DRAINAGE

Project Design Services Unit

June 2018

DEPARTMENT OF TRANSPORTATION

http://ihub/projectdelivery/design/index.html

CULVERT (2501) - TABULATIONS

STATEMENT OF ESTIMATED QUANTITIES							
TAB	SHT NO	ITEM	DESCRIPTION	UNITS	TOTAL ESTIMATED QUANTITY	SP 2222-22 80% FED, 20% STATE FUNDS	SP 1111-11 100% STATE FUNDS
D	25	2104.502	**REMOVE CATCH BASIN**	EACH	1	1	
D	25	2104.502	**REMOVE PIPE APRONS**	EACH	9	4	5
D	25	2104.503	**REMOVE PIPE CULVERTS**	LIN FT	269	171	98
D	25	2105.503	**15" CS PIPE CULVERT**	LIN FT	48	48	
D	25	2501.502	**15" GS PIPE APRON**	EACH	1		1
D	25	2501.502	**24" RC SAFETY APRON**	EACH	8	4	4
D	25	2501.503	**24" RC PIPE CULVERT CL III**	LIN FT	222	124	98
D	25	2511.504	**GEOTEXTILE FILTER TYPE 3**	SQ YD	60	26	34
D	25	2511.507	**RANDOM RIPRAP CLASS II**	CU YD	25	11	14
D	25	2554.502	**GUIDE POST TYPE B**	EACH	9	4	5

Do the column headings match the SEQ descriptions?

CENTERLINE CROSS CULVERTS DRAINAGE TABULATION — **D**

STRUCTURE NO.														DRAINAGE STRUCTURE										
															PAY HEIGHT									
FLOWS FROM	FLOWS TO	STATION	OFFSET						TOP OF CASTING ELEV.	INLET ELEV.	OUTLET ELEV.	REMOVE PIPE APRONS	REMOVE PIPE CULVERT	REMOVE CATCH BASIN	TYPE	DESIGN F	STEPS REQ.	CASTING ASSEMBLY	15" GS PIPE APRON	15" CS PIPE CULVERT	24" RC PIPE CULVERT CL III	24" RC SAFETY APRON	RANDOM RIPRAP CLASS II	GEOTEXT FILTER TYPE 3	GUIDE POSTS TYPE B
SP 2222-22												EACH	LIN FT	EACH		LIN FT	EACH	EACH	EACH	LIN FT	LIN FT	EACH	CU YDS	SQ YD	EACH
5475	5476	371+92	39.0	LT	TO	39.00	RT			991.36	990.87	2	66								66	2	5.5	13	2
5480	5481	372+87	32.0	LT	TO	38.00	RT			991.59	990.83	2	58								58	2	5.5	13	2
5490	5491	379+19	16.0'	LT	TO	22.0'	RT		994.98	989.08	989.08		47	1	CB	6.4	YES	A-7		48					
SP 2222-22 Sub-Total												*4*	*171*	*1*		*6*				*48*	*124*	*4*	*11*	*26*	*4*
SP 1111-11																									
5491		379+19	22.0	RT							974.86	1							1				2.9	8	1
5505	5506	391+64	27.0'	RT	TO	34.0'	LT			988.55	987.24	2	48								48	2	5.5	13	2
5510	5511	402+20	26.0'	RT	TO	35.0'	LT			985.05	983.19	2	50								50	2	5.5	13	2
SP 1111-11 Sub-Total												*5*	*98*						*1*		*98*	*4*	*14*	*34*	*5*
TABULATION TOTAL												***9***	***269***	***1***		***6***			***1***	***48***	***222***	***8***	***25***	***60***	***9***

REMOVE PIPE ARPONS	REMOVE PIPE CULVERT	REMOVE CATCH BASIN	15" GS PIPE APRON	15" CS PIPE CULVERT	24" RC PIPE CULVERT CL III	24" RC SAFETY APRON	RANDOM RIPRAP CLASS II	GEO-TEXTILE FILTER TYPE 3	GUIDE POSTS TYPE B

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TAB	SHT NO	ITEM	DESCRIPTION	UNITS	TOTAL ESTIMATED QUANTITY	SP 2222-22 80% FED, 20% STATE FUNDS	SP 1111-11 100% STATE FUNDS
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D	25	2104.502	REMOVE PIPE APRONS	EACH	9	4	5
D	25	2104.503	REMOVE PIPE CULVERTS	LIN FT	269	171	98
D	25	2105.503	15" CS PIPE CULVERT	LIN FT	48	48	
D	25	2501.502	15" GS PIPE APRON	EACH	1		1
D	25	2501.502	24" RC SAFETY APRON	EACH	8	4	4
D	25	2501.503	24" RC PIPE CULVERT CL III	LIN FT	222	124	98
D	25	2511.504	GEOTEXTILE FILTER TYPE 3	SQ YD	60	26	34
D	25	2511.507	RANDOM RIPRAP CLASS II	CU YD	25	11	14
D	25	2554.502	GUIDE POST TYPE B	EACH	9	4	5

Do the column headings match the SEQ - Pipe material?

15" **GS** PIPE APRON	15' **CS** PIPE CULVERT	24" **RC** PIPE CULVERT CL III	24" **RC** SAFETY APRON

CENTERLINE CROSS CULVERTS DRAINAGE TABULATION — **D**

STRUCTURE NO.																DRAINAGE STRUCTURE										
																PAY HEIGHT										
FLOWS FROM	FLOWS TO	STATION	OFFSET						TOP OF CASTING ELEV.	INLET ELEV.	OUTLET ELEV.	REMOVE PIPE APRONS	REMOVE PIPE CULVERT	REMOVE CATCH BASIN	TYPE	DESIGN F	STEP S REQ.	CASTING ASSEMBLY	15" GS PIPE APRON	15" CS PIPE CULVERT	24" RC PIPE CULVERT CL III	24" RC SAFETY APRON	RANDOM RIPRAP CLASS II	GEOTEXT FILTER TYPE 3	GUIDE POSTS TYPE B
SP 2222-22												EACH	LIN FT	EACH		LIN FT	EACH	EACH	EACH	LIN FT	LIN FT	EACH	CU YDS	SQ YD	EACH
5475	5476	371+92	39.0	LT	TO	39.00	RT			991.36	990.87	2	66								66	2	5.5	13	2
5480	5481	372+87	32.0	LT	TO	38.00	RT			991.59	990.83	2	58								58	2	5.5	13	2
5490	5491	379+19	16.0'	LT	TO	22.0'	RT		994.98	989.08	989.08		47	1	CB	6.4	YES	A-7		48					
SP 2222-22 Sub-Total												*4*	*171*	*1*		*6*				*48*	*124*	*4*	*11*	*26*	*4*
SP 1111-11																									
5491		379+19	22.0'	RT							974.86	1							1				2.9	8	1
5505	5506	391+64	27.0'	RT	TO	34.0'	LT			988.55	987.24	2	48								48	2	5.5	13	2
5510	5511	402+20	26.0'	RT	TO	35.0'	LT			985.05	983.19	2	50								50	2	5.5	13	2
SP 1111-11 Sub-Total												*5*	*98*						*1*		*98*	*4*	*14*	*34*	*5*
TABULATION TOTAL												***9***	***269***	***1***		***6***			***1***	***48***	***222***	***8***	***25***	***60***	***9***

CULVERT (2501) - TABULATIONS

STATEMENT OF ESTIMATED QUANTITIES							
TAB	SHT NO	ITEM	DESCRIPTION	UNITS	TOTAL ESTIMATED QUANTITY	SP 2222-22 80% FED, 20% STATE FUNDS	SP 1111-11 100% STATE FUNDS
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D	25	2104.502	REMOVE PIPE APRONS	EACH	9	4	5
D	25	2104.503	REMOVE PIPE CULVERTS	LIN FT	269	171	98
D	25	2105.503	15" CS PIPE CULVERT	LIN FT	48	48	
D	25	2501.502	15" GS PIPE APRON	EACH	1		1
D	25	2501.502	24" RC SAFETY APRON	EACH	8	4	4
D	25	2501.503	24" RC PIPE CULVERT CL III	LIN FT	222	124	98
D	25	2511.504	GEOTEXTILE FILTER TYPE 3	SQ YD	60	26	34
D	25	2511.507	RANDOM RIPRAP CLASS II	CU YD	25	11	14
D	25	2554.502	GUIDE POST TYPE B	EACH	9	4	5

Do the column headings match the SEQ – Class of pipe?

24" RC PIPE CULVERT

CL III

CENTERLINE CROSS CULVERTS DRAINAGE TABULATION — D

STRUCTURE NO.														DRAINAGE STRUCTURE PAY HEIGHT										
FLOWS FROM	FLOWS TO	STATION	OFFSET						TOP OF CASTING ELEV.	INLET ELEV.	OUTLET ELEV.	REMOVE PIPE APRONS	REMOVE PIPE CULVERT	REMOVE CATCH BASIN	TYPE	DESIGN F	STEPS REQ.	CASTING ASSEMBLY	15" GS PIPE APRON	15" CS PIPE CULVERT	24" RC PIPE CULVERT CL III	24" RC SAFETY APRON	RANDOM RIPRAP CLASS II	GEOTEXT FILTER TYPE 3	GUIDE POSTS TYPE B
												EACH	LIN FT	EACH		LIN FT	EACH	EACH	EACH	LIN FT	LIN FT	EACH	CU YDS	SQ YD	EACH
5475	5476	371+92	39.0	LT	TO	39.00	RT		991.36	990.87	2	66									66	2	5.5	13	2
5480	5481	372+87	32.0	LT	TO	38.00	RT		991.59	990.83	2	58									58	2	5.5	13	2
5490	5491	379+19	16.0'	LT	TO	22.0'	RT	994.98	989.08	989.08		47	1	CB	6.4	YES	A-7		48					
SP 2222-22 Sub-Total											*4*	*171*	*1*		*6*				*48*	*124*	*4*	*11*	*26*	*4*
5491		379+19	22.0'	RT						974.86	1							1				2.9	8	1
5505	5506	391+64	27.0'	RT	TO	34.0'	LT		988.55	987.24	2	48								48	2	5.5	13	2
5510	5511	402+20	26.0'	RT	TO	35.0'	LT		985.05	983.19	2	50								50	2	5.5	13	2
SP 1111-11 Sub-Total											*5*	*98*						*1*		*98*	*4*	*14*	*34*	*5*
TABULATION TOTAL											***9***	***269***	***1***		***6***			***1***	***48***	***222***	***8***	***25***	***60***	***9***

CULVERT (2501) - TABULATIONS

STATEMENT OF ESTIMATED QUANTITIES

TAB	SHT NO	ITEM	DESCRIPTION	UNITS	TOTAL ESTIMATED QUANTITY	SP 2222-22 80% FED, 20% STATE FUNDS	SP 1111-11 100% STATE FUNDS
D	25	2104.502	REMOVE CATCH BASIN	EACH	1	1	
D	25	2104.502	REMOVE PIPE APRONS	EACH	9	4	5
D	25	2104.503	REMOVE PIPE CULVERTS	LIN FT	269	171	98
D	25	2105.503	15" CS PIPE CULVERT	LIN FT	48	48	
D	25	2501.502	15" GS PIPE APRON	EACH	1		1
D	25	2501.502	24" RC SAFETY APRON	EACH	8	4	4
D	25	2501.503	24" RC PIPE CULVERT DESIGN 3006 CL III	LIN FT	222	124	98
D	25	2511.504	GEOTEXTILE FILTER TYPE 3	SQ YD	60	26	34
D	25	2511.507	RANDOM RIPRAP CLASS II	CU YD	25	11	14
D	25	2554.502	GUIDE POST TYPE B	EACH	9	4	5

Do the column headings match the SEQ – Design 3006 (if applicable)?

CENTERLINE CROSS CULVERTS DRAINAGE TABULATION D

STRUCTURE NO.								TOP OF CASTING ELEV.	INLET ELEV.	OUTLET ELEV.	REMOVE PIPE APRONS	REMOVE PIPE CULVERT	REMOVE CATCH BASIN	DRAINAGE STRUCTURE PAY HEIGHT				15" GS PIPE APRON	15" CS PIPE CULVERT	24" RC PIPE CULVERT CL III	24" RC SAFETY APRON	RANDOM RIPRAP CLASS II	GEOTEXT FILTER TYPE 3	GUIDE POSTS TYPE B
FLOWS FROM	FLOWS TO	STATION	OFFSET											TYPE	DESIGN F	STEPS REQ.	CASTING ASSEMBLY							
											EACH	LIN FT	EACH		LIN FT	EACH	EACH	EACH	LIN FT	LIN FT	EACH	CU YDS	SQ YD	EACH
5475	5476	371+92	39.0	LT	TO	39.00	RT		991.36	990.87	2	66								66	2	5.5	13	2
5480	5481	372+87	32.0	LT	TO	38.00	RT		991.59	990.83	2	58								58	2	5.5	13	2
5490	5491	379+19	16.0'	LT	TO	22.0'	RT	994.98	989.08	989.08		47	1	CB	6.4	YES	A-7		48					
SP 2222-22 Sub-Total											*4*	*171*	*1*		*6*				*48*	*124*	*4*	*11*	*26*	*4*
5491		379+19	22.0'	RT						974.86	1							1				2.9	8	1
5505	5506	391+64	27.0'	RT	TO	34.0'	LT		988.55	987.24	2	48								48	2	5.5	13	2
5510	5511	402+20	26.0'	RT	TO	35.0'	LT		985.05	983.19	2	50								50	2	5.5	13	2
SP 1111-11 Sub-Total											*5*	*98*						*1*		*98*	*4*	*14*	*34*	*5*
TABULATION TOTAL											***9***	***269***	***1***		***6***			***1***	***48***	***222***	***8***	***25***	***60***	***9***

ALL CONCRETE PIPE SEWER IS DESIGN 3006 GASKET JOINT PIPE.

ALL CONCRETE PIPE SEWER IS DESIGN 3006 GASKET JOINT PIPE.

CULVERT (2501) - TABULATIONS

STATEMENT OF ESTIMATED QUANTITIES							
TAB	SHT NO	ITEM	DESCRIPTION	UNITS	TOTAL ESTIMATED QUANTITY	SP 2222-22 80% FED, 20% STATE FUNDS	SP 1111-11 100% STATE FUNDS
D	25	2104.502	REMOVE CATCH BASIN	EACH	1	1	
D	25	2104.502	REMOVE PIPE APRONS	EACH	9	4	5
D	25	2104.503	REMOVE PIPE CULVERTS	LIN FT	269	171	98
D	25	2105.503	15" CS PIPE CULVERT	LIN FT	48	48	
D	25	2501.502	15" GS PIPE APRON	EACH	1		1
D	25	2501.502	24" RC SAFETY APRON	EACH	8	4	4
D	25	2501.503	24" RC PIPE CULVERT CL III	LIN FT	222	124	98
D	25	2511.504	GEOTEXTILE FILTER TYPE 3	SQ YD	60	26	34
D	25	2511.507	RANDOM RIPRAP CLASS II	CU YD	25	11	14
D	25	2554.502	GUIDE POST TYPE B	EACH	9	4	5

- Are all notes accounted for and do they make sense?
- Show all SP/Funding splits and a tabulation total.

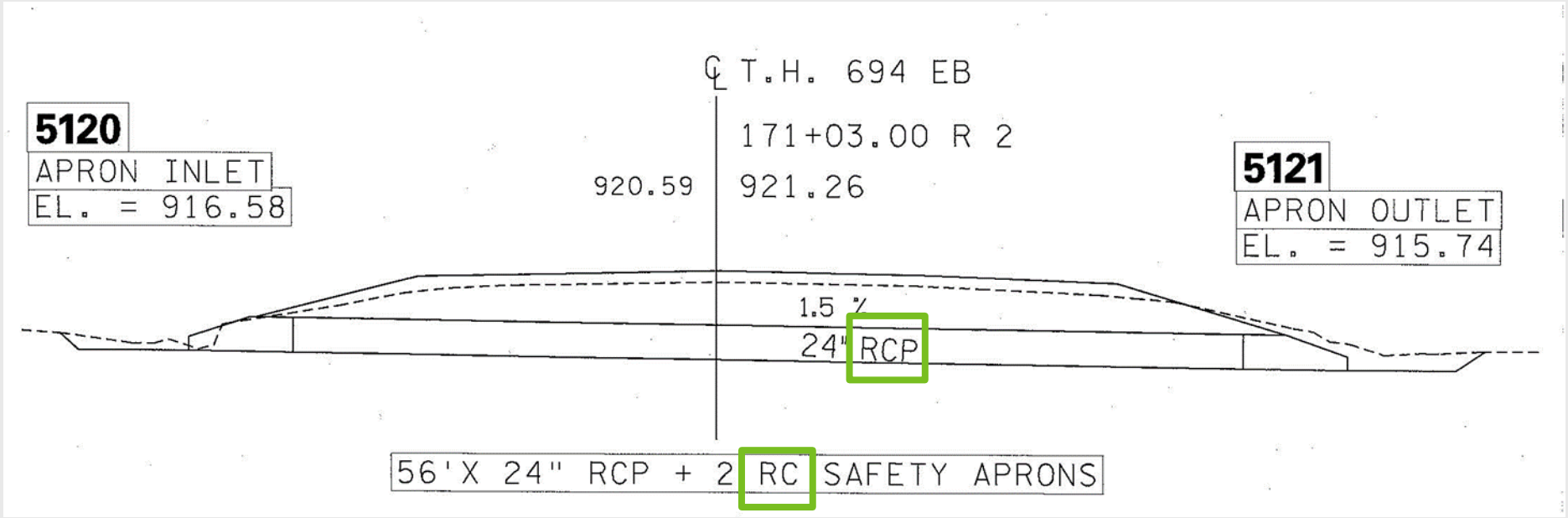
CENTERLINE CROSS CULVERTS DRAINAGE TABULATION — D

STRUCTURE NO.				TOP OF CASTING ELEV.	INLET ELEV.	OUTLET ELEV.	REMOVE PIPE APRONS	REMOVE PIPE CULVERT	REMOVE CATCH BASIN	DRAINAGE STRUCTURE PAY HEIGHT				15" GS PIPE APRON	15" CS PIPE CULVERT	24" RC PIPE CULVERT CL III	24" RC SAFETY APRON	RANDOM RIPRAP CLASS II	GEOTEXT FILTER TYPE 3	GUIDE POSTS TYPE B
FLOWS FROM	FLOWS TO	STATION	OFFSET							TYPE	DESIGN F	STEPS REQ.	CASTING ASSEMBLY							
SP 2222-22							EACH	LIN FT	EACH		LIN FT	EACH	EACH	EACH	LIN FT	LIN FT	EACH	CU YDS	SQ YD	EACH
5475	5476	371+92	39.0 LT TO 39.00 RT		991.36	990.87	2	66								66	2	5.5	13	2
5480	5481	372+87	32.0 LT TO 38.00 RT		991.59	990.83	2	58								58	2	5.5	13	2
5490	5491	379+19	16.0' LT TO 22.0' RT	994.98	989.08	989.08		47	1	CB	6.4	YES	A-7		48					
SP 2222-22 (80% Fed, 20% State Funds) Sub-Total							*4*	*171*	*1*		*6*				*48*	*124*	*4*	*11*	*26*	*4*
SP 1111-11																				
5491		379+19	22.0' RT			974.86	1							1				2.9	8	1
5505	5506	391+64	27.0' RT TO 34.0' LT		988.55	987.24	2	48								48	2	5.5	13	2
5510	5511	402+20	26.0' RT TO 35.0' LT		985.05	983.19	2	50								50	2	5.5	13	2
SP 1111-11 (100% State Funds) Sub-Total							*5*	*98*						*1*		*98*	*4*	*14*	*34*	*5*
TABULATION TOTAL							***9***	***269***	***1***		***6***			***1***	***48***	***222***	***8***	***25***	***60***	***9***

CULVERT (2501) – PROFILES MATERIALS

Do the profile MATERIALS agree with the tabulations?

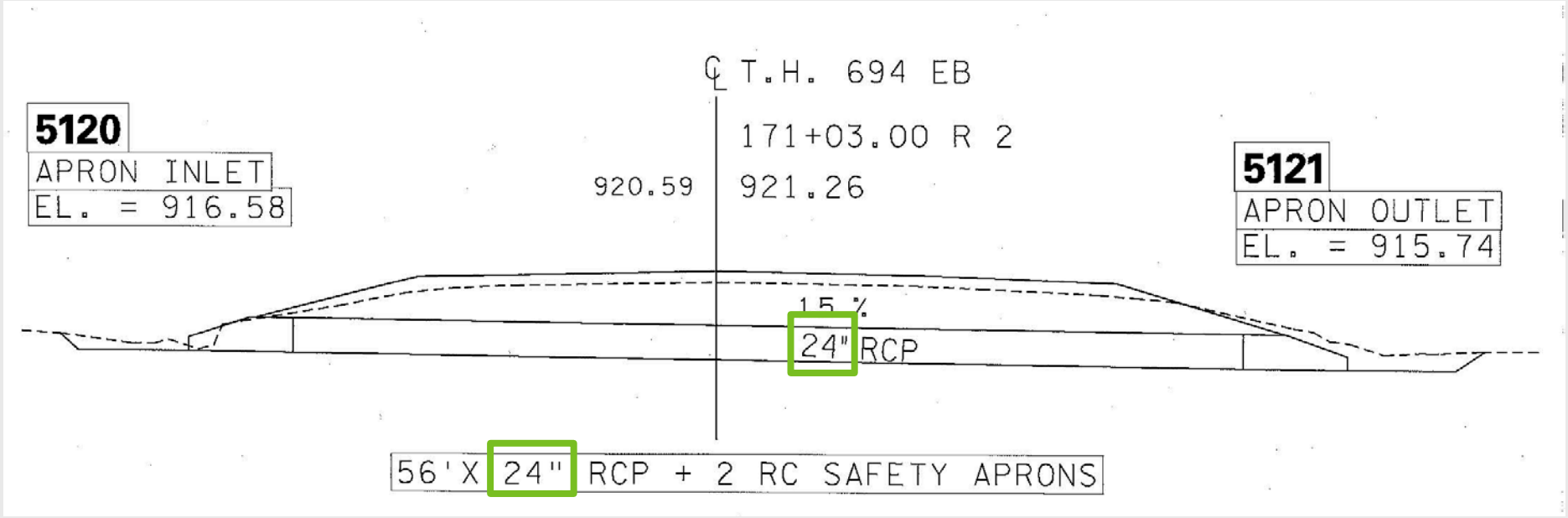
24" **RC** PIPE CULVERT CL III	24' **RC** SAFETY APRON



CULVERT (2501) – PROFILES PIPE SIZES

Do the profile pipe SIZES agree with the tabulations?

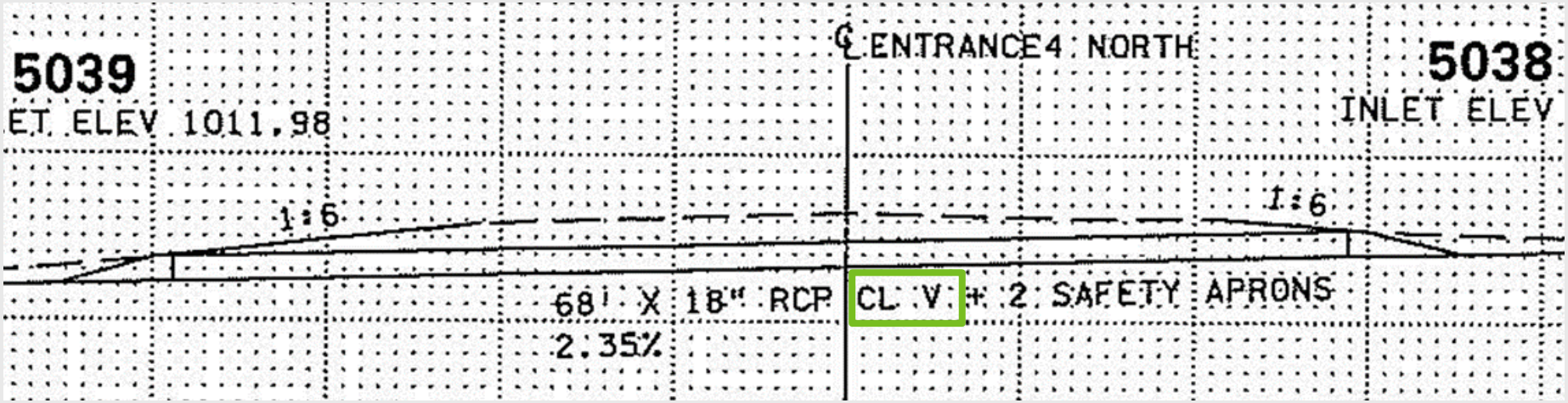
24" **RC**
PIPE
CULVERT
CL III



CULVERT (2501) – PROFILES PIPE CLASS

Do the profile pipe CLASS agree with the tabulations?

18" **RC**
PIPE
CULVERT
CLASS V

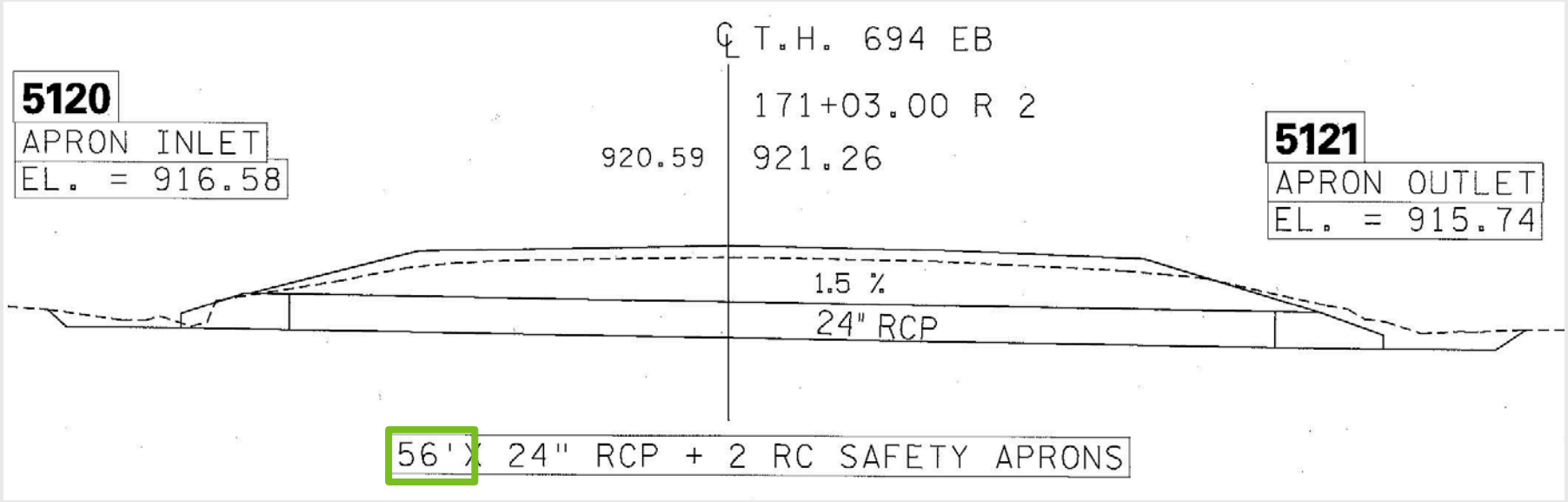


CULVERT (2501) – PROFILES PIPE LENGTHS

Do the profile pipe LENGTHS agree with the tabulations?

- Sometimes the profile length includes the apron length…if so it should be noted.

CENTERLINE CROSS CULVERTS				
STRUCTURE NO.		STATION	24" RC PIPE CULVERT	24" RC SAFETY APRON
FLOWS FROM	FLOWS TO		LIN FT	EACH
5075	5076	147+76	92	2
5095	5096	150+50	58	1
5115	5116	161+02	55	2
5120	5121	171+03	**56**	2
		TOTAL	**261**	**7**

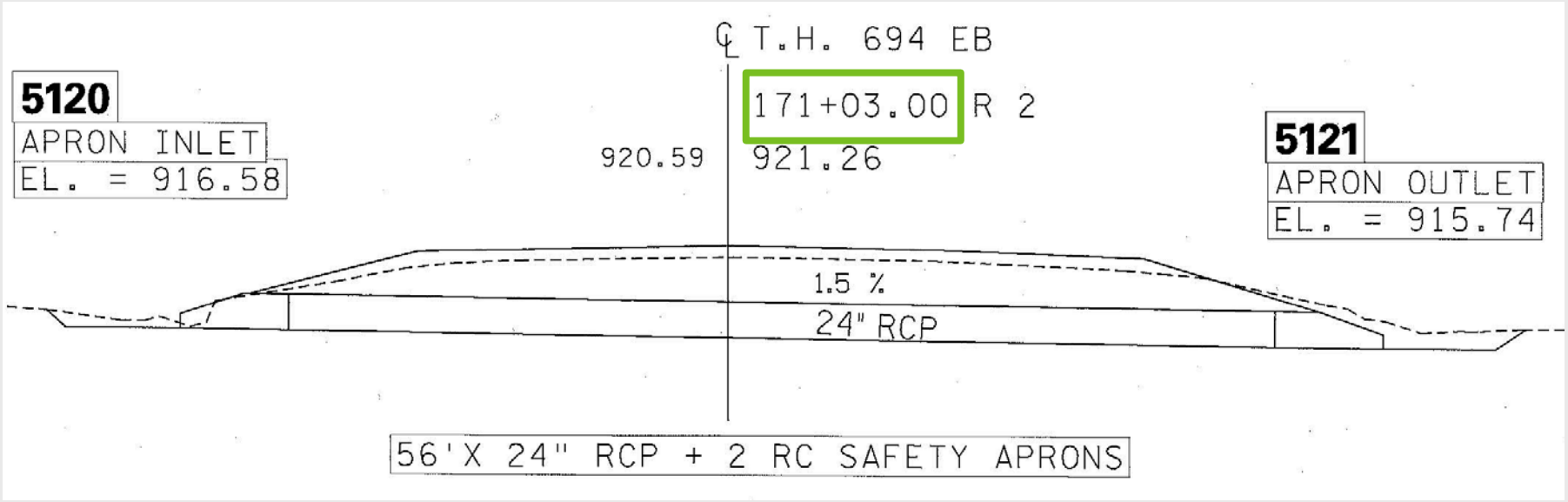


CULVERT (2501) – PROFILES PIPE STATIONING

Do the profile pipe STATIONING agree with the tabulations?

- ❖ They should match exactly, not be rounded off.

CENTERLINE CROSS CULVERTS				
STRUCTURE NO.		STATION	24" RC PIPE	24" RC SAFETY
FLOWS FROM	FLOWS TO		LIN FT	EACH
5075	5076	147+76	92	2
5095	5096	150+50	58	1
5115	5116	161+02	55	2
5120	5121	**171+03**	56	2
		TOTAL	**261**	**7**

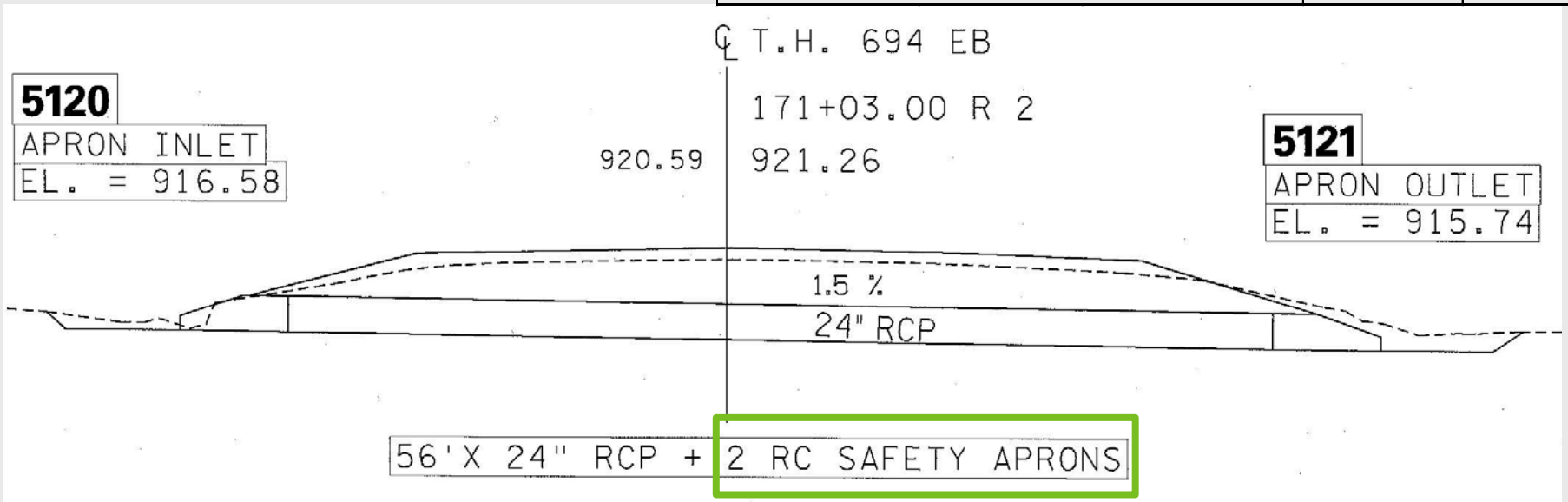


CULVERT (2501) – PROFILES APRONS

Does the profile agree with the tabulation for the APRON…

- Size
- Material
- Type (e.g. safety, flared)
- Quantity

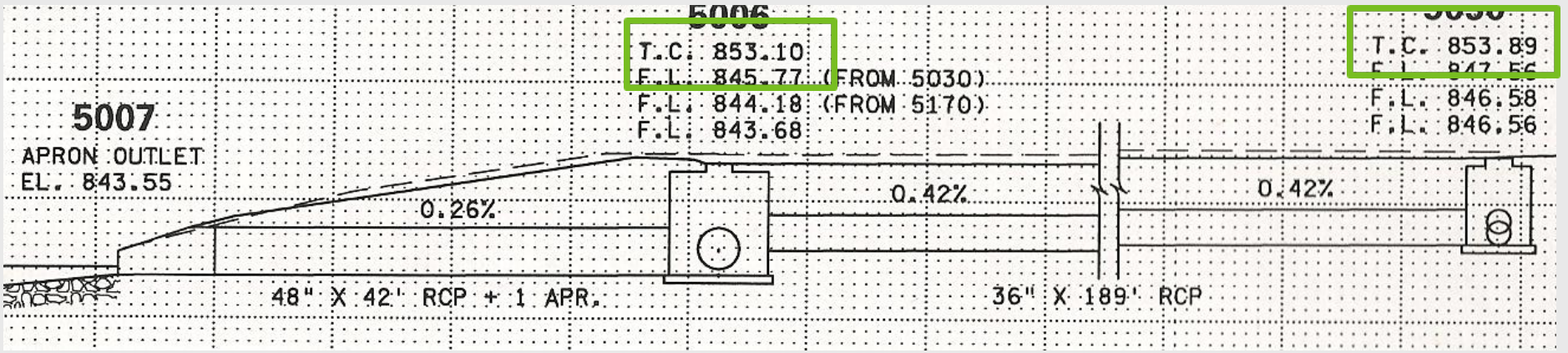
CENTERLINE CROSS CULVERTS				
STRUCTURE NO.		STATION	24" RC PIPE	**24" RC SAFETY**
FLOWS FROM	FLOWS TO		LIN FT	**EACH**
5075	5076	147+76	92	**2**
5095	5096	150+50	58	**1**
5115	5116	161+02	55	**2**
5120	5121	171+03	56	**2**
		TOTAL	**261**	**7**



STORM SEWER (2503) - PROFILES

This should be the same as what is stated in the CULVERT profile slides above. Plus the top of casting in the profile should match the tabulation.

DRAINAGE TABULATION (THIS SHEET ONLY)										
STRUCTURE NO.		STRUCTURE LOCATION						TOP OF CASTING ELEV.	INLET ELEV.	OUTLET ELEV.
FLOWS FROM	FLOWS TO	STATION	OFFSET							
5007		379+19	22.0'	RT						843.55
5006	5007	391+64	27.0'	RT	TO	34.0'	LT	**853.10**	845.77	843.68
5030	5006	402+20	26.0'	RT	TO	35.0'	LT	**853.89**	847.56	846.56
TABULATION TOTAL										



DRAINAGE SUMMARY TABULATION ITEM DESCRIPTIONS

All pay items are covered and match the SEQ DESCRIPTIONS.

STATEMENT OF ESTIMATED QUANTITIES							
TAB	SHT NO	ITEM	DESCRIPTION	UNITS	TOTAL ESTIMATED QUANTITY	SP 2222-22	SP 1111-11
D	25	2104.502	REMOVE CATCH BASIN	EACH	1	1	
D	25	2104.502	REMOVE PIPE APRONS	EACH	9	4	5
D	25	2104.503	REMOVE PIPE CULVERTS	LIN FT	269	171	98
D	25	2105.503	15" CS PIPE CULVERT	LIN FT	48	48	
D	25	2501.502	15" GS PIPE APRON	EACH	1		1
D	25	2501.502	24" RC SAFETY APRON	EACH	8	4	4
D	25	2501.503	24" RC PIPE CULVERT DESIGN 3006 CL III	LIN FT	222	124	98

DRAINAGE SUMMARY						
ITEM DESCRIPTION	UNIT	SHEET NO.				TOTAL
		100		101	102	
		SP 1111-11	SP2222-22	SP 1111-11	SP 1111-11	
REMOVE CATCH BASIN	EACH		1			1
REMOVE PIPE APRONS	EACH	1	4	2	2	9
REMOVE PIPE CULVERTS	LIN FT	33	171	35	30	269
15" CS PIPE CULVERT	LIN FT		48			48
15" GS PIPE APRON	EACH			1		1
24" RC SAFETY APRON	EACH		4		4	8
24" RC PIPE CULVERT DESIGN 3006 CL III	LIN FT		124		98	222

DRAINAGE SUMMARY TABULATION SP/FUNDING SPLITS

The SP/FUNDING splits need to be shown and match the SEQ.

STATEMENT OF ESTIMATED QUANTITIES							
TAB	SHT NO	ITEM	DESCRIPTION	UNITS	TOTAL ESTIMATED QUANTITY	SP 2222-22 80% FED, 20% STATE FUNDS	SP 1111-11 100% STATE FUNDS
D	25	2104.502	REMOVE CATCH BASIN	EACH	1	1	
D	25	2104.502	REMOVE PIPE APRONS	EACH	9	4	5
D	25	2104.503	REMOVE PIPE CULVERTS	LIN FT	269	171	98
D	25	2105.503	15" CS PIPE CULVERT	LIN FT	48	48	
D	25	2501.502	15" GS PIPE APRON	EACH	1		1
D	25	2501.502	24" RC SAFETY APRON	EACH	8	4	4
D	25	2501.503	24" RC PIPE CULVERT DESIGN 3006 CL III	LIN FT	222	124	98

DRAINAGE SUMMARY								
ITEM DESCRIPTION	UNIT	SHEET NO.				SUB-TOTAL		TOTAL
		100		101	102	SP 2222-22 80% FED,	SP 1111-11 100%	
		SP 1111-11	SP2222-22	SP 1111-11	SP 1111-11			
REMOVE CATCH BASIN	EACH		1			1		1
REMOVE PIPE APRONS	EACH	1	4	2	2	4	5	9
REMOVE PIPE CULVERTS	LIN FT	33	171	35	30	171	98	269
15" CS PIPE CULVERT	LIN FT		48			48		48
15" GS PIPE APRON	EACH			1			1	1
24" RC SAFETY APRON	EACH		4		4	4	4	8
24" RC PIPE CULVERT DESIGN 3006 CL III	LIN FT		124		98	124	98	222

DRAINAGE SUMMARY TABULATION TOTAL COLUMN

The tabulation needs to include a SUB-TOTAL and TOTAL column.

DRAINAGE SUMMARY								
ITEM DESCRIPTION	UNIT	SHEET NO.				SUB-TOTAL		TOTAL
		100		101	102	SP 2222-22 80% FED, 20% STATE FUNDS	SP 1111-11 100% STATE FUNDS	
		SP 1111-11	SP2222-22	SP 1111-11	SP 1111-11			
REMOVE CATCH BASIN	EACH		1			1		1
REMOVE PIPE APRONS	EACH	1	4	2	2	4	5	9
REMOVE PIPE CULVERTS	LIN FT	33	171	35	30	171	98	269
15" CS PIPE CULVERT	LIN FT		48			48		48
15" GS PIPE APRON	EACH			1			1	1
24" RC SAFETY APRON	EACH		4		4	4	4	8
24" RC PIPE CULVERT DESIGN 3006 CL III	LIN FT		124		98	124	98	222

DRAINAGE - ENTRANCE APRONS

IS THE APRON IN THE CLEAR ZONE?

- No…flared apron, no grate
- Yes…
  - Entrance Culvert apron…
    - Recommend it be a safety apron
    - Grate is required when the safety apron is….
      - > 24”
      - Span > 24”
      - There are multiple aprons

This information can be found in the Road Design Manual and the Design Scene

DRAINAGE – CENTERLINE APRONS

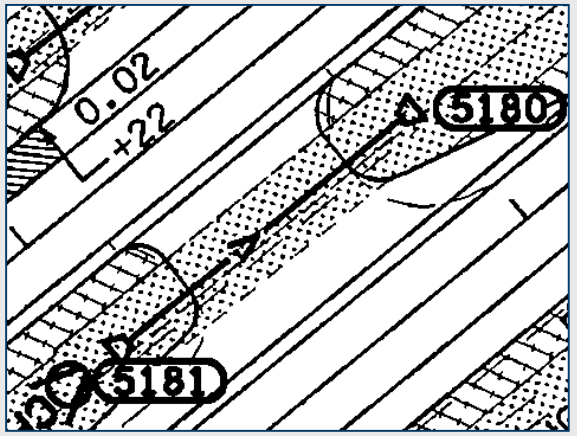
IS THE APRON IN THE CLEAR ZONE?

- No…flared apron, no grate
- Yes…
  - Centerline Culvert apron, grate is required when…
    - Safety Apron is…
      - > 36”
      - Multiple aprons > 30”
      - Span safety aprons > 36”
      - Multiple span aprons > 28”
    - Flared Apron is…
      - > 15”
      - All span apron
      - All multiple aprons

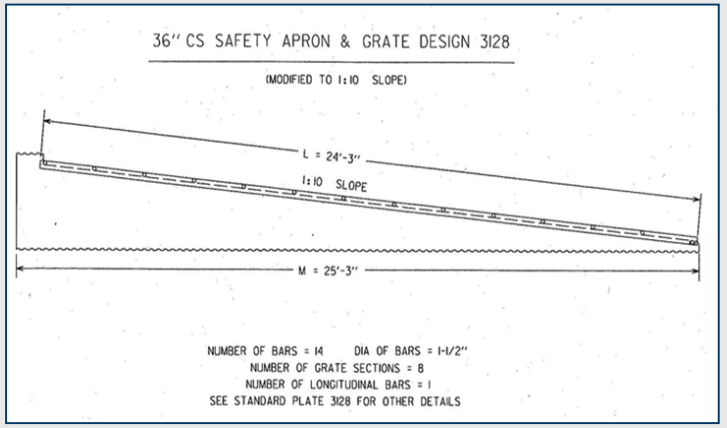
This information can be found in the Road Design Manual and the Design Scene

DRAINAGE – PARALLEL MEDIAN APRON

When an apron is in the median of a divided roadway and is parallel to the roadway it MUST….



- Be at a 1:10 slope
- Be a metal safety apron
- Have a safety grate
- Have a detail which can be found (internally only) at http://ihub/designsupport/standards/design.html under
  - SAFEAPRN1_10SM for 12” to 21”
  - SAFEAPRON1_10B for 24” to 36”
- Include Standard plate 3128 which shows the connection to concrete pipe



This information can be found in the Design Scene

DRAINAGE – STORM SEWER OPTION (2503)

- Storm Sewer may have a plastic pipe option.
- Use standard concrete pipe pay items.
- Must add to the SEQ…*PLASTIC PIPE MAY BE USED AS AN OPTION FOR XX LIN FT, SEE TAB FOR LOCATIONS.*

DRAINAGE – GENERIC CULVERTS (2501)

- Generic culverts are generally used for entrance pipes.
- When giving the plastic pipe option they must use the generic items….
  - 2501.602 XX” SAFETY APRON by the EACH with the note…Apron material shall be the same as pipe material except that the apron for CP & PP pipe shall be CS.
  - 2501.602 XX” PIPE APRON by the EACH with the note… Apron material shall be the same as pipe material except that the apron for CP, PP and CS pipe shall be GS.
  - 2501.603 XX” PIPE CULVERT by the LIN FT with the note…CS, CP, PP, RC may be used as acceptable pipe options. CS was used to determine the pipe lengths.

DRAINAGE – GENERIC CENTERLINE CULVERTS (2501)

Centerline culverts are rarely used with an option.

- To use the generic option it MUST…
  - Be less than 48”
  - Be less than 5000 ADT

- Use standard concrete pipe pay items.

- Must add *NOTE…PLASTIC PIPE MAY BE USED AS AN OPTION FOR XX LIN FT, SEE TAB FOR LOCATIONS.*

DRAINAGE – STORM SEWER BEDDING

When there are storm sewer (2503) items in the plan then….

- Payment for the bedding quantities should be included in the SEQ and TABULATIONS.
- Excavation and backfill do NOT need to be tabulated separately but are considered to be included in the cost of the storm sewer items.
- Include the detail in the plan (see slide 24 for detail location) The detail is titled STORM DRAIN BEDDING
  - The detail on the left (RIGID) is for concrete pipes.
  - The detail on the right (Flexible) is for metal and/or plastic pipes.
    - These details should NOT need to be edited.

DRAINAGE – BEDDING DETAIL LOCATION

Go to “MnDOT A to Z”

Click on…

- “S”
- “Standard Plans”
- “Main Menu”
- “Design Details” (it’s at the bottom)

DRAINAGE – CULVERT BEDDING with TREATMENTS

When there are culvert (2501) items in the plan that require treatments, typically centerline culverts in areas prone to frost heave...

- Payment for excavation, bedding, and special backfill quantities should be included in the SEQ and TABULATIONS (preferable the drainage tabulation).

- Identify the treatment type in the TABULATIONS.

- Include the detail in the plan (see slide 24 for detail location)
  - "CULV BEDDING RIGID" if using concrete pipes.
  - "CULV BEDDING FLEX" if using metal and/or plastic pipes.
    - These details can be editing according to the District materials Engineers recommendations.

DRAINAGE – CULVERT BEDDING without TREATMENTS

When there are culvert (2501) items in the plan that requires treatments, typically centerline and side culverts for local roadways but do not typically apply to entrance culverts.

- Payment for the bedding quantities should be included in the SEQ and TABULATIONS.

- Excavation and backfill do NOT need to be tabulated separately but are considered to be included in the cost of the storm sewer items unless a special backfill is required. When special backfill is required backfill should be included in the SEQ and TABULATIONS.

- Include the detail in the plan (see slide 24 for detail location)
  - "CULV BEDDING RIGID" if using concrete pipes.
  - "CULV BEDDING FLEX" if using metal and/or plastic pipes.
    - Details are not modified unless an alternate bedding design is used.

DRAINAGE – CULVERT BEDDING ENTRANCE CULVERTS

Entrance culverts for agricultural, residential, or commercial entrances.

- If placed with “Select grading material” as backfill then
  - No detail is needed
  - No quantities need to be in the tabulations.

DRAINAGE – CULVERT BEDDING ENTRANCE CULVERTS

- If bedding is required then…
  - Payment for the bedding quantities should be included in the SEQ and TABULATIONS.
  - Excavation and backfill do NOT need to be tabulated separately but are considered to be included in the cost of the storm sewer items.
- Include the detail in the plan (see slide 24 for detail location)
  - "CULV BEDDING RIGID" if using concrete pipes.
  - "CULV BEDDING FLEX" if using metal and/or plastic pipes.
    - Details are not modified unless an alternate bedding design is used.

DRAINAGE – BOX CULVERT BEDDING

- Excavation and backfill do NOT need to be tabulated separately but are considered to be included in the cost of the box culvert items.

- Include the detail in the plan (see slide 24 for detail location)
  - "BOX CULV BEDDING" Details are not modified unless an alternate bedding design is used.

DRAINAGE – PIPE LINING STORM SEWER (2503)

STORM SEWER LINING - 2503

- Must state pipe size.
- 2503.603 LINING SEWER PIPE X” by LIN FT
- Grout is incidental unless otherwise noted.

DRAINAGE – PIPE LINING CULVERT (2507)

CULVERT LINING - 2507

- Must state pipe size.

- 2507.503 LINING CULVERT PIPE (XX”) by the LIN FT, when using this pay item, also include either…
  - 2519.507 CLSM LOW DENSITY by the CU YD or
  - 2519.507 CLSM HIGH DENSITY by the CU YD or
  - A note stating the use of cured in place pipe.

- If placing a special or cured in place plastic (CIPP)
  - Use 2507.603 LINING CULVERT PIPE (X”) SPECIAL by LIN FT
  - Note how it is special or …*CURED IN PLACE PLASTIC (CIPP) EITHER IN THE SEQ OR TABULATION.*

DRAINAGE – DEWATERING

When DEWATERING is paid for in the plan a location should be referenced either as a note in the SEQ or in a TABULATION where this is needed and at least one of the following should be included…

- A detail/schematic of the dewatering.
- The flow rates for each of the locations.
- Information is included in the Special Provisions.

DEWATERING TABULATION						
STATION	INPLACE	EXISTING	NORMAL WATER	2-YEAR EVENT	2-YEAR EVENT	DRAINAGE AREA
TH 1	CULVERT	RESOURCE	DEPTH FEET	DEPTH FEET	FLOW CFS	ACRES
272+00	24" RCP	WETLAND	1.5	2.2	12	29
645+06	24" RCP	TRIBUTARY-DNR PROTECTED WATER	0.5	3.1	35	323
900+50	30" RCP	WETLAND	0.5	2	14	41
TH 2	CULVERT	RESOURCE	DEPTH FEET	DEPTH FEET	FLOW CFS	ACRES
174+81	48" RCP	TRIBUTARY	0.3	3.2	64	250
182-83	60" RCP	TRIBUTARY	1	2.1	40	186
47+96	60" RCP	TRIBUTARY	1	2	16	164

DEPARTMENT OF TRANSPORTATION

QUESTIONS????

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