMPER. ALL TAPS WILL BE MADE USING MECHANICAL TAPPING MACHINE. FOR PVC INSTALLATIONS, SADDLE AND BEND MUST BE BEDDED IN #67 STONE. BEDDING AND HAUNCHING OF PIPE BARREL MUST COMPLY WITH REQUIREMENTS OF DETAILS S-4 OR S-5 ACCORDING TO PIPE MATERIAL.

CAST IRON OR BRONZE CLEAN OUT PLUG

4" D.I. OR PVC PIPE

COMBINATION WYE AND 1/8 BEND (ONE PIECE)

4' DIAMETER CONCRETE COLLAR 6" THICK

45° SEWER SADDLE

EXISTING MAIN

BARREL OF PIPE BEDDING (CLASS II, III, OR IV)

MIN. GRADE 1%

1/16" OR 1/8" BEND

1 PIECE OF PIPE

FINISHED GRADE

CURB

PAVEMENT

CAST IRON OR BRONZE CLEAN OUT PLUG

PROPERTY LINE

NOTE:
PAVEMENT OPTION

MUST BE 2" BELOW GRADE

WHEN SEWER CLEAN OUT IS IN PAVEMENT OR IMPERVIOUS SURFACE, IT MUST BE INSTALLED INSIDE A VALVE BOX (OR MINI-MANHOLE) WITH COVER LABELED "SEWER".

MACHINE. FOR PVC INSTALLATIONS, SADDLE AND BEND MUST BE BEDDED IN #67 STONE. BEDDING AND HAUNCHING EXISTING TYPICAL SANITARY SEWER LATERAL CONNECTION Y.C.A.

MAIN

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CURB

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PVC TO D.I. PIPE ADAPTER - USE 'FERNCO COUPLING 445-401' OR APPROVED EQUAL TO SEAL.

BACKFILL UNDER PVC SADDLE, ADAPTOR, AND CAST IRON BEND WITH #67 STONE AS SHOWN ON S-4.
NOTE: SADDLE TO BE
GENECO E40 OR EQUAL

LATERNAL SADDLE INSTALLATION DETAIL
FOR VCP AND DUCTILE IRON PIPE

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

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<th>DWG. NO.</th>
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<td>3-30-00</td>
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</table>
1. HOLE SHALL BE CORED IN RISER SECTION FOR PUBLIC SERVICE MAIN EXTENSION.
2. RUBBER BOOT SHALL BE UTILIZED ON ALL CORES
3. CORES SHALL BE IN CENTER OF RISER SECTION
4. CONNECTION TO TEE MANHOLE MUST BE MADE BY CONTRACTOR APPROVED BY CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT
STANDARD 4" BRONZE CLEANOUT PLUG

CLEANOUT FERRULE WITH PLUG

STYLES ACCEPTED:
INVERTED NUT
RAISED NUT

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NOTES:

1. PUMP STATION MUST MEET ALL ZONING SET-BACK REQUIREMENTS
2. PUMP STATION MUST MEET ALL LANDSCAPING REQUIREMENTS
3. WATER SERVICE FOR YARD HYDRANT MUST HAVE RPZ BACKFLOW PROTECTION. SIZE OF SERVICE MAY VARY
4. PUMP STATION EASEMENT TO BE 60'x60' MINIMUM
5. EQUIPMENT LOCATIONS MAY VARY
6. 5' BUFFER SHALL BE REQUIRED BETWEEN FENCE AND EASEMENT LINE.

* FOR ELECTRICAL PANEL
REFER TO DETAILS S-36 & S-37

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**NOTES**

1. BACKING PLATE TO BE 1/4" ALUMINUM. MOUNT TO "I" BEAM POSTS WITH STAINLESS STEEL NUT, BOLTS, AND WASHERS.
2. ALL ELECTRICAL WORK SHALL CONFORM TO LATEST NATIONAL, STATE AND LOCAL CODES AND REQUIREMENTS.
3. SHOW CONDUIT SIZE AND RUNS WITH WIRE SIZE AND NUMBER ON PUMP STATION PLANS.
4. PANEL LAYOUT IS SCHEMATIC ONLY. ADJUST AS NEEDED TO ACCOMMODATE EQUIPMENT. MAINTAIN 4" MIN. CLEARANCE BETWEEN PANELS AND SIDE SHIELDS.
5. ALL ENCLOSURES SHALL BE NEMA 4X RATED AND LOCKABLE.
6. ENCLOSURES SHALL BE MOUNTED TO ALUMINUM BACKING PLATE WITH NYLON SPACERS & STAINLESS STEEL NUTS, BOLTS & WASHERS.
7. CONDUIT SHALL BE RIGID ALUMINUM OR GALVANIZED. MEYERS HUBS SHALL BE USED AT ALL PANEL CONNECTIONS.
8. NO EQUIPMENT SHALL BE MOUNTED LESS THAN 36" ABOVE FINISHED GRADE. MIN. CLEARANCE FROM WORK LIGHT TO STANDING PAD SHALL BE 6' 6".

* FOR WEATHER HOOD REFER TO DETAIL S-37

---

**CITY OF RALEIGH**

**DEPARTMENT OF PUBLIC UTILITIES**

**PUMP STATION**

**ELECTRICAL PANEL**

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</table>
NOTES:
1. HOOD TO 12 Ga. MILL FINISH ALUMINIUM
2. HOOD TO BE HELIARC "STITCH" WELDED TO 1/4" ALUMINIUM PLATE EQUIPMENT BACKING BOARD
3. HOOD SHALL BE SAME WIDTH AS ALUMINIUM PLATE EQUIPMENT BACKING BOARD
4. PROVIDE MOUNTING TABS FOR WORK LIGHT BOX
TYPICAL SANITARY SEWER SERVICE BACKWATER VALVE STYLES:

TYPICAL BACKWATER VALVE INSTALLATIONS:

BASEMENT OR CRAWL SPACE

YARD/VAULT INSTALLATION FOR
BUILDINGS BUILT ON SLAB AND
OTHER LOCATIONS WHERE VALVE
CANNOT BE INSTALLED IN
BASEMENT OR CRAWL SPACE.

NOTES:

1. INSTALLATIONS OF GREATER THAN 4' IN DEPTH MAY REQUIRE MANHOLE.

2. VALVES MUST BE INSTALLED IN A LOCATION AT WHICH THEY CAN BE
CLEANED AND SERVICED REGULARLY.
NOTE:

1) USE A MINIMUM OF TWO SPIDERS PER PIPE JOINT ONE FOURTH OF THE PIPE JOINT LENGTH IN FROM BOTH THE BELL AND SPIGOT ENDS.
ADJUSTED TO FINISHED GRADE

PRECAST BAFFLE 4" THICK

NOTES:
1. REINFORCEMENT: H-20 BRIDGE LOADING (TRAFFIC RATED)
2. CONCRETE: 4000 PSI @28 DAYS
3. EARTHCOVER: 0' TO 5' MAX.

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

1000 GALLON GREASE INTERCEPTOR

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<td>3/19/04</td>
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</table>
NOTES:
1. REINFORCEMENT: H-20 BRIDGE LOADING (TRAFFIC RATED)
2. CONCRETE: 4000 PSI @ 28 DAYS

8" W/ 6/5/4" BOOT

PRECAST BAFFLE 4" THICK

ADJUSTED TO FINISHED GRADE

SOLID RING & COVER,

OPEN

INLET

OUTLET

\( \frac{1}{3} \) L

\( \frac{1}{2} \) DEPTH

\( \frac{3}{4} \) DEPTH

\( \frac{4}{3} \) L

LENGTH
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<th>INTERCEPTORS CAPACITY (GAL.)</th>
<th>SEPARATORS CAPACITY (GAL.)</th>
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<tr>
<td>300</td>
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NOTES:

1. Baffle wall located at a distance from inlet wall \(\frac{3}{4}\) to \(\frac{3}{4}\) of the total length of the interceptor or separator as shown on detail S-40. Baffle walls located at a distance approximately of \(\frac{1}{2}\) of the total length of the separator as shown on detail S-40.01.

2. Each interceptor or separator shall have inlet and outlet tees. The outlet tee shall extend 50% into the liquid depth. The inlet tee shall extend 25% into the liquid depth. Inlet and outlet tees must be open to allow the collection of F.O.G. sample.

3. Access openings over each compartment within the interceptor or separator shall be 24 inches in diameter and contain pick holes. All covers shall be constructed of cast iron or equivalent traffic bearing material. Manhole covers must extend to finish grade and be installed to exclude the entrance of stormwater into the interceptor or separator.

4. Full size dual sweep cleanouts shall be installed on the inlet and outlet sides of the interceptor or separator.

5. Interceptors and separators must be vented in accordance with the NC State Plumbing Code.

6. Concrete: 4000 psi @ 28 days.

7. Design: ACI 318 BUILDING CODE
   - ASTM C1613-06 FOR GREASE INTERCEPTORS
   - ASTM C913-02 FOR WATER AND WASTEWATER STRUCTURES
   - ASTM C890-06 FOR MINIMAL STRUCTURAL DESIGN LOADING

8. Interceptors and separators shall be designed to withstand an H-20 wheel load.

9. Interceptors or separators made of polyethylene or fiberglass shall include a minimum 12,000 psi tensile strength, 19,000 psi flexural strength, and 800,000 psi flexural modulus.

10. All interceptors and separators shall be installed in accordance with the manufacturers specifications.
BUILDING WITH NEXT UPSTREAM MANHOLE HIGHER THAN THE LOWEST DRAIN AND BLOCKAGE IN SEWER MAIN

BACKWATER CONDITION INTO BUILDING WITHOUT BACKWATER VALVE

BACKWATER CONDITION PREVENTED BY BACKWATER VALVE

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

TYPICAL SEWER SERVICE REQUIRING BACKWATER VALVE

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STANDARD ODOR CONTROL BLDG.
SIDE ELEVATION

25 YR. ASPHALT SHINGLES; BLDG. FELT; 1/2 CDX PLYWOOD

CONTINUOUS RIDGE VENT

8" CMU FILL WITH INSULATION

3 X 7' 16GA. INS. STEEL DOOR

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

STANDARD ODOR CONTROL BLDG.
SIDE ELEVATION

DWG. NO. REVISIONS DATE REVISIONS DATE
S-45 LBN 10-6-04
CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

STANDARD ODOR CONTROL BLDG.
FLOOR ELEVATION

DWG. NO. S-46
REVISIONS LBN
DATE 10-6-04

NOT TO SCALE
CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

11-19-04

CRITICAL GRADE MUFFLER
ALL COMPONENTS STAINLESS STEEL

GEN. NO.
S-48

L.B.N.

3' W CONCRETE SIDEWALK ALL SIDES OF UNIT

GENERATOR PAD PER MANUFACTURERS SPEC.
ANCHOR GENERATOR TO PAD W/ STAINLESS STEEL ANCHORS AND 1/4" SS SPACER WASHERS

ADD 1/4" THICK SS WASHERS AT EACH ANCHOR BOLT LOCATION TO PROVIDE SPACE BETWEEN BASE AND CONCRETE

CONFIRM CONDUIT STUB-UP PER SHOP DRAWING

MAINTAIN 4' CLEARANCE ALL SIDES

SEE DETAIL

DOUBLE WALL FUEL TANK

CONCRETE PAD W/REBAR THICKNESS PER MANUF. SPEC

CITY OF RALEIGH
DEPARTMENT OF PUBLIC UTILITIES

GENERATOR PAD

DWG. NO.
S-48

REVISIONS
L.B.N.

DATE
11-19-04

REVISIONS
DATE
ADD MECHANICAL JOINT RETAINER GLANDS THROUGHOUT ASSEMBLY.

GENERAL NOTES:
1. STEEL RODS AND BOLTS SHALL BE 3/4" HOT DIPPED GALVANIZED.
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT BENDS.
3. RESTRAINED MECHANICAL GLANDS TO BE USED AT ALL FITTINGS.
4. MUST USE DUCTILE IRON EYE BOLTS WHERE NECESSARY.
5. ALL PIPING IN VERTICAL BENDS MUST BE DUCTILE IRON.
6. PIPE SHALL BE DUCTILE IRON A MINIMUM OF ONE JOINT IN EACH DIRECTION.
7. 3' MINIMUM COVER MUST BE MAINTAINED ON ALL FORCE MAINS.

<table>
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<tr>
<th>SIZE OF 45 BEND</th>
<th>STATIC THRUST IN POUNDS</th>
<th>NO. OF RODS REQUIRED</th>
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<td>12'</td>
<td>17,312</td>
<td>4</td>
</tr>
<tr>
<td>16'</td>
<td>30,779</td>
<td>8</td>
</tr>
<tr>
<td>24'</td>
<td>69,252</td>
<td>8</td>
</tr>
</tbody>
</table>
NOTES:

1. FOR CROSSINGS OF LESS THAN 10’ NO CASING IS REQUIRED IF THE JOINT OF PIPE IS CENTERED ON THE CROSSING.
2. THRUST COLLAR MAY BE FIELD WELDED ON STEEL CASING PIPE. IF NO CASING IS REQUIRED THE THRUST COLLAR MUST BE FACTORY WELDED ON DIP CARRIER PIPE.
OUTSIDE VIEW
N.T.S.

1/8" TENSION WIRE WITH A 3" "EYE & EYE" TURNBUCKLE, WIRE ROPE THIMBLES AND CLAMPS. SECURE EACH END OF WIRE WITH SCREW EYEBOLTS.

INSIDE VIEW
N.T.S.

PLACE LOWER END OF BRACE TOWARDS THE HINGE, NOT THE LATCH

CONCRETE FOUNDATION, TYP.
ENLARGED DETAIL

SECTION B-B

NOTES:
1. PIPE FOR INSIDE DROP SHALL BE SDR 35 PVC CONFORMING TO ASTM SPECIFICATION D3034.
2. BOTTOM BEND TO BE 90° SHORT BEND, BELL SPIGOT, OF SDR 35 PVC. SPIGOT OF BEND TO REST DIRECTLY ON EXISTING SHELF. CONSTRUCT MASONRY TROUGH FROM DROP EFFLUENT TO MAIN CHANNEL.
3. NOTCH BELL OF PVC DROP TO ACCEPT D.I.P. SPIGOT AS SHOWN.
4. LOCATE STRAPS AT PIPE BELL AND ABOVE BELL OF 90° BEND AS SHOWN. ADD EXTRA STRAPS AS NECESSARY TO MAINTAIN MAXIMUM SPACING OF TEN FEET.
5. HOLE IN MANHOLE WALL TO BE MADE WITH A CORING MACHINE. INSTALL FLEXIBLE RUBBER COUPLING.
6. CORE HOLE SHALL NOT ENTER CONE SECTION.
7. STEPS SHALL BE RELOCATED IF THEY CONFLICT WITH INSIDE DROP.

SECTION A-A

RESHAPE INVERT