OSS Commercial Designer Workshop

Piping

Alice R. Quinn

November 7, 2017

Indiana State Department of Health

Piping

- Building Sewers
- Effluent Sewers
- Effluent Force Main
- Distribution Laterals
- Drainage Pipe

Piping

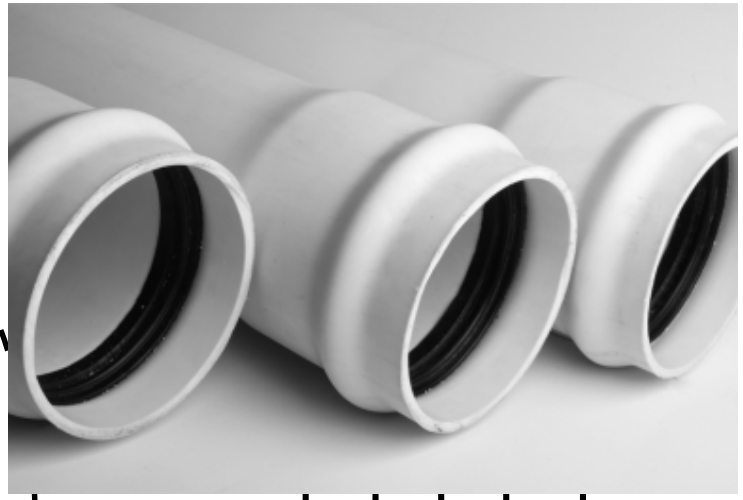
- Separation Distances (wells & water lines)
- Pipe specification (section 75)
  - Diameter
  - ASTM / SCH number
  - SDR number (if necessary)
  - Type of joints (if necessary)
- Slope
  - Length
  - Invert elevations at beginning and end
  - Diameter

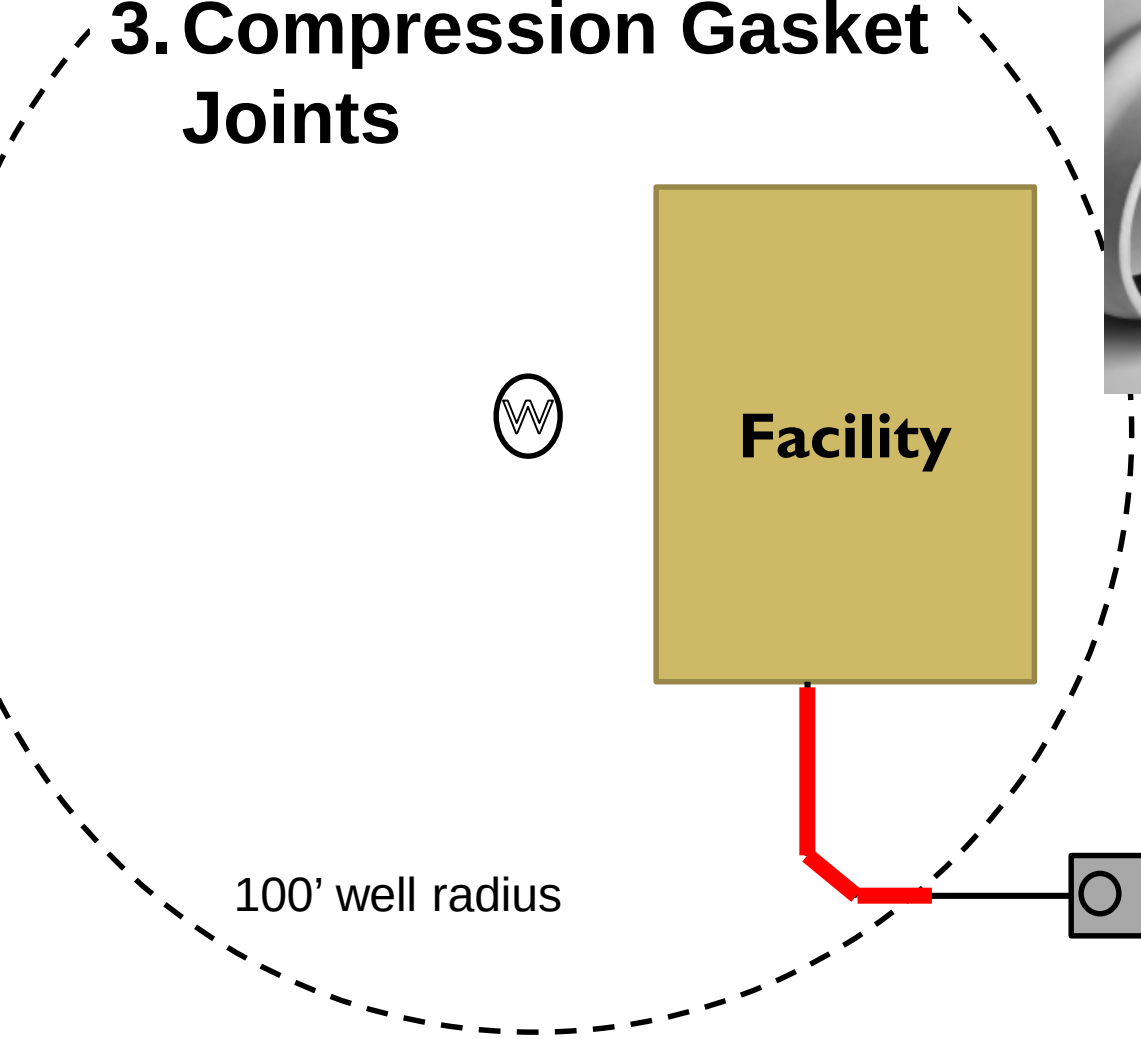
Piping - Separation Distances

Section 61(d) Sewers and Water Supply Wells

- 100 foot separation required, unless
- Upgraded sewers are used
  - Pressure rated pipe, SDR 26 or less, compression gasket joints
  - Waterworks grade ductile iron pipe with tyton or mechanical joints
- No less than 30' separation

1. **Pressure Rate Pipe**
2. **SDR 26 or less**
3. **Compression Gasket Joints**





Piping - Separation Distances

Section 61(f) Sewers and Water Lines

- Not laid in the same trench
  - Horizontal separation of 10'
  - When crossing are necessary, 18" vertical clearance with the water line above the sewer
  - When impossible to maintain horizontal and vertical clearances
    - Upgraded sewers are used
      - Pressure rated pipe, SDR 26 or less, compression gasket joints
      - Waterworks grade ductile iron pipe with tyton or mechanical joints

Pipe Specifications

Section 75

(a) Commercial OSS piping

(1) Gravity Sewer

(2) Pressure sewers, force mains, manifolds, pressure distribution laterals

(b) Compression gasket joints used on pressure sewers when <10' from water line.

(c) Soil absorption system gravity distribution

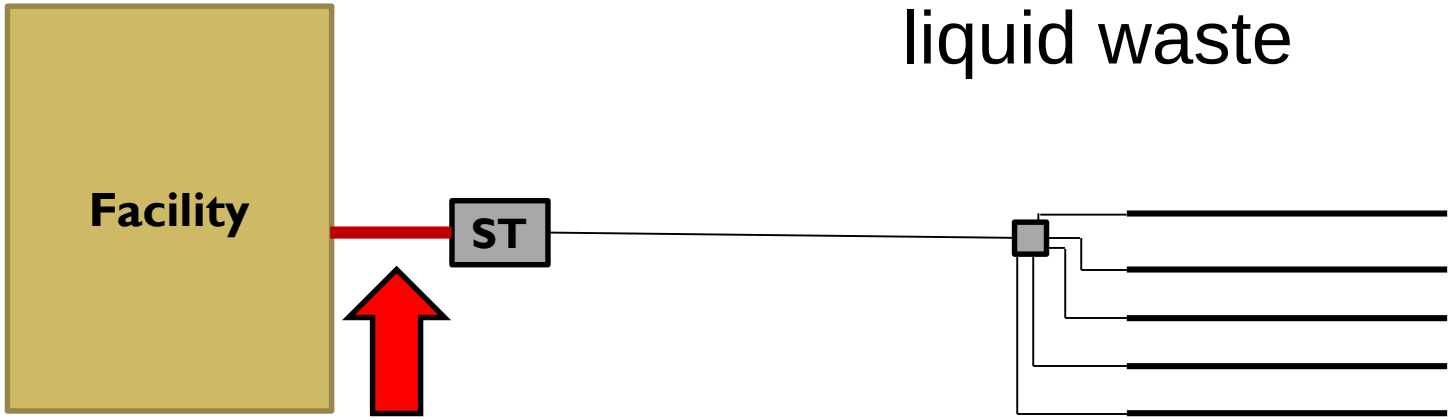
(d) Gravity distribution lateral hole spacing

(e) Subsurface drainage systems

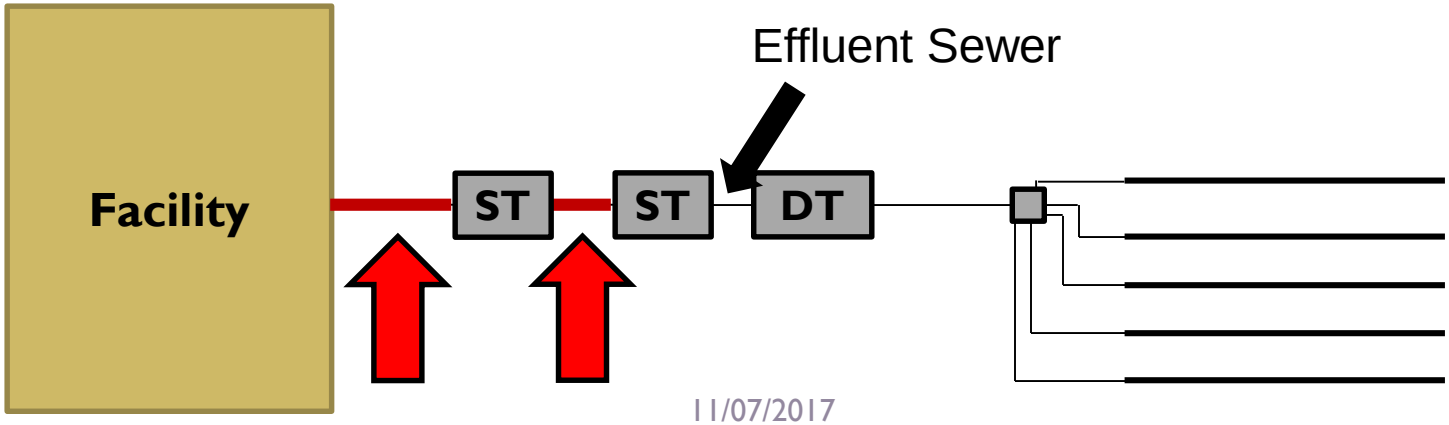
Building Sewers

- Building to Septic Tank

Building sewers carry solids and liquid waste



- Septic Tank to Septic Tank



Building Sewers

- Building to Septic Tank
- Septic Tank to Septic Tank

(See On-Site Sewage System Overall Site Plan Example Drawing)

YES	N/A	Gravity Building Sewer (piping from building to septic tank and between septic tanks)	(see 410 IAC 6-10.1-75)	Meets or Exceeds	Does Not Meet	Additional Information	N/A	
		Approved Building Sewer Pipe (choose all that apply)						78

ASTM SCH SDR Joints

PVC

- ASTM 2665-12 (4" and 6" only)
- ASTM F 891-10 SDR 35 (4" thru 8" only)
- ASTM D 3034-08 (SDR 26 or 35 - 4" - 15")
- ASTM 2241-09 SDR 13.5, 17, 21 or 26
- ASTM D 1785-06 Schedule 40, 80, or 120

ABS

- ASTM D 2661-11 (4" and 6" only)
- ASTM D 2680-09 (8" thru 15" only)
- ASTM D 2751-05 SDR 23.5 or 35 (4" and 6" only)
- ASTM D 1527-05 Schedule 40, 80, or 120
- ASTM D 2282-05 SDR 13.5, 17, 21 or 26

OTHER

- * Upgraded Pipe (DR 11, DR 9 HDPE Direct Bury - if "joining" pipe required, installer must be certified by manufacturer)
- * Upgraded Pipe (Waterworks Ductile Iron with Mechanical/Tyton Joints)
- * Upgraded Pipe PVC (ASTM 2241-09 SDR 13.5, 17, 21 or 26 with compression gasket joint

Upgraded pipe

*- Upgraded pipe required if sewer located ten (10) feet horizontally from a water line or 18" vertical crossing with the waterline above the sewer and one hundred (100) feet from water supply well or suction pump suction line. If applicable, you must use one of the 3 "upgraded pipe" options above.

Calculated Building Sewer Slopes (minimum of 1.33% for 4", 0.67% for 6")	Building Sewer Pipe #1	Building Sewer Pipe #2	Building Sewer Pipe #3	
Diameter (inches):				
Pipe Length (feet):				
Invert Elevation at Building (feet):				
Invert Elevation at Septic Tank (feet):				
Calculated Slope (%):	#DIV/0!	#DIV/0!	#DIV/0!	108

Diameter Length Elevations

	Cleanout required? (required prior to any 90° elbows within building sewer piping)	130
	Vertical Drop (required only to keep building sewer pipe slope < 12%) with Cleanout Immediately Upslo	132

Building Sewers

Section 65
Slopes & Requirements

- 3' outside the foundation
- Table IV – Minimum slope
- Nothing less than 4"

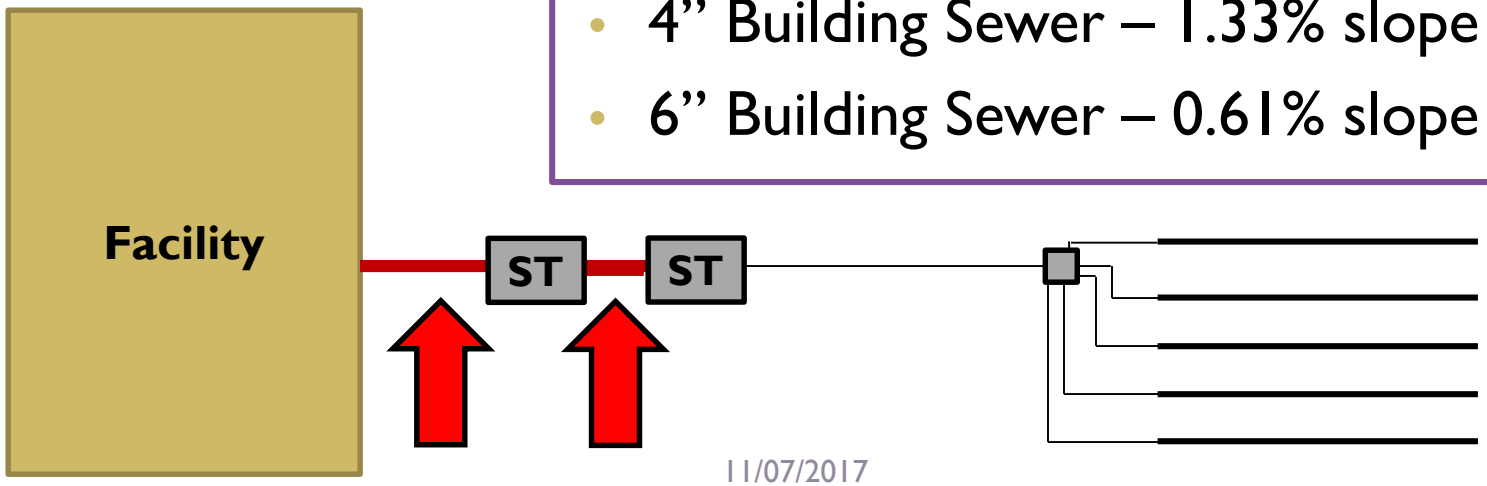
Section 75(a)(1) & (2)
Pipe Specifications

- Gravity pipe
- Pressure pipe

- ASTM
- SCH/SDR
- Joints

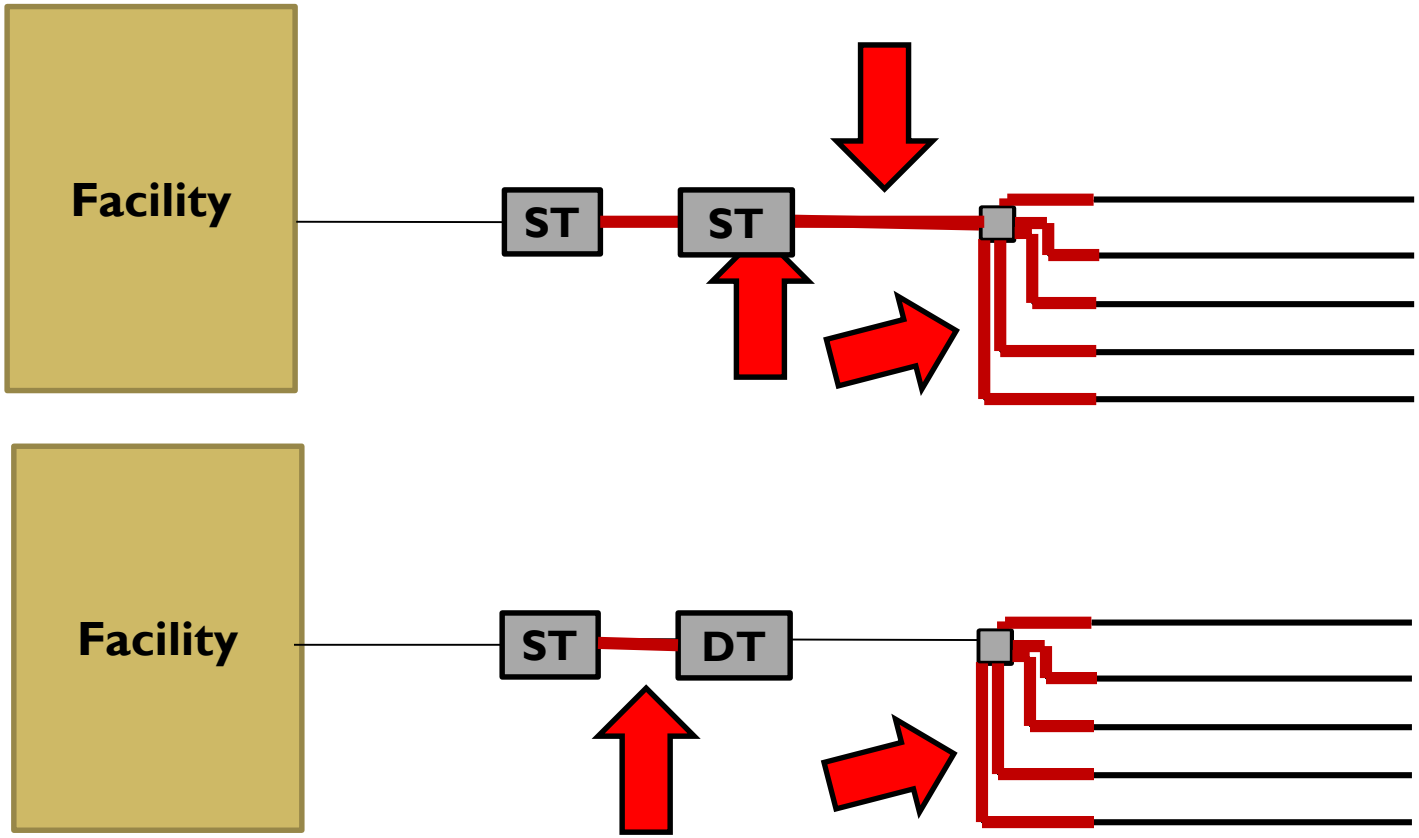
Section 82(i) & (j) - Slopes

- 4" Building Sewer – 1.33% slope
- 6" Building Sewer – 0.61% slope



Effluent Sewers

- Septic Tank to Distribution Box
- Septic Tank to Dose Tank
- Distribution box to trenches (aka Header pipes)



Effluent Sewers

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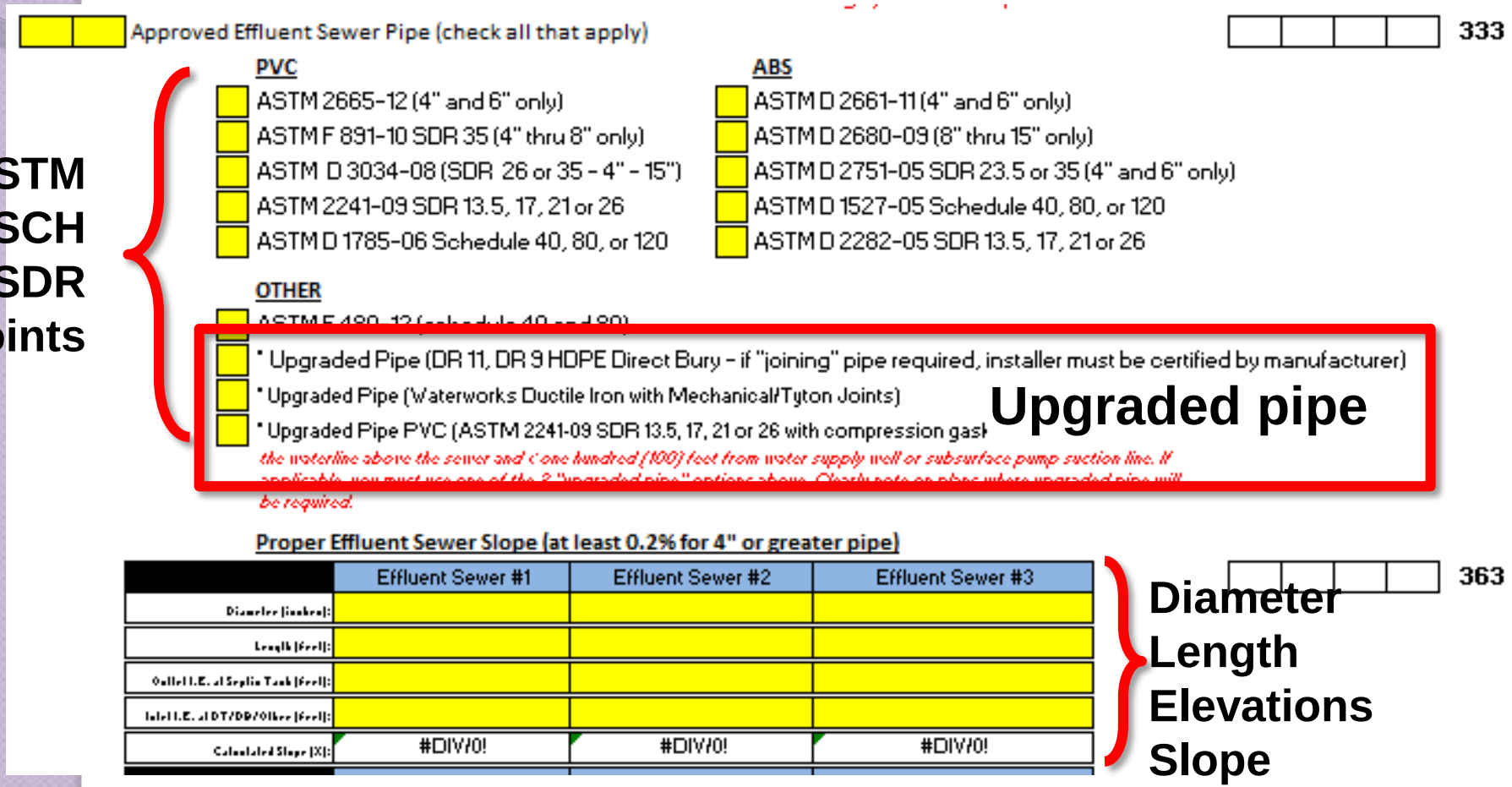


Effluent Sewers

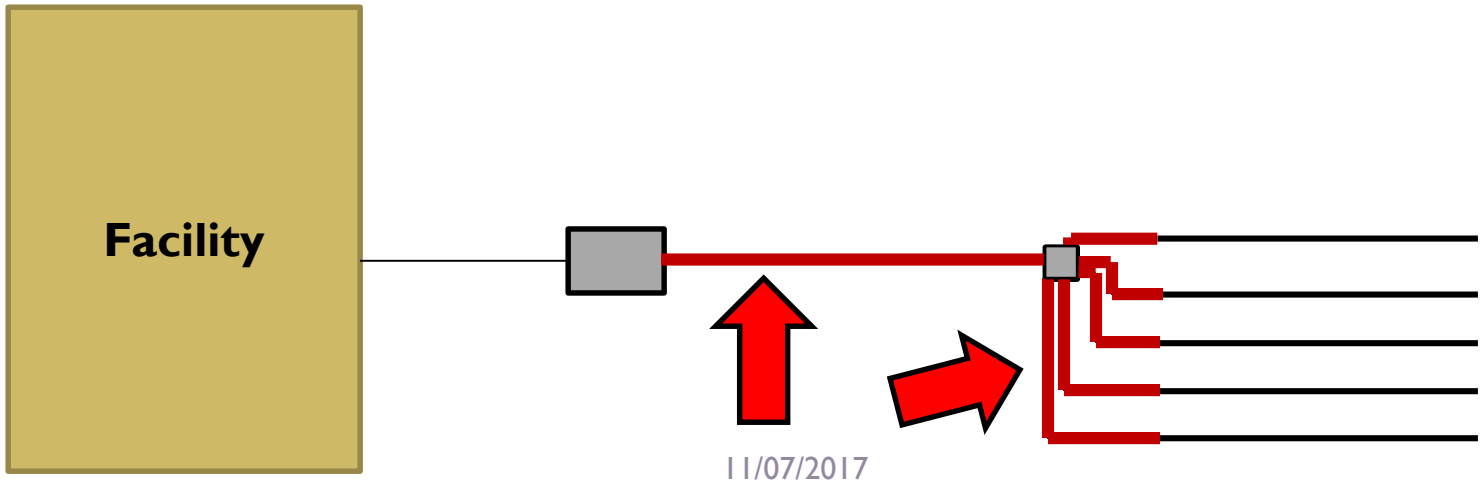
Section 75(a)(1) & (2)
Pipe Specifications

- Gravity pipe
- Pressure pipe

- ASTM
- SCH/SDR
- Joints

Section 82(l)
Slopes

- Min. 4" Effluent Sewer
- Min. 0.20% slope



Effluent Force Main

- Effluent pump to Distribution Box or Manifold

"Effluent" force main from "effluent" lift station (check all that apply) — 460

- Below frostline? (410 IAC 6-10.1-84(d)) — 462
- Automatic air relief valve installed at high point of force main? — 464
- Proper separation to water lines (10' horizontal for parallel and 18" vertical for crossings)? — 466
- Easement (required if crosses any property lines) — 468

470

ASTM / SCH / SDR

PVC

- ASTM 2241-09 SDR 13.5, 17, 21 or 26
- ASTM D 1785-06 Schedule 40, 80, or 120

ABS

- ASTM D 1527-05 Schedule 40, 80, or 120
- ASTM D 2282-05 SDR 13.5, 17, 21 or 26

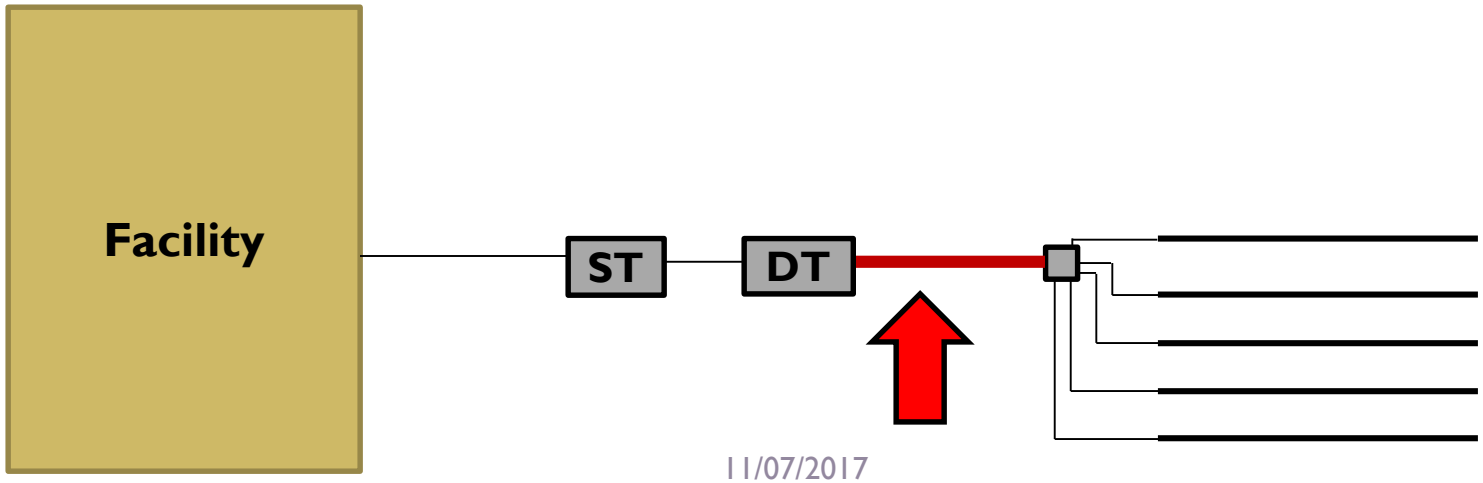
OTHER

- DR 11, DR 9 HDPE Direct Bury - if "joining" pipe required, installer must be certified by manufactur

	Effluent Force Main #1	Effluent Force Main #2	Effluent Force Main #3
Diameter (inches):			
Length (feet):			

479

Diameter
Length



Effluent Force Main

- Effluent pump to Distribution Box or Manifold

Section 75(a)(2)
Pipe Specifications

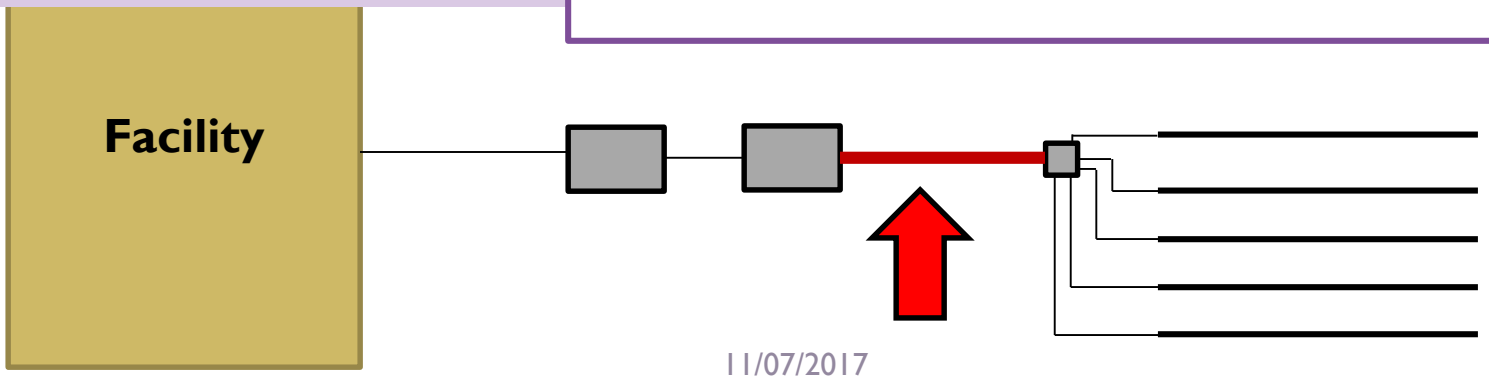
- Pressure pipe
  - ASTM
  - SCH/SDR
  - Joints

Section 84(d)

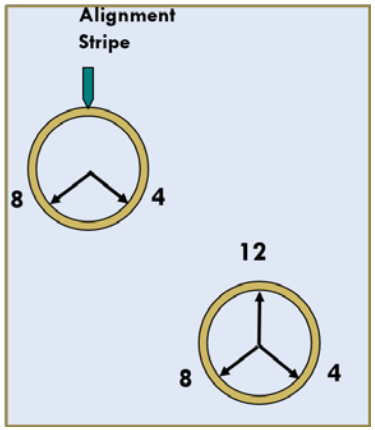
- EFM must drain unless installed below frost line (Table IX)

Section 84(g), 90(d)
Diameter

- 1 - 4" for flood dose
- 1.5 - 4" for elevated sand mound



Distribution Lateral Pipe



- Gravity distribution lateral

Section 75 (a) or (c) Pipe Specifications

- Gravity pipe
- Pressure pipe
- Gravity distribution lateral (4”)

- ASTM
- SCH/SDR

Section 75 Pipe Specifications

- Rows of holes (2-3)
- Hole spacing (120°)
- Hole size (5/8” or 3/4”)
- Hole spacing (≤5”)

Distribution Lateral Pipe

- Pressure distribution lateral

Section 75(a)(2) Pipe Specifications	• Pressure pipe	• ASTM • SCH/SDR
Section 86(k) Diameter	• 1-3” for subsurface pressure laterals	
Section 90(h) Diameter	• 1-1.5” for ESM distribution laterals	

Manifold

Section 75(a)(2) Pipe Specifications

- Pressure pipe
  - ASTM
  - SCH/SDR

Section 86(j) Diameter

- 1-6” for subsurface pressure systems

Section 90(g) Diameter

- 2-4” for Elevated Sand Mound system

Drainage Pipe

Section 75(e)
Pipe Specifications

- ASTM
- NRCS

Section 63(g)
Requirements

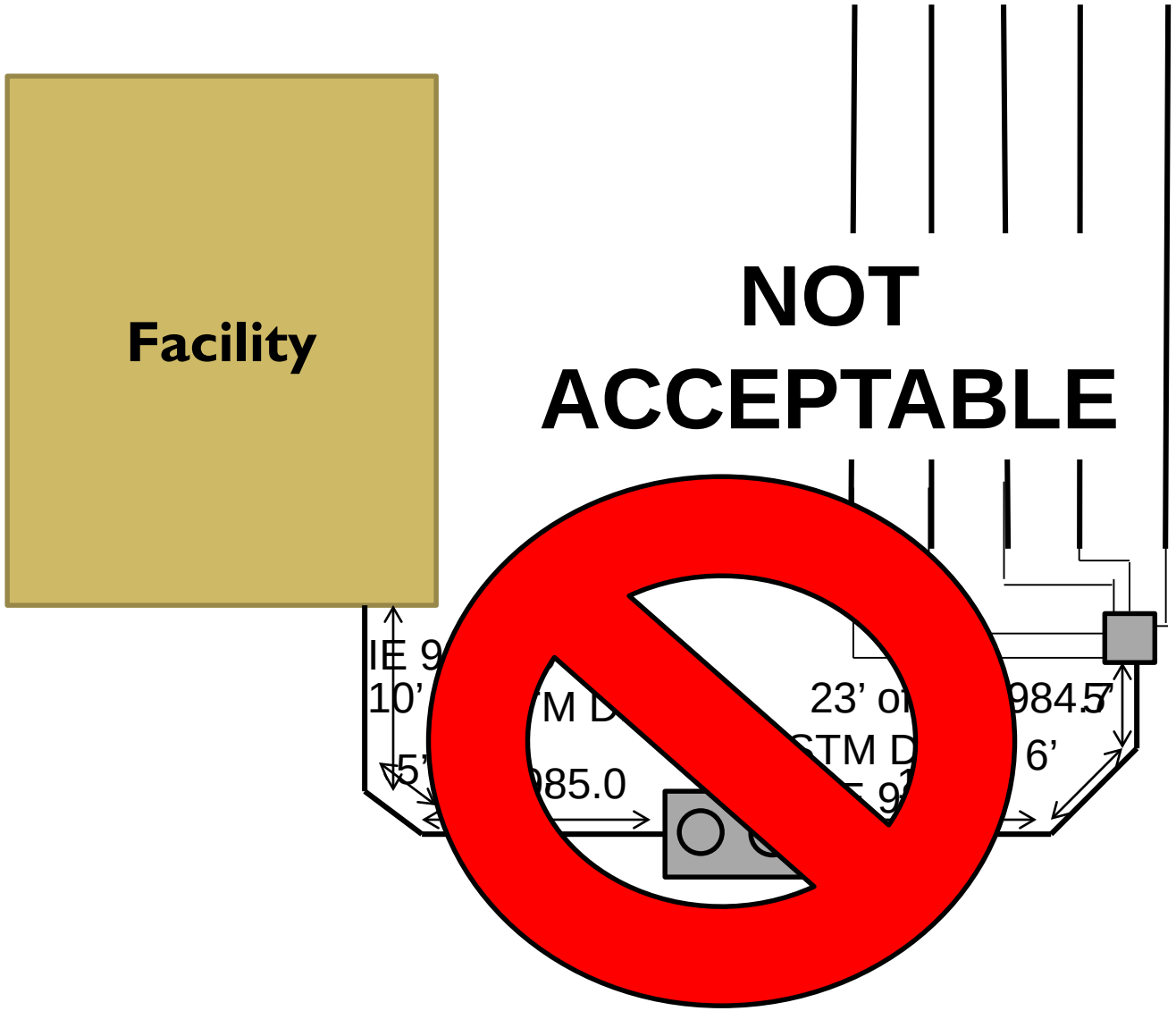
- Min. 4" diameter
- Slotted
- Wrapped with geotextile

Sands	Loamy sands
Sandy loams	Fine sandy loams
Loams	Silt Loams
Silts	

Section 63(h)
Slope

- 4" drain tile – 0.2% slope
- 6" drain tile – 0.1% slope

Plan Review - Sewers



Plan Review – Piping Summary

Pipe Table							
Component	**Pipe**	**Length**	**Dia.**	**Pipe Spec (ASTM#, SDR, SCH, Joints)**	**IE Beg**	**IE End**	**Calculated Slope**
Bldg Sewer	P1	30’	4”	ASTM D 2241, SDR 21, compression gasket joints	985.50	985.00	1.67%
Effluent Sewer	P2	3’	4”	ASTM D 3034, SDR 35	984.75	984.50	8.33%
Effluent Force Main	P3	23’	2”	ASTM D 2241, SDR 21	984.25	986.30	
Effluent Sewer (Header)	P4 P5 P6 P7 P8	6’ 13.5’ 20’ 28’ 37’	4” 4” 4” 4” 4”	ASTM D 3034, SDR 35	986.22 986.22 986.22 986.22 986.22	986.20 986.00 985.90 985.75 985.62	0.33% 1.63% 1.60% 1.68% 1.62%
Gravity Dist. Lat.	P9	5 at 100’	4”	ASTM D 2729			
Drainage	P10	370’	4”	ASTM F 405			

Plan Review – Piping Summary

☑ ☐ Approved Effluent Sewer Pipe (check all that apply) ☐☐☐☐ 333

PVC

- ☐ ASTM 2665-12 (4" and 6" only)
- ☐ ASTM F 891-10 SDR 35 (4" thru 8" only)
- ☑ ASTM D 3034-08 (SDR 26 or 35 - 4" - 15")
- ☐ ASTM 2241-09 SDR 13.5, 17, 21 or 26
- ☐ ASTM D 1785-06 Schedule 40, 80, or 120

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- ☐ ASTM D 1527-05 Schedule 40, 80, or 120
- ☐ ASTM D 2282-05 SDR 13.5, 17, 21 or 26

OTHER

- ☐ ASTM F 480-12 (schedule 40 and 80)
- ☐ * Upgraded Pipe (DR 11, DR 9 HDPE Direct Bury - if "joining" pipe required, installer must be certified by manufacturer)
- ☐ * Upgraded Pipe (Waterworks Ductile Iron with Mechanical/Tyton Joints)
- ☐ * Upgraded Pipe PVC (ASTM 2241-09 SDR 13.5, 17, 21 or 26 with compression gasket j

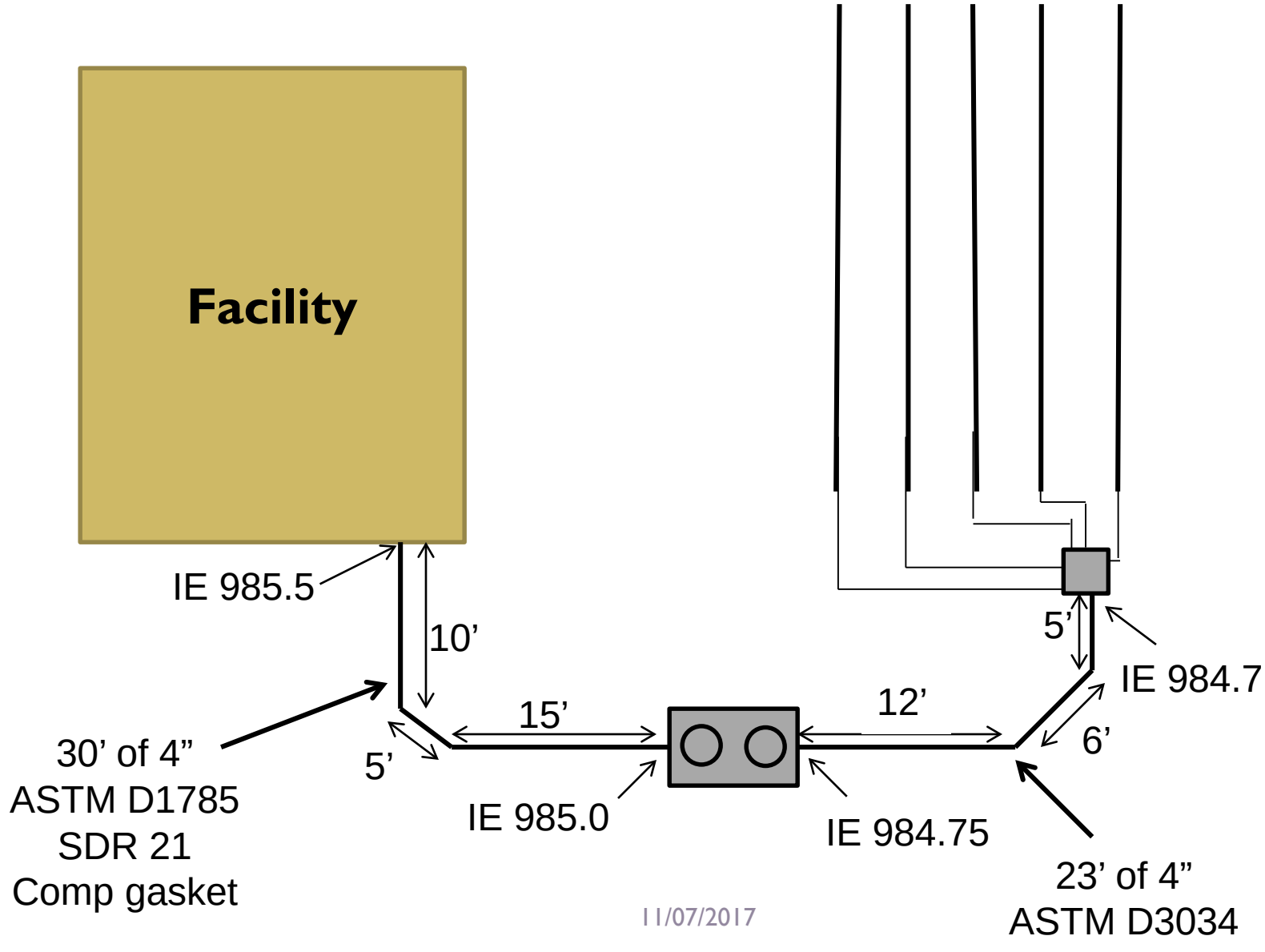
waterline above the sewer and < one hundred (100) feet from water supply well or subsurface pump suction line. If applicable, you must use one of the 2 "upgraded pipe" options above. Clearly note on plans where upgraded pipe will be required.

Proper Effluent Sewer Slope (at least 0.2% for 4" or greater pipe)

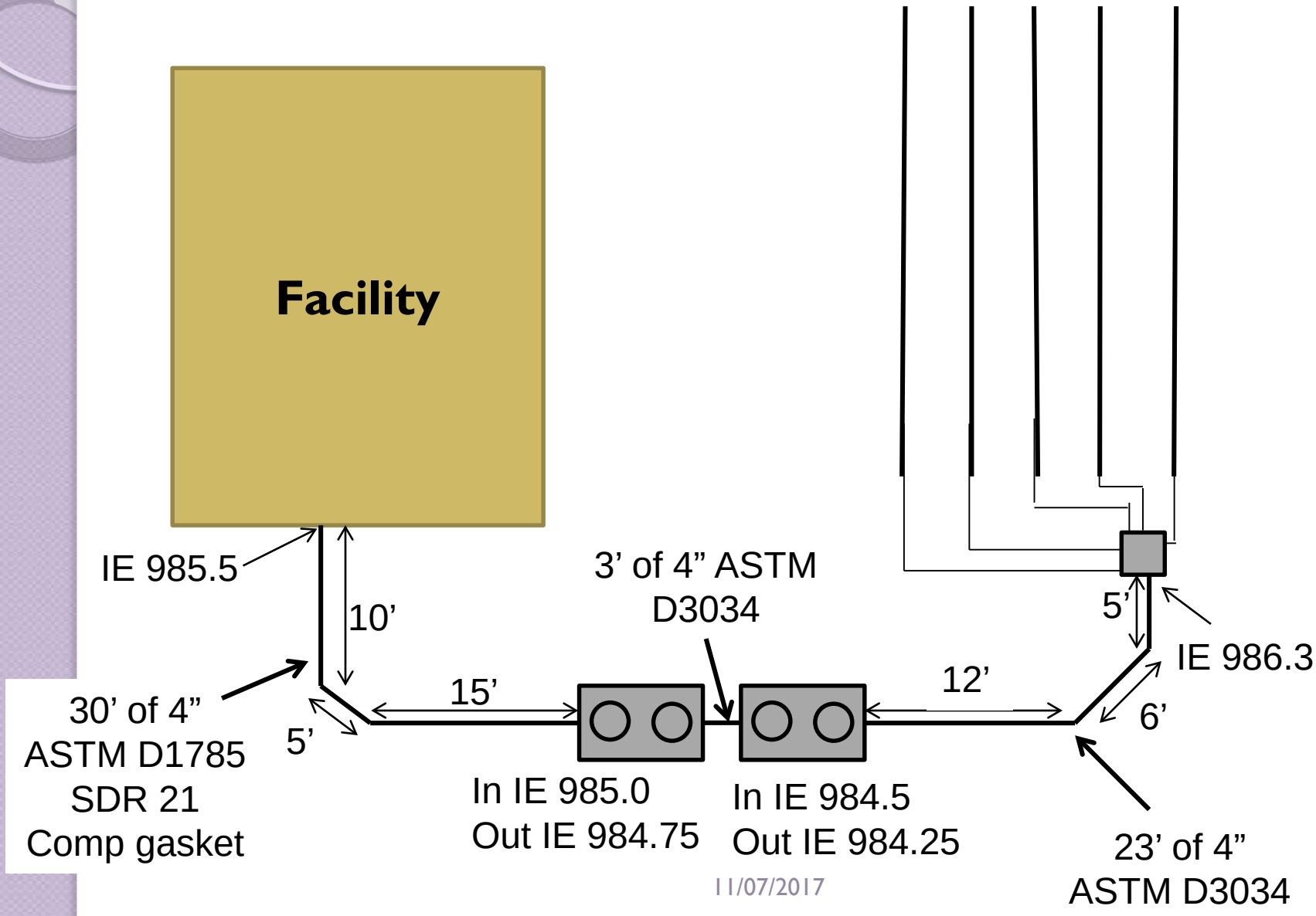
	Effluent Sewer #1	Effluent Sewer #2	Effluent Sewer #3
Diameter (inches):	4.00	4.00	
Length (feet):	42.00	13.00	
Outlet I.E. at Septic Tank (feet):	891.35	891.00	
Inlet I.E. at DT/DB/Other (feet):	890.80	890.80	
Calculated Slope (%):	1.31	1.54	#DIV/0!

☐☐☐☐ 363

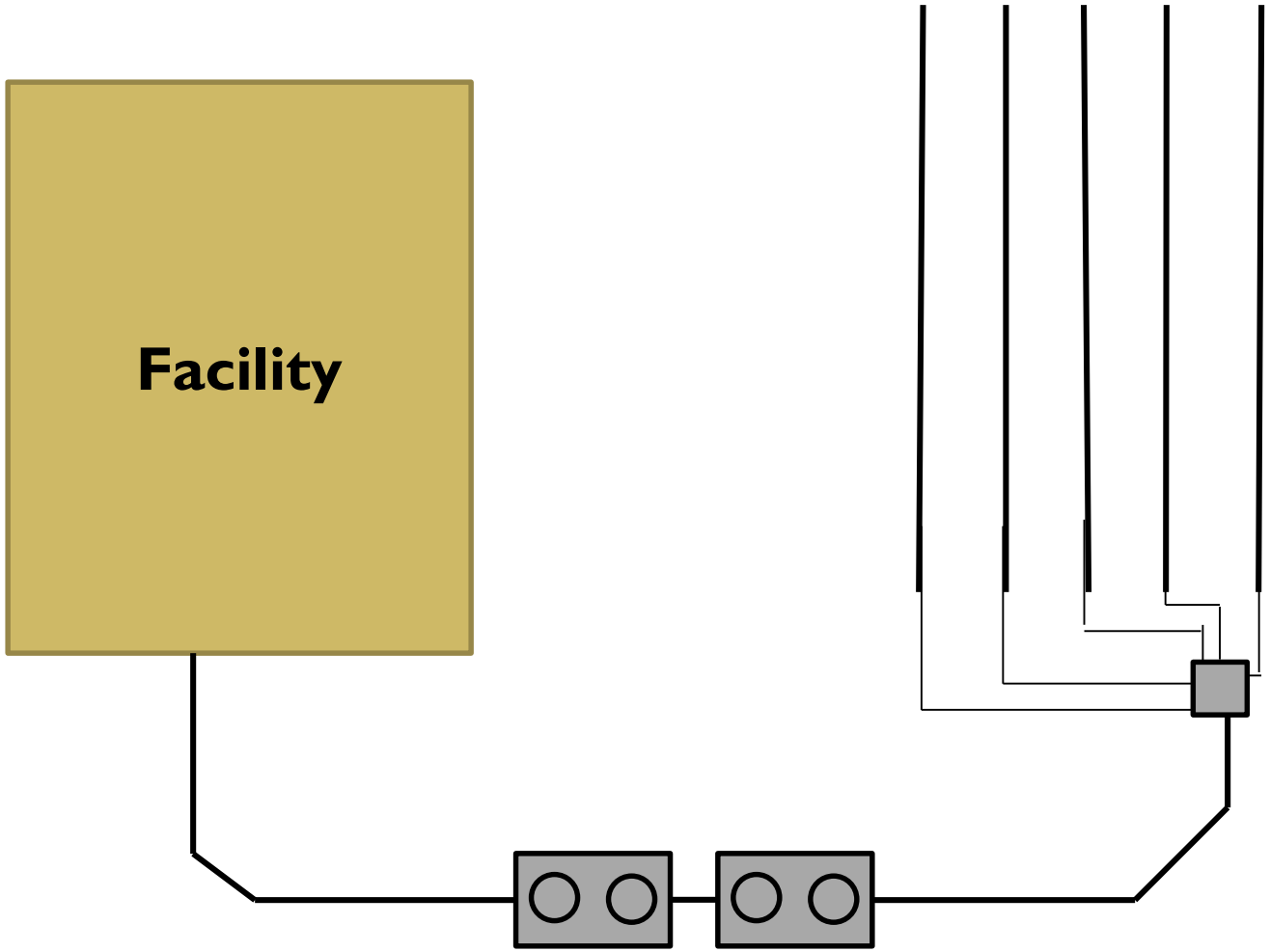
Plan Review - Sewers



Plan Review - Sewers



Plan Review - Sewers



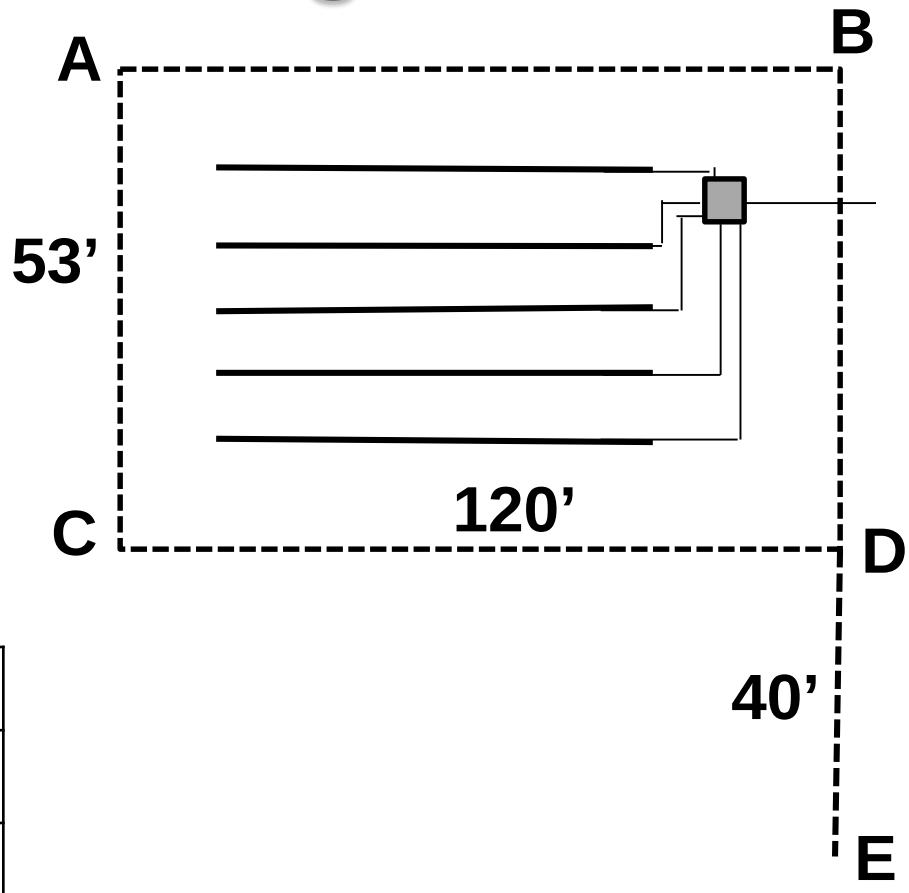
Plan Review – Trench Summary

Trench Summary									
#	Length	Dia.	ASTM#	Elevations				Trench Depth	
				Prox	Mid	Distal	Trench Bottom	Min.	Max.
1	100’	4”	D 2729	986.70	986.78	986.87	985.70’	12”	14”
2	100’	4”	D 2729	985.58	986.60	986.66	985.50’	13”	14”
3	100’	4”	D 2729	986.30	986.44	986.47	985.30’	12”	14”
4	100’	4”	D 2729	986.33	986.38	986.40	985.25’	13”	14”
5	100’	4”	D 2729	986.35	986.40	986.40	985.25’	13”	14”

Plan Review – Drainage

Drainage Depth Summary			
	Ground	Invert	Depth
A	986.84	982.60	50”
B	986.75	982.34	53”
C	986.34	982.10	50”
D	986.15	981.80	52”
E	981.50	981.50	0

Drainage Slope Summary		
	Length	Slope
AB	120’	0.22%
BD	53’	1.01%
AC	53’	0.94%
CD	120’	0.25%
DE	40’	0.75%



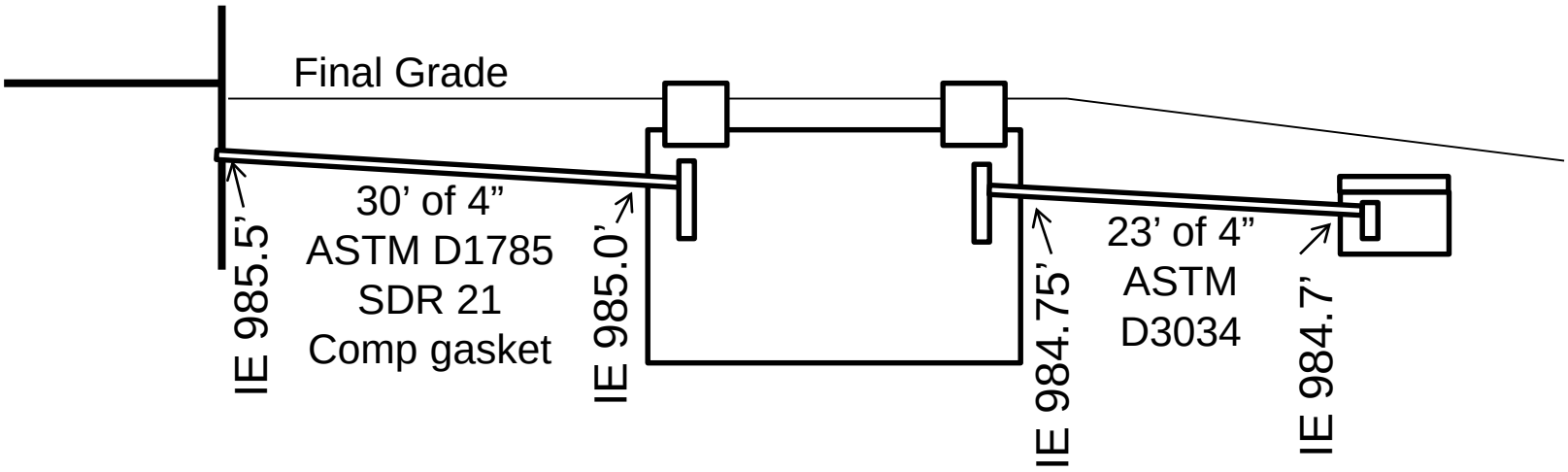
Plan Review – Drainage

Perimeter Drain Slope Check (minimum of 0.2% for 4" and 0.1% for 6" pipe)

	Pipe Segment AB	Pipe Segment BD	Pipe Segment AC
Length of Pipe Segment (feet):	120.00	53.00	53.00
Invert Elev. At Beginning (feet):	982.60	982.34	982.60
Invert Elev. At End (feet):	982.34	981.80	982.10
Calculated Slope (%):	0.217	1.019	0.943
	Pipe Segment CD	Pipe Segment DE	Pipe Segment FG
Length of Pipe Segment (feet):	120.00	40.00	
Invert Elev. At Beginning (feet):	982.10	981.80	
Invert Elev. At End (feet):	981.80	981.50	
Calculated Slope (%):	0.250	0.750	#DIV/0!
	Pipe Segment GH	Pipe Segment HI	Pipe Segment IJ
Length of Pipe Segment (feet):			

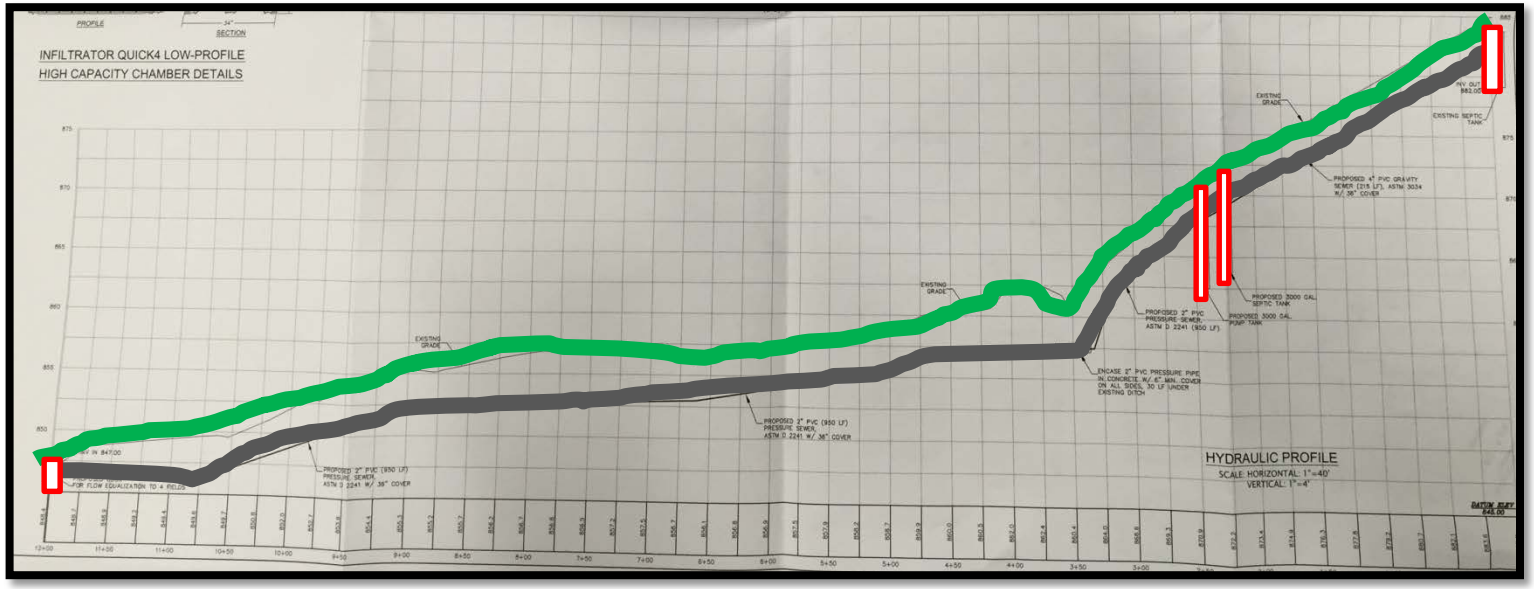
Plan Review - Sewers

- Hydraulic profile
  - Inlet and outlet inverts for components
  - Piping Specifications and lengths



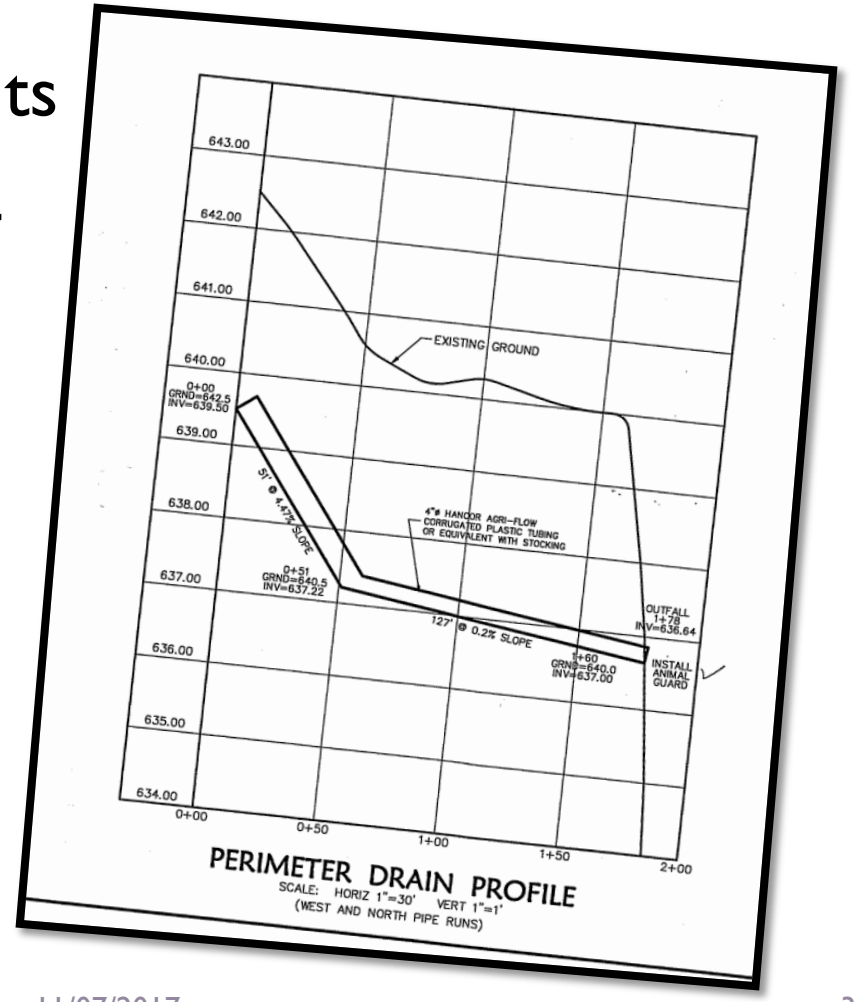
Hydraulic Profiles

- Treatment Train
  - Existing/finished grade
  - Inlet and outlet inverts for components
  - Slope of piping



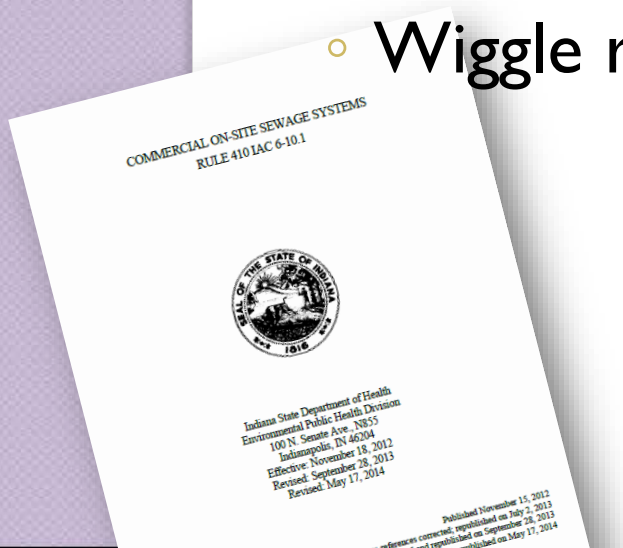
Hydraulic Profiles

- Drainage
  - Perimeter segments
  - Through to outlet



Ultimate Goal??

- Plans…
  - Legible
  - Understandable
  - Useable
- MINIMUM design?
  - Reality
  - Wiggle room


COMMERCIAL ON-SITE SEWAGE SYSTEMS
RULE 410 IAC 6-10.1

Indiana State Department of Health
Environmental Public Health Division
100 N. Senate Ave., N265
Indianapolis, IN 46204
Effective: November 18, 2012
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Revised: May 17, 2014

Published November 15, 2012

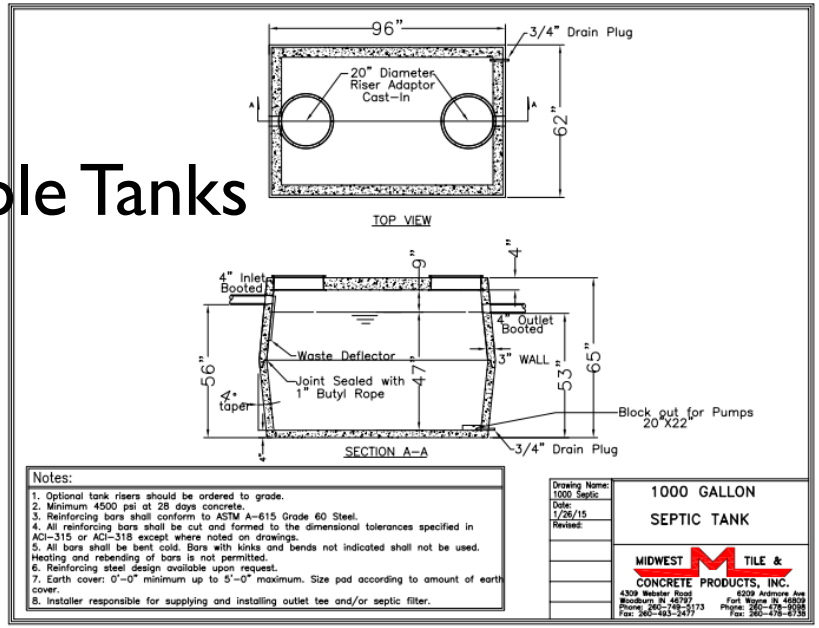
0.4’ of fall in 30’ is 1.33% slope

What if the building sewer outlet is lowered 1”?

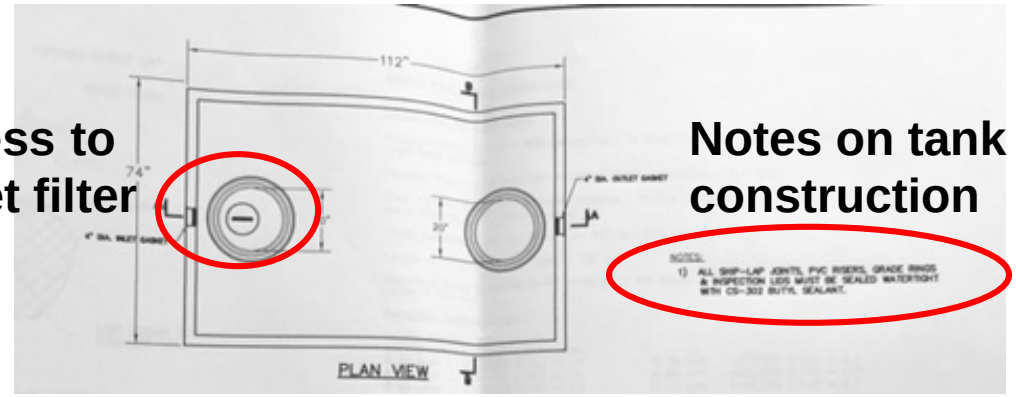
0.32’ of fall in 30’ . . .
The slope is only 1.05% . . .

Septic Tanks

- Manufacturer's Cross Section
  - Approved (www.onsite.isdh.in.gov)
  - Construction Material
    - Poly or fiberglass?
- Working Capacity
- Compartments / Multiple Tanks
- Accessories
  - Access Ports
  - Risers to Final Grade
  - Pipe Connectors
  - Divider Walls
  - Outlet Filter (www.onsite.isdh.in.gov)



Septic Tank Cross Section



Access to outlet filter

Notes on tank construction

Risers to grade

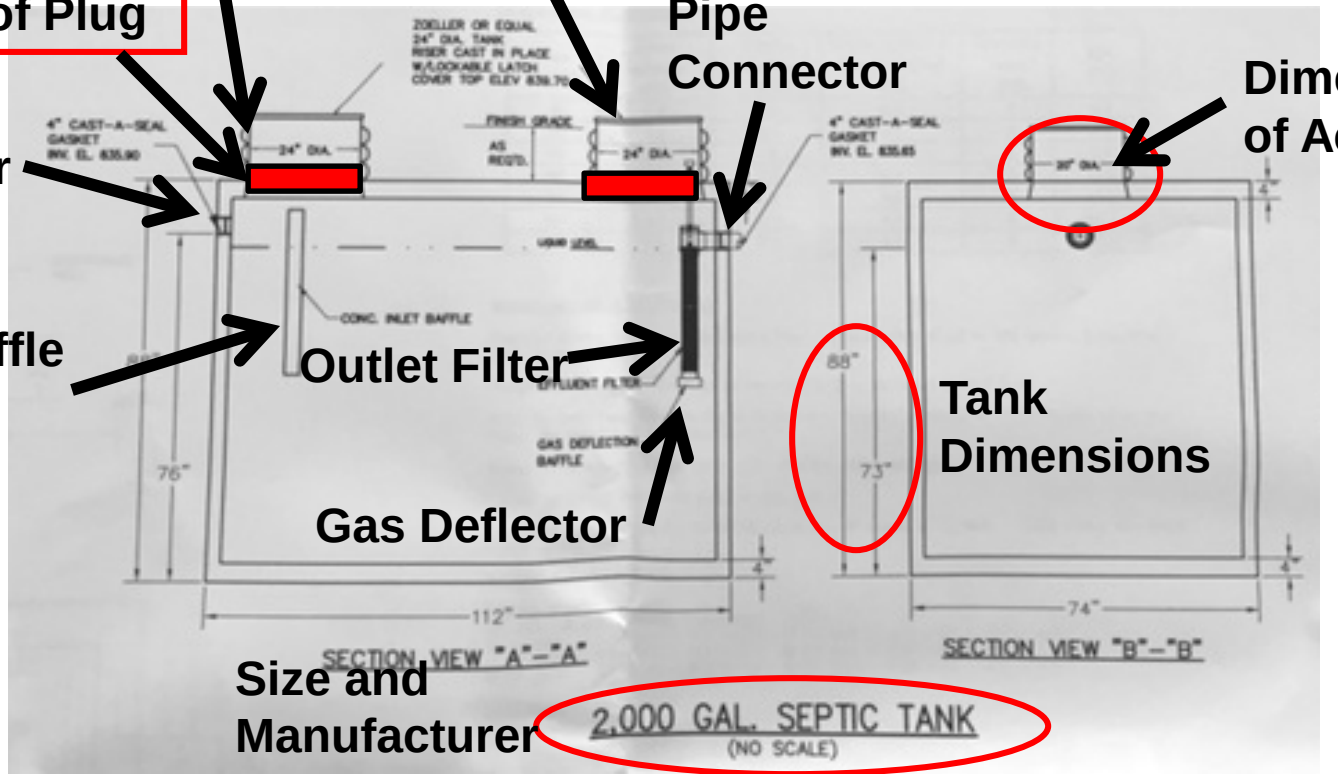
Childproof Plug

Secured Lid

Pipe Connector

Pipe Connector

Dimension of Access



Inlet Baffle or Tee

Outlet Filter

Tank Dimensions

Gas Deflector

Size and Manufacturer

2,000 GAL. SEPTIC TANK
(NO SCALE)

2 Compartment Septic Tank

Risers to grade

Secured Lid

Pipe Connector

Inlet Baffle or Tee

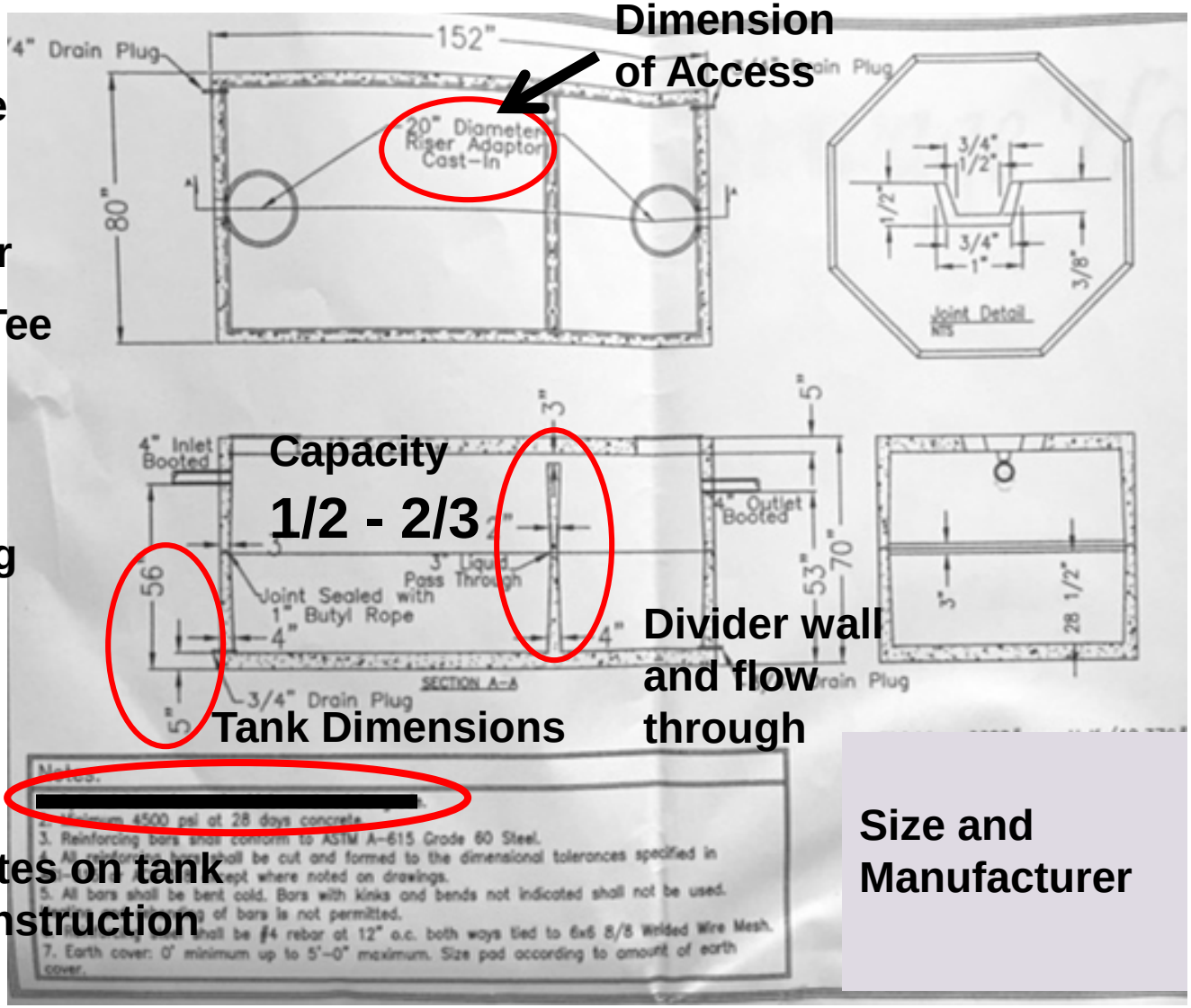
Outlet Filter

Gas Deflector

Childproof Plug

Optional Risers??

Notes on tank construction

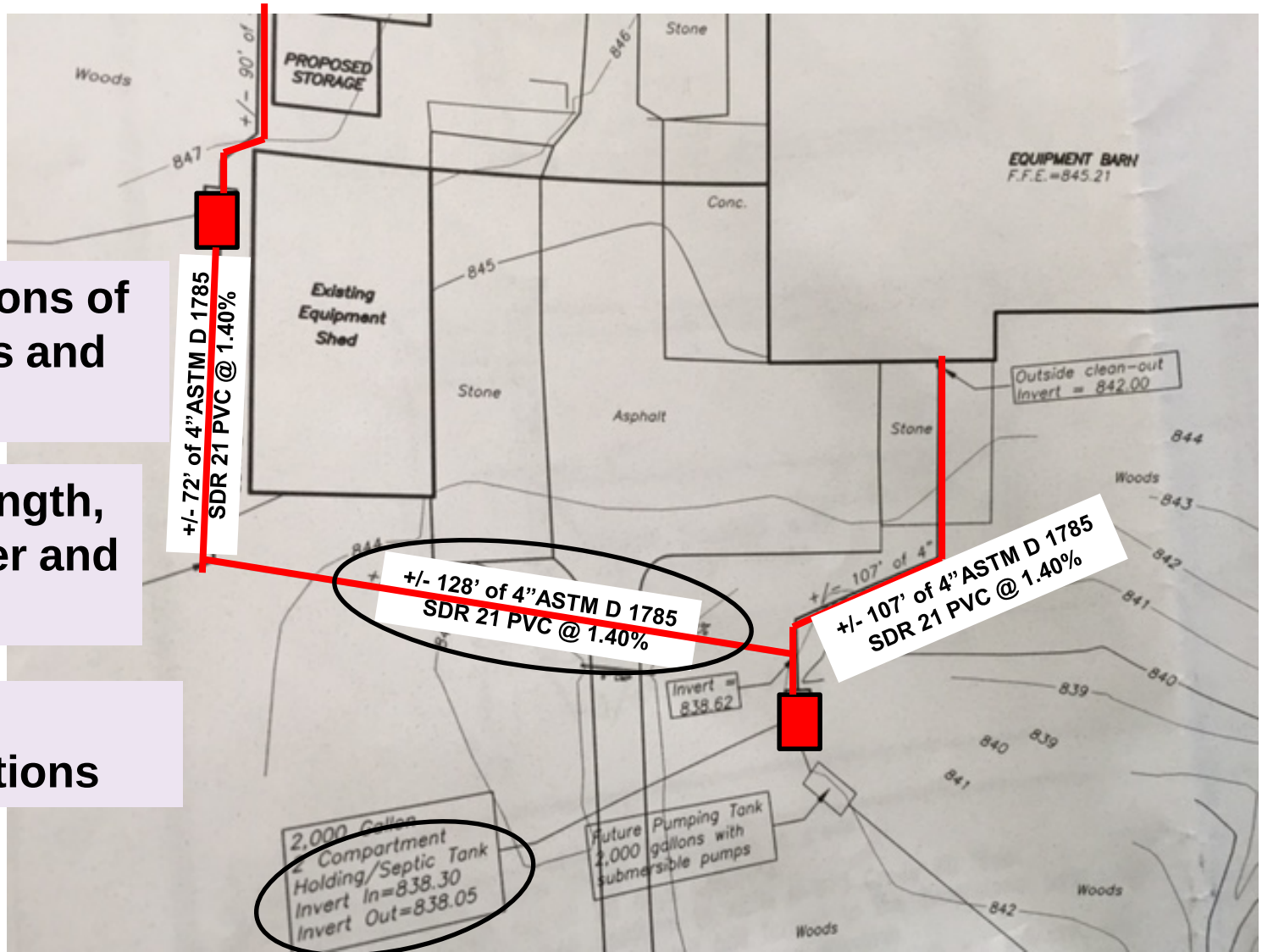


Multiple Tanks in Series

Locations of sewers and tanks

Pipe Length, Diameter and Specs

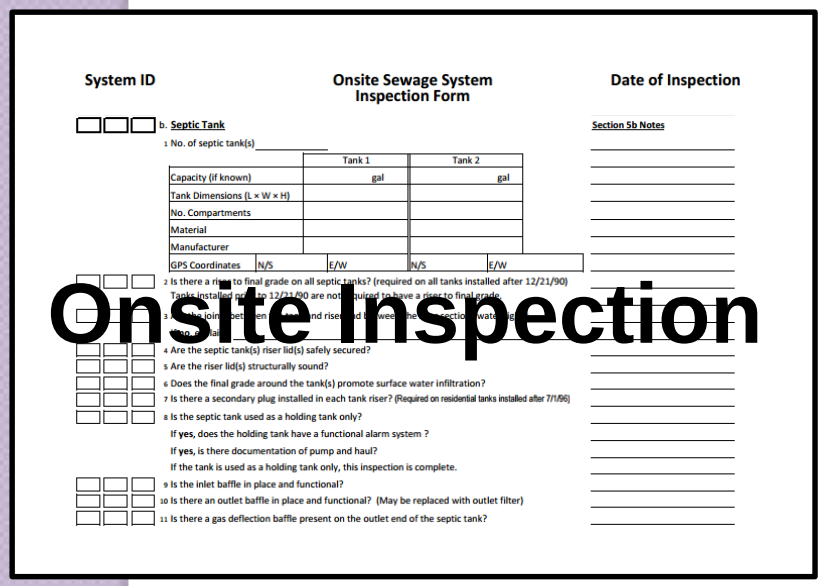
Invert Elevations



Watertight Tanks

Indiana Onsite Waste Water Professional's Association, Inc.

Vacuum Testing



System ID | Onsite Sewage System Inspection Form | Date of Inspection

b. **Septic Tank**

1 No. of septic tank(s) _____

	Tank 1	Tank 2
Capacity (if known)	gal	gal
Tank Dimensions (L × W × H)		
No. Compartments		
Material		
Manufacturer		
GPS Coordinates	N/S E/W	N/S E/W

2 Is there a riser to final grade on all septic tanks? (required on all tanks installed after 12/21/90)
Tanks installed prior to 12/21/90 are not required to have a riser to final grade.

3 Is the joint between the tank and riser sealed to prevent the infiltration of water?

4 Are the septic tank(s) riser lid(s) safely secured?

5 Are the riser lid(s) structurally sound?

6 Does the final grade around the tank(s) promote surface water infiltration?

7 Is there a secondary plug installed in each tank riser? (Required on residential tanks installed after 7/1/96)

8 Is the septic tank used as a holding tank only?
If yes, does the holding tank have a functional alarm system ?
If yes, is there documentation of pump and haul?
If the tank is used as a holding tank only, this inspection is complete.

9 Is the inlet baffle in place and functional?

10 Is there an outlet baffle in place and functional? (May be replaced with outlet filter)

11 Is there a gas deflection baffle present on the outlet end of the septic tank?

Section 5b Notes

Onsite Inspection