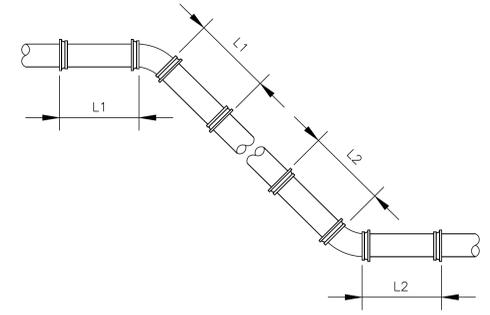


three inches = one foot  
 one and one half inches = one foot  
 one inch = one foot  
 one inch = one foot  
 three quarters inch = one foot  
 one half inch = one foot  
 one half inch = one foot  
 three eighths inch = one foot  
 one quarter inch = one foot  
 one eighth inch = one foot

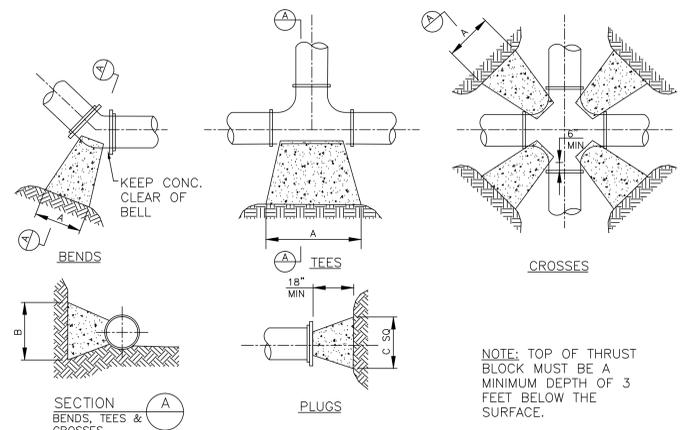
**PIPE RESTRAINT DISTANCE SCHEDULE**  
 MINIMUM RESTRAINT DISTANCE IN FEET

Pipe Dia. (in)	Horz. 90° Elbow	Horz. 45° Elbow	Horz. 22.5° Elbow	Horz. 11.25° Elbow	Vert. 45° Elbow		Vert. 22.5° Elbow		Vert. 11.25° Elbow		Reducer	Reducer	Stub & Endcap	Tee	Reducing Tee	Reducing Tee
					L1	L2	L1	L2	L1	L2						
6	22	9	5	3	43	8	21	4	11	2	-	-	104	46	6"x4" 1	-
8	28	12	6	3	57	10	28	5	14	3	8"x6" 58	8"x4" 98	137	78	8"x6" 27	8"x4" 1
10	33	14	7	4	68	12	33	6	17	3	10"x8" 55	10"x6" 101	164	105	10"x8" 62	10"x6" 7
12	39	17	8	4	81	14	39	7	20	4	12"x10" 57	12"x8" 103	194	134	12"x10" 92	12"x8" 47



**1 RESTRAINT LENGTHS FOR VERTICAL OFFSETS**  
 CW-213 SCALE:N.T.S.

- RESTRAINT DISTANCES BASED ON THE FOLLOWING:
  - PIPE MATERIAL: DUCTILE IRON W/ POLYETHYLENE ENCASEMENT
  - SAFETY FACTOR: 1.5 TO 1
  - DEPTH OF BURY: 4 FT.
  - SOIL TYPE: GW (WELL-GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES)
  - TRENCH TYPE: #5 (PIPE BEDDED IN COMPACTED GRANULAR MATERIAL TO THE CENTERLINE OF THE PIPE, COMPACTED GRANULAR OR SELECT MATERIAL TO TOP OF PIPE. (APPROXIMATELY 90 PERCENT STANDARD PROCTOR, AASHTO T-99)
  - TEST PRESSURE OF 250 PSI
  - FOR REDUCER: LARGE DIAMETER PIPE SIDE LENGTH TO BE RESTRAINED.
  - FOR HORIZONTAL BENDS RESTRAINT LENGTH IS ON BOTH SIDES OF THE FITTING.
- FOR TEES; RESTRAINT LENGTH IS ON THE BRANCH PIPE WHICH IS PERPENDICULAR FROM THE STRAIGHT THRU RUN OF THE TEE. STRAIGHT RUN IS ASSUMED TO BE SOLID PIPE FOR 5 FT EACH SIDE OF THE FITTING.
- FITTINGS SHALL BE RESTRAINED WITH MEGALUG MECHANICAL JOINT RESTRAINTS OR APPROVED EQUAL IN ADDITION TO THRUST BLOCKS AT JOINTS. PUSH ON PIPE JOINT RESTRAINTS WITHIN MINIMUM RESTRAINT DISTANCE SHALL BE U.S. PIPE FIELD LOK 350 GASKETS OR APPROVED EQUAL.
- VALVES ARE CONSIDERED A DEAD-END CONDITION WHEN CLOSED AND SHOULD HAVE A MINIMUM RECOMMEND RESTRAINT DISTANCE EQUAL TO A STUB AND END CAP.
- THESE RESTRAINT DISTANCES ARE TO BE CONSIDERED TYPICAL FOR THE CONDITIONS SHOWN. CONTRACTOR TO INCREASE DISTANCE AND NUMBER OF RESTRAINTS AS REQUIRED FOR ACTUAL MATERIAL INSTALLED AND FOR ANY CONDITION WHICH IS DIFFERENT AT NO COST TO OWNER. CONTRACTOR TO INSTALL IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS AND RECOMMENDED DISTANCES IF GREATER.



**2 THRUST BLOCK DETAIL**  
 CW-213 SCALE:N.T.S.

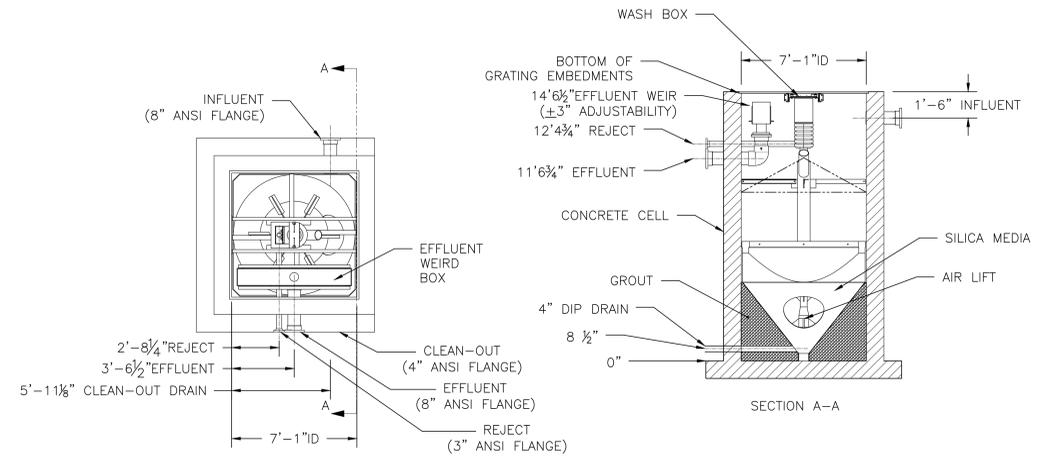
REQUIRED BEARING AREA ON UNDISTURBED SOIL AND TYPICAL DIMENSIONS

PIPE SIZE	90 DEGREE BEDS		45 DEGREE BEDS		11.25 DEGREE BEDS		22.5 DEGREE BEDS		TEES/PLUGS	
	AREA (sq.ft)	"A" "B"	AREA (sq.ft)	"A" "B"	AREA (sq.ft)	"A" "B"	AREA (sq.ft)	"A" "B"	AREA (sq.ft)	"A" "B"
6	5.3	43 18	2.9	23 18	0.7	6 18	1.5	12 18	3.7	30 18
8	9.2	55 24	5.0	30 24	1.3	8 24	2.5	15 24	6.4	39 24
10	13.8	66 30	7.5	36 30	1.9	9 30	3.8	18 30	9.7	46 30
12	19.4	78 36	10.6	42 36	2.7	11 36	5.3	21 36	13.8	55 36
14	26.0	89 42	14.0	48 42	3.6	12 42	7.2	25 42	18.5	63 42

AREA IN SQUARE FEET "A" AND "B" IN INCHES.  
 BEARING TABLE AREA IS BASED ON 200 PSI MAXIMUM WITH SOIL BEARING CAPACITY OF 2000 LBS/SQUARE FOOT.  
 FOR HIGHER WATER PRESSURES OR LOWER SOIL PRESSURES, CONSULT ENGINEER FOR ADJUSTMENTS.  
 BEARING LABEL AREA DOES NOT INCLUDE A SAFETY FACTOR.  
 A SAFETY FACTOR AND ADDITIONAL BEARING AREA MAY BE REQUIRED AS DIRECTED BY THE ENGINEER.

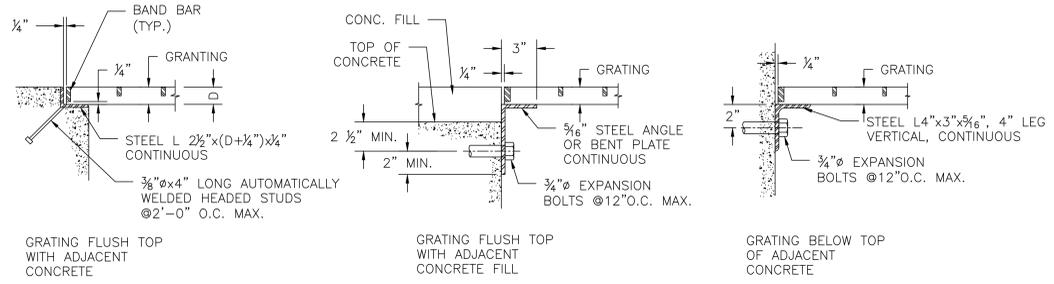
**NOTES:**

- COVER OVER TOP OF PIPE SHALL BE BELOW FROST LINE OR 36" MINIMUM, 72" MAXIMUM ACCORDING TO REGULATORY REQUIREMENTS. WHEN LOCATED WITHIN THE STATE RIGHT-OF-WAY, THE COVER OVER THE TOP OF PIPE SHALL BE 36" MINIMUM. IF GRADING PLANS RECEIVED BY THE ENGINEER/OWNER WITH THE REQUEST FOR WATER MAIN LAYOUT, INDICATE ADJUSTMENTS TO EXISTING GRADE, THEN PIPE SHALL BE INSTALLED TO MEET MINIMUM AND MAXIMUM COVER FROM PROPOSED GRADES SHOWN ON SAID PLANS.
- THRUST BLOCKS SHALL BE BUILT AGAINST UNDISTURBED SOIL WITH ADEQUATE BACKING TO PREVENT MOVEMENT OF FITTING.
- NO THRUST BLOCKS TO BE PLACED IN SEWER LATERAL DITCHES.
- THRUST BLOCKING FIT IN EASEMENT, IN SOME CASES ADDITIONAL RESTRAINT MAY BE REQUIRED.
- BASED IN 150 PSI STATIC PRESSURE PLUS 50 PSI WATER HAMMER AND 2000 PSF SOIL BEARING.
- POLYETHYLENE ENCASEMENT ON ALL D1 PIPE AND FITTINGS.
- PIPE JOINTS AND BOLTS MUST BE ACCESSIBLE.
- ALLOW SUFFICIENT CLEARANCE BETWEEN CONCRETE AND BOLTS FOR FUTURE MAINTENANCE.
- ALL ANCHOR BOLTS SHALL BE GALVANIZED STEEL, MINIMUM 1/2" DIAMETER. COAT EXPOSED ROD WITH ASPHALT CEMENT AFTER CONCRETE HAS SET.
- ALL M.J. AND FLG. FITTINGS TO RECEIVE THRUST BLOCKS SHALL HAVE THE FASTENER AREAS FELT WRAPPED AND TAPED PRIOR TO THE CONCRETE POUR TO ALLOW FUTURE ACCESS TO THE FASTENERS AT THE JOINTS.
- THRUST BLOCKING DETAILS ARE SHOWN HERE FOR TYPICAL INSTALLATIONS. IN SOME CASES, ADDITIONAL RESTRAINT MY BE REQUIRED.
- PORTLAND CEMENT CONCRETE USED FOR THRUST BLOCKS SHALL BE MIN 3000 PSI CONCRETE.
- FOR UNSTABLE SOIL CONDITIONS, CHECK WITH ENGINEER FOR THRUST BLOCK DIMENSIONS.



- NOTES:**
- THIS DRAWING IS FOR GENERAL ARRANGEMENT ONLY.
  - SINGLE CELL ONLY SHOWN FOR ILLUSTRATION PURPOSES

**3 COPPER TREATMENT SYSTEM - SCHEMATIC EQUIPMENT LAYOUT CONTINUOUS BACKWASH GRAVITY SAND FILTER REACTIVE FILTRATION**  
 CW-213 SCALE: 1/4"=1'-0"



**4 TYPICAL GRATING SUPPORT DETAILS**  
 CW-213 SCALE:N.T.S.

**CONSTRUCTION DOCUMENTS**

CONSULTANTS:  49 South Main Street Suite 200 PHILADELPHIA, PA 19104 tel: 973.654.2473 fax: 973.654.4880 www.reillyengineering.com	ARCHITECT/ENGINEERS:  NORTHEAST INFRASTRUCTURE, LLC 1100 CHURCH STREET HONOLULU, HI 96813 570-253-0846 OFFICE 570-253-1935 FAX WWW.NEINFRA.COM	Drawing Title <b>DETAILS</b>	Project Title <b>MODERNIZE WASTEWATER TREATMENT PLANT</b>	Project Number 561A4-13-108	Office of Construction and Facilities Management 
		Approved Project Director VA NUHCS PLANNING AND ENGINEERING	Location 151 KNOLLCROFT ROAD, LYONS, NJ	Building Number	
Revisions:	Date	Date 07/19/2018	Checked J.S.D.	Drawn B.V.N.	Drawing Number <b>CW-213</b>
VA FORM 08-6231			Date 07/19/2018	Dwg. 19 of 38	









