Environmental Consultants
and Contractors

4041 Park Oaks Blvd.
Suite 100
Tampa, FL 33610-9501

813 621-0080
FAX 813 623-6757
www.scsengineers.com

SCS ENGINEERS

March 16, 2011
File No. 09207049.04

Mr. Douglas Hyman, P.E.
Environmental Resource Management
Florida Department of Environmental Protection, Southwest District
13051 N. Telecom Parkway
Temple Terrace, Florida 33637-0926

Subject: Statement of Completion, Transfer to Operations Phase and Record Drawings
Citrus County Phase 3 Expansion Project
Citrus County, Florida
Permit Number 09-0291076-001

Dear Mr. Hyman:

On behalf of the Citrus County Solid Waste Management Division (SWMD), SCS Engineers (SCS) is submitting the required documentation in compliance with General Condition 13 and Specific Condition 8 of the Environmental Resource Permit No. 09-0291076-001 for the Citrus County Central Landfill Phase 3 Expansion Project.

Attachment 1 of this letter contains two originals of the "Environmental Resource Permit As-Built Certification by a Registered Professional" (Form No. 62-343.900(5), F.A.C.) signed by Dominique H. Bramlett, a Registered Professional Engineer in the State of Florida as required by General Condition 13 of the permit.

Attachment 2 of this letter contains two originals of the "Request for Transfer of Environmental Resource Permit Construction Phase to Operation Phase" (Form No. 62-343.900(7), F.A.C.) signed by Casey Stephens the director of Citrus County Solid Waste Management Department, the operating entity as required by General Condition 13 of the permit.

Attachment 3 of this letter contains two originals of the Record Drawings signed and sealed by Dominique H. Bramlett, a Registered Professional Engineer in the State of Florida as required by Specific Condition 8 of the permit. All components of the surface water management system were constructed in general accordance with the plans. The Record Drawings also include the As-Built Survey that has been signed and sealed by a Registered Surveyor in the State of Florida.

Attachment 4 of this letter contains two originals of the Box Culvert and Endwalls Report. In lieu of the precast structure as shown on the drawings the structure was poured in place. The Report contains the calculation worksheets and drawings signed and sealed by a Registered Professional Engineer in the State of Florida.

Dept. Of Environmental Protection
MAR 17 2011
Southwest District

If you have any questions, please feel free to contact us at 813-621-0080.

Sincerely,

Dominique H. Bramlett, P.E.
Senior Project Engineer
SCS ENGINEERS

C. Ed Hilton, P.E.
Vice President
SCS ENGINEERS

DHB/CEH:dhb

cc: Steve Morgan, P.E., FDEP Tampa
Casey Stephens, Citrus County Solid Waste Management Division

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT
TAMPA

Attachment 1

"Environmental Resource Permit As-Built Certification by a Registered Professional" (Form No. 62-343.900(5), F.A.C.)

Form #62-343.900(5), F.A.C.
Form Title: As-Built Certification by a Registered Professional
Effective Date: October 3, 1995

ENVIRONMENTAL RESOURCE PERMIT
AS-BUILT CERTIFICATION BY A REGISTERED PROFESSIONAL

Permit Number: 09-0291076-001

Project Name: Citrus County Central Landfill, Phase 3 Expansion Project

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT TAMPA

I hereby certify that all components of this surface water management system have been built substantially in accordance with the approved plans and specifications and are ready for inspection. Any substantial deviations (noted below) from the approved plans and specifications will not prevent the system from functioning as designed when properly maintained and operated. These determinations are based upon on-site observation of the system conducted by me or by my designee under my direct supervision and/or my review of as-built plans certified by a registered professional or Land Surveyor licensed in the State of Florida.

Dominique H. Bramlett, P.E.
Name (please print)

Signature of Professional 3/16/11

SCS Engineers
Company Name

Florida Registration Number 61829

4041 Park Oaks Blvd., Suite 100
Company Address

Date

Tampa, Florida 33610
City, State, Zip Code

(813) 621-0080
Telephone Number

(Affix Seal)

Substantial deviations from the approved plans and specifications:

All components of the surface water management system were constructed in general accordance with the plans.

(Note: attach two copies of as-built plans when there are substantial deviations)

Within 30 days of completion of the system, submit two copies of the form to:

Florida Department of Environmental Protection
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

62-343.900(5)
On-Line Document
Formatted 12/01/97 kag

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT
TAMPA

Attachment 2

"Request for Transfer of Environmental Resource Permit Construction Phase to Operation Phase" (Form No. 62-343.900(7), F.A.C.)

Form #: 62-353.900(7)F.A.C.
Form Title: Request for Transfer to Operation Phase
Effective Date: September 25, 1995

Request for Transfer of Environmental Resource Permit Construction Phase to Operation Phase

(To be completed and submitted by the operating entity)

Florida Department of Environmental Protection

Southwest District Office
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT TAMPA

It is requested that Department Permit Number 09-0291076-001 authorizing the construction and operation of a surface water management system for the below mention project be transferred from the construction phase permittee to the operation phase operating entity.

Project: Citrus County Central Landfill, Phase 3 Expansion Project

From: Name: Citrus County Solid Waste Management Division
Address: P.O. Box 340
City: Lecanto State: FL Zip: 34460

To: Name: Citrus County Solid Waste Management Division
Address: P.O. Box 340
City: Lecanto State: FL Zip: 34460

The surface water management facilities are hereby accepted for operation and maintenance in accordance with the engineers certification and as outlined in the restrictive covenants and articles of incorporation for the operating entity. Enclosed is a copy of the document transferring title of the operating entity for the common areas on which the surface water management system is located. Note that if the operating entity has not been previously approved, the applicant should contact the Department staff prior to filing for a permit transfer.

The undersigned hereby agrees that all terms and conditions of the permit and subsequent modifications, if any, have been reviewed, are understood and are hereby accepted. Any proposed modifications shall be applied for and obtained prior to such modification.

Operating Entity: Citrus County Solid Waste Management Division

Name

Title: Director

Telephone: (352) 527-7670

Enclosure

☐ Copy of recorded transfer of title surface water management system
☐ Copy of plat(s)
☐ Copy of recorded restrictive covenants, articles of incorporation, and certificate of incorporation.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT
TAMPA

Attachment 3

Record Drawings
(Under Separate Cover)

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT
TAMPA

Attachment 4

Box Culvert and Endwalls Report

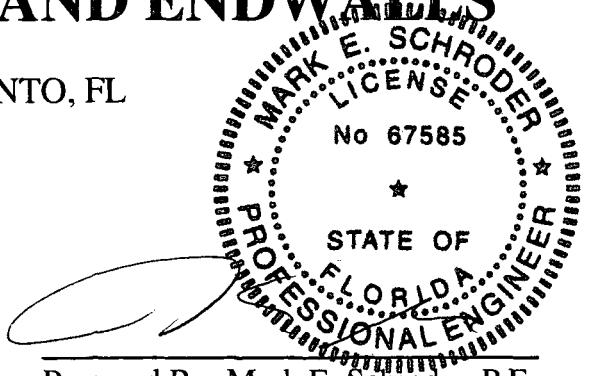
FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT
TAMPA

CALCULATION WORKSHEETS

FOR

CITRUS CENTRAL LANDFILL PHASE 3 EXPANSION PROJECT BOX CULVERT AND ENDWALLS

LECANTO, FL



Prepared By: Mark E. Schroder, P.E.
Florida License #67585

JAN 1 1 2011

December 2010

Project No. 10-154

Kings Bay Engineering FL Certificate #28555
9478 W Marquette Lane, Crystal River, FL 34428 | 352-564-8017 | mes@kbcivil.com

Reference:C:\Program Files\FDOT Structures Programs\LRFDBoxCulvertV3.1\ReadData.xmcd(R)

CurrentDataFile = "\Data Files\CCLandFillBox1.dat"

Box Culvert Program:
Estimate of Quantities

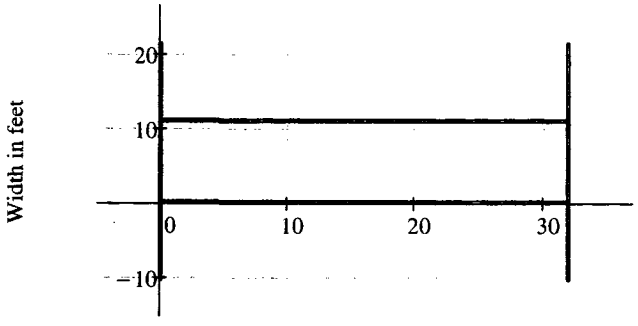
© 2002 Florida Department of Transportation

Project = "CCLandfill Box Culvert"

DesignedBy = "Mark E Schroder, P.E."

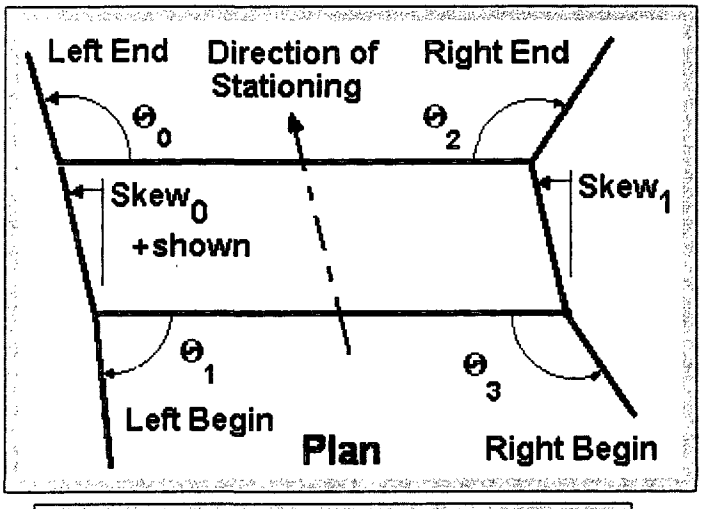
CheckedBy = "MES"

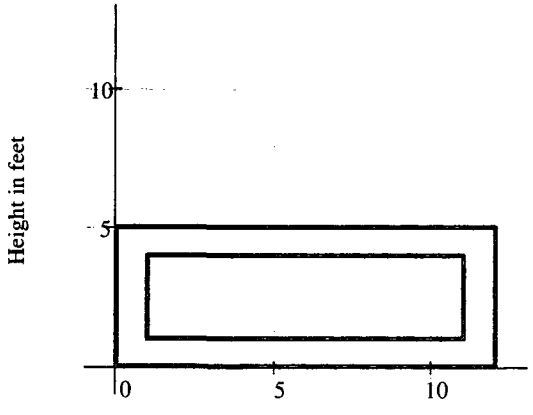
Comment = "Single Cell, 0 deg Skew, Wingwalls Parallel to Centerline"



Length in feet

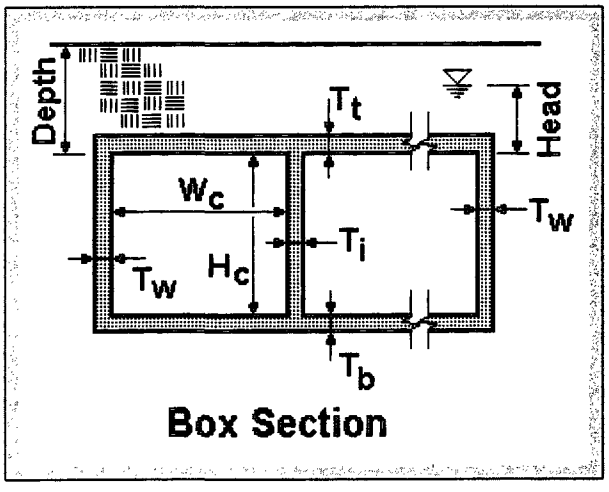
Plan - Box Culvert





Width in feet

Cross Section - Box Culvert



Box Dimensions HydraulicOpening := $W_c \cdot H_c \cdot NoOfCells$ HydraulicOpening = $30\,ft^2$ SoilHeight = 0.2 ft

NoOfCells = 1 W_c = 10 ft H_c = 3 ft L_c = 32 ft θ^T = (90 90 90 90)·deg Head = 0 ft

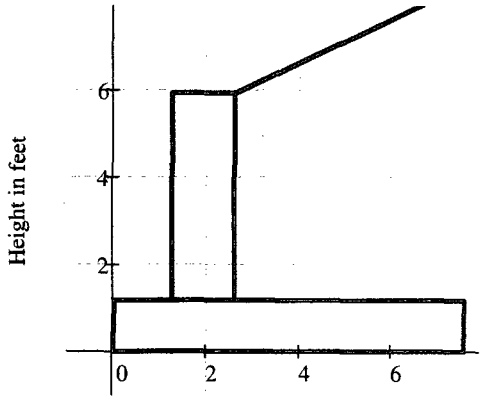
T_t = 12·in T_b = 12·in T_w = 12·in T_i = 12·in Cover = 2·in Depth = 1.17 ft

Cutoff wall and Headwall Dimensions

$Skew_{left}$ = 0·deg B_{lhw} = 16·in H_{lhw} = 21·in B_{lcw} = 12·in H_{lcw} = 24·in

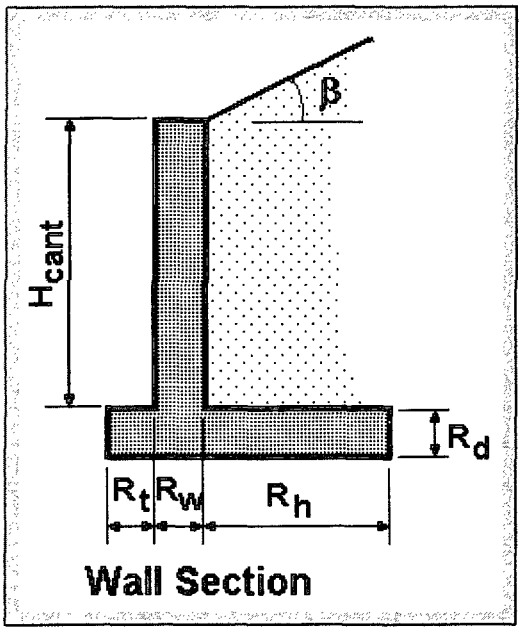
$Skew_{right} = 0 \cdot deg$ $B_{rhw} = 16 \cdot in$ $H_{rhw} = 21 \cdot in$ $B_{rcw} = 12 \cdot in$ $H_{rcw} = 24 \cdot in$

Wingwall Dimensions CurrentDataFile = "\Data Files\CCLandFillBox1.dat"

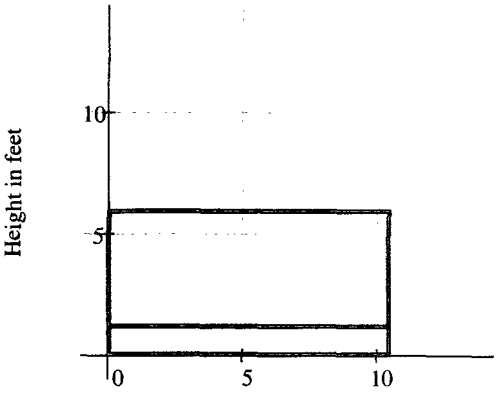


Width in feet

Cross Section - First Wingwall

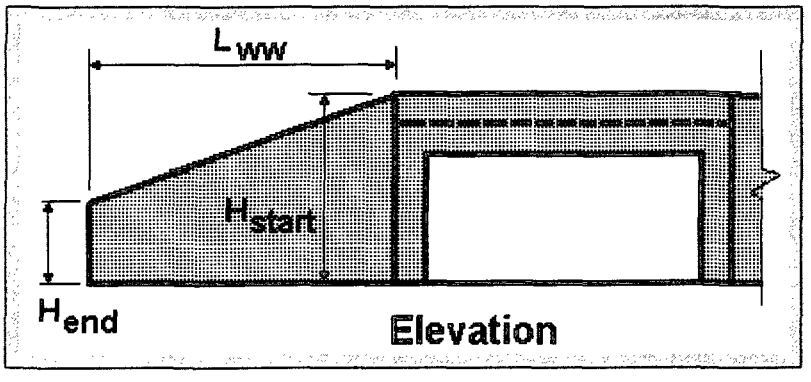


$$R_t = \begin{pmatrix} 15 \\ 15 \\ 15 \\ 15 \end{pmatrix} \cdot in \quad R_w = \begin{pmatrix} 16 \\ 16 \\ 16 \\ 16 \end{pmatrix} \cdot in \quad R_h = \begin{pmatrix} 60 \\ 60 \\ 60 \\ 60 \end{pmatrix} \cdot in \quad R_d = \begin{pmatrix} 14 \\ 14 \\ 14 \\ 14 \end{pmatrix} \cdot in \quad \beta = \begin{pmatrix} 26.57 \\ 26.57 \\ 26.57 \\ 26.57 \end{pmatrix} \cdot deg$$



Width in feet

Elevation - First Wingwall



$$H_{end} = \begin{pmatrix} 4.75 \\ 4.75 \\ 4.75 \\ 4.75 \end{pmatrix} ft \quad H_{start} = \begin{pmatrix} 4.75 \\ 4.75 \\ 4.75 \\ 4.75 \end{pmatrix} ft \quad L_{ww} = \begin{pmatrix} 10.42 \\ 10.42 \\ 10.42 \\ 10.42 \end{pmatrix} ft \quad \theta = \begin{pmatrix} 90 \\ 90 \\ 90 \\ 90 \end{pmatrix} \cdot deg$$

Summary of Concrete Quantities

$Vol_{cw.left} = 0.44 \cdot yd^3$ $Vol_{cw.right} = 0.44 \cdot yd^3$

$Vol_{bot.slab} = 15.56 \cdot yd^3$ $Vol_{walls} = 7.11 \cdot yd^3$ $Vol_{top.slab} = 14.22 \cdot yd^3$

$Vol_{hw.left} = 0.44 \cdot yd^3$ $Vol_{hw.right} = 0.44 \cdot yd^3$

$$Vol_{wall} = \begin{pmatrix} 2.44 \\ 2.44 \\ 2.44 \\ 2.44 \end{pmatrix} \cdot yd^3 \quad Vol_{ww.cowall} = \begin{pmatrix} 0.3216 \\ 0.3216 \\ 0.3216 \\ 0.3216 \end{pmatrix} \cdot yd^3 \quad Vol_{footing} = \begin{pmatrix} 3.41 \\ 3.41 \\ 3.41 \\ 3.41 \end{pmatrix} \cdot yd^3 \quad TotalVol_{wingwall} = \begin{pmatrix} 6.18 \\ 6.18 \\ 6.18 \\ 6.18 \end{pmatrix} \cdot yd^3$$

$Vol_{box} = 38.73 \cdot yd^3$ $\sum Vol_{wall} = 9.78 \cdot yd^3$ $\sum TotalVol_{footing} = 14.94 \cdot yd^3$ $TotalVolume = 63.45 \cdot yd^3$

Summary of Soil and Miscellaneous Values

$E = 3020 \cdot ksi$ $f_c = 3.4 \cdot ksi$ $Extension = 0$

Extension type
0 - new box (no extension)
1- left extension
2 - right extension

$Env = 1$

Environmental Class
1 - slightly aggressive
2 - moderately aggressive
3 - extremely aggressive

$F_y = 60 \cdot ksi$ $n_{mod} = 9$

$ConsiderLLSurcharge_{ww} = 1$ *0 - No, 1 - Yes* $ConsiderLL_{hw} = 1$ *0 - No, 1 - Yes* $BarrierDL_{hw} = 0 \cdot \frac{kip}{ft}$

$\gamma_{soil} = 110 \cdot \frac{lbf}{ft^3}$ $k_s = 100000 \cdot \frac{lbf}{ft^3}$ $\phi = 32 \cdot deg$ $q_{nom} = 2000 \cdot \frac{lbf}{ft^2}$

Summary of Reinforcement Check Values

$Check_{box} = "OK"$ $Check_{cw} = "OK"$ $Check_{hw} = "OK"$ $Check_{ww} = "OK"$ $TotalCheck = "OK"$

$$BarSize_{slabs} = \begin{pmatrix} 5 \\ 5 \\ 5 \\ 5 \end{pmatrix} \quad S_{slabs} = \begin{pmatrix} 8 \\ 8 \\ 8 \\ 8 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
bot slab, top mat
bot slab, bot mat

$$BarSize_{long} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad S_{long} = \begin{pmatrix} 12 \\ 12 \\ 12 \\ 12 \\ 12 \end{pmatrix} \cdot in$$

top slab, top mat
top slab, bot mat
interior wall(s)
exterior walls
bot slab, both m.

$$BarSize_{walls} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad S_{walls} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$$

interior wall(s)
exterior walls

$$BarSize_{corners} = \begin{pmatrix} 5 \\ 5 \end{pmatrix} \quad S_{corners} = \begin{pmatrix} 8 \\ 8 \end{pmatrix} \cdot in$$

top corner
bot corner

$$BarSize_{cw} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad Num_{cw} = \begin{pmatrix} 2 \\ 2 \\ 2 \\ 2 \end{pmatrix}$$

top bar, left cw
bot bar, left cw
top bar, right cw
bot bar, right cw

$$StirSize_{cw} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} \quad S_{stirrup.cw} = \begin{pmatrix} 15 \\ 15 \end{pmatrix} \cdot in$$

$$BarSize_{hw} = \begin{pmatrix} 5 \\ 5 \\ 5 \\ 5 \end{pmatrix} \qquad Num_{hw} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix}$$

top bar, left hw

bot bar, left hw

top bar, right hw

bot bar, right hw

$$StirSize_{hw} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} \qquad S_{stirrup.hw} = \begin{pmatrix} 10 \\ 10 \end{pmatrix} \cdot in$$

Reinforcement List - Main Box

$Reinf_{box} =$

	0	1	2
0	"Bar Location"	"Size"	"Desig"
1	"top face, top slab"	5	101
2	"bot face, top slab"	5	102
3	"top face, bot slab"	5	103
4	"bot face, bot slab"	5	104
5	"top ext corner"	5	105
6	"bot ext corner"	5	106
7	"inside face, ext wall"	4	108
8	"long top face, bot slab"	4	109
9	"long top face, top slab"	4	110
10	"long bot face, top slab"	4	111
11	"long bot face, bot slab"	4	112
12	"long each face, ext wall"	4	113
13	"long each face, ext wall"	4	...

Reinforcement Lists - Left Begin and Left End Wingwalls

$Rw_0 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"wall vert, soil side"	5	401	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	402	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	404	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall vert, front side"	4	406	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall vert, soil side"	5	407	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0
"top footing heel"	3	409	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"bot footing toe"	3	410	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"temp footing"	3	411	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall to box ties"	5	412	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0
0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0

$Rw_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"wall vert, soil side"	5	501	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	502	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	504	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall vert, front side"	4	506	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall vert, soil side"	5	507	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0
"top footing heel"	3	509	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"bot footing toe"	3	510	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"temp footing"	3	511	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall to box ties"	5	512	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0
0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0

Reinforcement Lists - Right Begin and Right End Wingwalls

$Rw_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"wall vert, soil side"	5	601	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	602	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	604	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall vert, front side"	4	606	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall vert, soil side"	5	607	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0
"top footing heel"	3	609	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"bot footing toe"	3	610	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"temp footing"	3	611	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall to box ties"	5	612	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0
0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0

$Rw_3 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"wall vert, soil side"	5	701	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall horiz, front side"	4	702	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall horiz, soil side"	4	704	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall vert, front side"	4	706	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0
"wall vert, soil side"	5	707	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0
"top footing heel"	3	709	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"bot footing toe"	3	710	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
"temp footing"	3	711	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0
"wall to box ties"	5	712	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0
0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0

Reinforcement Lists - Headwalls and Cutoff Walls

$Rh_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	5	801	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
"bottom"	5	802	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
"stirrups"	3	803	5.13	15	27	0	0	1.36	0.5	0.5	0.42	0.95	0.83	0.83	0	0

$Rh_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	5	804	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
"bottom"	5	805	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
"stirrups"	3	806	5.13	15	27	0	0	1.36	0.5	0.5	0.42	0.95	0.83	0.83	0	0

$Rc_1 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	807	11.67	2	1	0	0	11.67	0	0	0	0	0	0	0	0
"bottom"	4	808	11.67	2	1	0	0	11.67	0	0	0	0	0	0	0	0
"stirrups"	3	809	4.9	10	7	0	0	1.61	0.67	0.5	0.5	0	0	0	0	0

$Rc_2 =$

"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
"top"	4	810	11.67	2	1	0	0	11.67	0	0	0	0	0	0	0	0
"bottom"	4	811	11.67	2	1	0	0	11.67	0	0	0	0	0	0	0	0
"stirrups"	3	812	4.9	10	7	0	0	1.61	0.67	0.5	0.5	0	0	0	0	0

No variables are modified in this file CurrentDataFile = "\Data Files\CCLandFillBox1.dat"

QuickWall 7.1 - RETAINING WALL ANALYSIS AND DESIGN

Job ID : CC Central Landfill
Job Description : Headwalls Designed By : Mark Schroder, PE

FOOTING DESIGN METHOD: Ultimate Strength ACI 318-08
STEM DESIGN METHOD : Ultimate Strength ACI 318-08 (Concrete)
WALL TYPE : Cantilever Retaining Wall

RETAINING WALL DIMENSIONS:

Wall Stem Height	=	6.00	ft.
Stem Thickness @ Top	=	12.00	in.
Stem Thickness @ Bottom	=	12.00	in.
Footing Thickness	=	12.00	in.
Heel Width	=	2.50	ft.
Toe Width	=	1.50	ft.

Stem Bar Size	= # 5	at	12.00	in.	o.c.
Heel Bar Size	= # 5	at	12.00	in.	o.c.
Toe Bar Size	= # 5	at	12.00	in.	o.c.

Footing Key Depth	=	0.00	ft.
Footing Key Width	=	0.00	ft.
BackFill Slope (Vert/Horiz)	=	0.00	:12

RETAINING WALL LOADS:

Horizontal Equivalent Fluid Pressure	=	35.00 pcf.	(Load Case = Soil)
Backfill Height	=	6.00 ft.	
Equivalent Fluid Pressure Angle	=	0.00 deg.	
Vertical Surcharge on Backfill	=	220 psf.	(Load Case = Soil)
Horizontal Surcharge	=	0 psf.	(Load Case = Live)
Vertical Surcharge on Toe	=	0 psf.	(Load Case = Soil)
Wind Load on Fence	=	0 psf.	(Load Case = Wind)
Fence Height	=	0.00 ft.	

Line Ld. No.	Type (H or V)	Magnitude (plf)	Dist. (x) (ft.)	Load Case
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Notes: 1. "H" = Horizontal loads. "V" = Vertical loads.
2. Vertical loads are positive down.

ULTIMATE STRENGTH LOAD COMBINATIONS (Concrete Design):

1.4D + 1.4H
1.2D + 1,6L + 1.6H + 0.5R
1.2D + 1.6R + 1.0L
1.2D + 1.6R + 0.8W
1.2D + 1.6W + 1.0L + 0.5R
1.2D + 1.0E + 1.0L + 0.2R
0.9D + 1.6W + 1.6H
0.9D + 1.0E + 1.6H

WORKING STRESS LOAD COMBINATIONS (Stability Checks and Masonry Design):

D + L + R + H
D + L + W + H
D + L + W + 0.5R + H
D + L + R + 0.5W + H
D + L + R + E/1.4 + H
D + E/1.4 + H

RETAINING WALL RESISTING FORCES:

Allowable Soil Pressure	=	2,000 psf.
Passive Equivalent Fluid Press.	=	300.00 pcf.
Passive Soil Height	=	1.00 ft.
Coefficient of Friction	=	0.50
Cohesion	=	0 psf.

Use Vertical Surcharge as Resisting Wt.? = No

Overturning Safety Factor	=	2.50
Sliding Safety Factor	=	1.50
Limit Reaction to Mid 1/3?	=	No

MATERIAL DATA:

Concrete Strength, f'c	=	3.40 ksi.
Steel Yield Strength, Fy	=	60.00 ksi.
Concrete Unit Weight	=	150.00 pcf.
Soil Unit Weight	=	110.00 pcf.
Fence Weight	=	0.00 psf.

REINFORCING STEEL DATA:

Concrete cover to center of steel:

Wall Inside Face	=	3.00 in.
Footing Heel (Top Face)	=	3.00 in.
Footing Toe (Bottom Face)	=	3.00 in.

Minimum Ratios for Shrinkage and Temperature Reinf:

Vertical Stem Reinf.	=	0.0018
Horizontal Stem Reinf.	=	0.0020
Footing Reinforcement	=	0.0018

****
S U M M A R Y O F R E S U L T S
****

DIMENSIONS:

Stem Height	= 6.00 ft.	Heel Length	= 2.50 ft.
Stem Thick. @ Top	= 12.00 in.	Toe Length	= 1.50 ft.
Stem Thick. @ Base	= 12.00 in.	Total Ftg. Width, B	= 5.00 ft.
Footing Thickness	= 12.00 in.	Key Depth	= 0.00 ft.
		Key Width	= 0.00 ft.

ANALYSIS RESULTS:

Max Brg Press. @ Toe	= 1,267 psf. O.K.	Sliding Force	= 1,348 Lb
@ Heel	= 119 psf. O.K.	Resisting Force	= 2,183 Lb
Allowable Brg. Press.	= 2,000 psf.	F.O.S.	= 1.62 O.K.
Resultant Loc From C.L.	= 0.69 ft.	Overturn. Moment	= 3,716 ft-lb
Kern Point Loc., B/6	= 0.83 ft.	Resisting Moment	= 9,986 ft-lb
Limit Resultant To Mid 1/3?	= No	F.O.S.	= 2.69 O.K.

DESIGN RESULTS: Design Method, Stem: USD, ACI 318-08 (Concrete)
Ftg.: Ultimate Strength ACI 318-08

	Mu (ft-k)	Vu (kip)	Phi Vn (kip)	Shr Chk.	As Reqd. (in^2)	As Furn. (in^2)	Astl. Chk.	Devel. Lgth.
Stem :	4.03	1.68	9.45	O.K.	0.303	0.310	O.K.	O.K.
Toe :	1.72	1.22	9.45	O.K.	0.259	0.310	O.K.	O.K.
Heel :	2.57	1.76	9.45	O.K.	0.259	0.310	O.K.	O.K.
Key :	0.00	0.00	0.00		0.000	0.000		

Notes: 1. Stem moments are positive if they cause tension on the soil face. Negative if they cause tension on the outside face. Stem shear is positive to the left as measured on a section cut below the top of wall.

2. Heel moments are positive if they cause tension in the top of the footing. Heel shear is positive up as measured on a section cut to the right of the end of the heel.

3. Toe moments are positive if they cause tension in the bottom of the footing. Toe shear is positive up as measured on a section cut to the left of the end of the toe.

****
STABILITY ANALYSIS REPORT
****

Stability Analysis: Governing Combination = D + L + R + H

RESISTING FORCES				OVERTURNING FORCES			
Element	Weight	x Arm	= Moment	Element	Force	x Arm	= Moment
Soil	1,815		6,311	R at Top			
Ftg.	750	2.50	1,875	R at Bot.			
Stem	900	2.00	1,800	Horiz. EFP	858	2.33	2,001
Vert Sur				Vert Sur	490	3.50	1,715
Vert EFP				Horiz Sur			
Toe Sur.				Wind			
Fence Wt.				Horiz line			
V. line				Vert. line			
Sum WT =	3,465	MR =	9,986	Sum F =	1,348	MOT =	3,716

Friction Force	=	1,733 Lb	F.O.S. Sliding	= RF / F =	1.62
Passive Pressure	=	450 Lb	F.O.S. Overturn.	= MR / MOT =	2.69
Cohesion	=	0 Lb			
Resist. Force, Sum RF	=	2,183 Lb	Coef. Vert. Surcharge or Line Load to Horiz. = EFP / Soil Dens.	=	0.318

Resultant Loc From Toe,	X = (MR - MOT) / Sum WT	=	1.81 ft.
Eccentricity From Ftg. C.L.,	e = (B / 2) - X	=	0.69 ft.
Soil Pressure @ Toe	= (WT / B) * (1 + 6e/B)	=	1,267 psf.
Soil Pressure @ Heel	= (WT / B) * (1 - 6e/B)	=	119 psf.

****
DETAILED DESIGN REPORT
****

STEM DESIGN: Steel Design Comb = 1.2D + 1.6L + 1.6H + 0.5R
Shr Strength @ Base, Phi Vn = 9.45 kip

Dist From Top (ft)	d (in.)	Mu (ft-k)	Vu (kip)	As Flex. (in^2)	As Min. (in^2)	As T+S (in^2)	As Reqd (in^2)	Comb
0.60	9.00	0.02	0.08	0.001	0.001	0.259	0.259	2
1.20	9.00	0.10	0.17	0.002	0.003	0.259	0.259	2
1.80	9.00	0.24	0.29	0.006	0.008	0.259	0.259	2
2.40	9.00	0.45	0.43	0.011	0.015	0.259	0.259	2
3.00	9.00	0.76	0.59	0.019	0.025	0.259	0.259	2
3.60	9.00	1.16	0.77	0.029	0.038	0.259	0.259	2
4.20	9.00	1.68	0.96	0.042	0.056	0.259	0.259	2
4.80	9.00	2.32	1.18	0.058	0.077	0.259	0.259	2
5.40	9.00	3.10	1.42	0.077	0.103	0.259	0.259	2
6.00	9.00	4.03	1.68	0.101	0.134	0.303	0.303	2

Vertical Stem Reinforcement:
Shear-Friction Steel Added at Stem Base (ACI 08 11.6), Avf = 0.044 in^2
Available Length for Hook Embedment into Footing = 9.50 in.
Available Length for Straight Embedment into Stem = 70.00 in.

	Development Length Straight (in.)	Hook (in.)	Percent Develop.	Spac. (in.)	50% Cut Off (in.)
#4	12.35	7.20	100.00	7.91	72.00
#5	15.43	9.00	100.00	12.26	72.00
#6	18.52	10.80	87.93	15.30	72.00
#7	27.01	12.61	75.37	17.88	72.00
#8	30.87	14.41	65.95	18.00	72.00
#9	34.82	16.25	58.46	18.00	72.00
#10	41.49	18.30	51.93	18.00	72.00
#11	51.14	20.31	46.77	18.00	72.00

Horizontal Stem Reinforcement:
Area of steel for Shrinkage and Temp. Reinforcement = 0.288 in^2

	-----Spacing, in.----- I.F. Only	EA. Face	------Total Bars------ I.F. Only	EA. Face
#4	8.33	16.67	10.00	6.00
#5	12.92	18.00	7.00	5.00
#6	18.00	18.00	5.00	5.00
#7	18.00	18.00	5.00	5.00
#8	18.00	18.00	5.00	5.00
#9	18.00	18.00	5.00	5.00
#10	18.00	18.00	5.00	5.00
#11	18.00	18.00	5.00	5.00

TOE DESIGN:

* Steel Design Comb. = 0.9D + 1.6W + 1.6H
* Thickness Design Comb. = 0.9D + 1.6W + 1.6H
* Available Length for Hook Embedment into Stem = 9.50 in.
* Available Length for Straight Embed. into Toe = 16.00 in.

d (in.)	Mu (ft-k)	Vu (kip)	Phi Vn (kip)	As Flex. (in^2)	As Min. (in^2)	As T+S (in^2)	As Req'd (in^2)
9.00	1.72	1.22	9.45	0.043	0.057	0.259	0.259

	Development Length Straight (in.)	Hook (in.)	Percent Develop.	Spac. (in.)
#4	12.35	7.20	100.00	9.26
#5	15.43	9.00	100.00	14.35
#6	18.52	10.80	86.38	17.60
#7	27.01	12.61	59.24	16.45
#8	30.87	14.41	51.83	18.00
#9	34.82	16.25	45.95	18.00
#10	41.49	18.30	38.56	18.00
#11	51.14	20.31	31.28	18.00

HEEL DESIGN:

* Steel Design Comb. = 1.2D + 1.6L + 1.6H + 0.5R
* Thickness Design Comb. = 0.9D + 1.6W + 1.6H
* Available Length for Straight Embedment into Toe = 28.00 in.
* Available Length for Straight Embedment into Heel = 28.00 in.

d (in.)	Mu (ft-k)	Vu (kip)	Phi Vn (kip)	As Flex. (in^2)	As Min. (in^2)	As T+S (in^2)	As Req'd (in^2)
9.00	2.57	1.76	9.45	0.064	0.085	0.259	0.259

	Development Length Straight (in.)	Hook (in.)	Percent Develop.	Spac. (in.)
#4	12.35	7.20	100.00	9.26
#5	15.43	9.00	100.00	14.35
#6	18.52	10.80	100.00	18.00
#7	27.01	12.61	100.00	18.00
#8	30.87	14.41	90.70	18.00
#9	34.82	16.25	80.41	18.00
#10	41.49	18.30	67.48	18.00
#11	51.14	20.31	54.75	18.00

LONGITUDINAL FOOTING REINFORCEMENT (TEMP & SHRINK ONLY):

	Spacing (in.)
#4	9.26
#5	14.35
#6	20.37
#7	27.78
#8	36.57
#9	46.30
#10	58.80
#11	72.22

CITRUS COUNTY
SOLID WASTE MANAGEMENT DIVISION

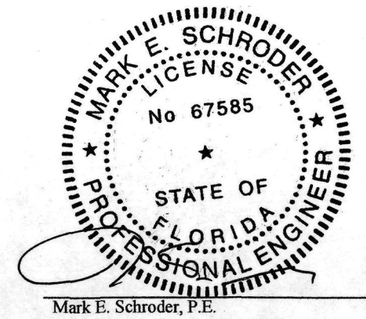
CENTRAL LANDFILL
PHASE 3 EXPANSION PROJECT
BOX CULVERT AND HEADWALLS

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT
TAMPA

DRAWING INDEX

DRAWING NO.	DRAWING TITLE
1	COVER SHEET
2	BOX CULVERT DATA
3	BOX CULVERT - INDEX 289, SHEET 1
4	BOX CULVERT - INDEX 289, SHEET 2
5	BOX CULVERT - INDEX 289, SHEET 3
6	BOX CULVERT - INDEX 289, SHEET 5
7	24" RCP HEADWALL DETAILS

Kings Bay Engineering
FL Certificate #28555
9478 W Marquette Lane
Crystal River, FL 34428
(352) 564-8017



Mark E. Schroder, P.E.
Florida License #67585
DATE: JAN 11 2011

REV 1: Issued For County Permit - 12/10/10

BOX CULVERT DATA TABLES

BOX, HEADWALL AND CUTOFF WALL DATA TABLE (inches unless shown otherwise) — Table Date 7-01-09

LOCATION	STRUCTURE /BRIDGE NUMBER	BOX									HEADWALL AND CUTOFF WALL									
		Wc(ft)	Hc(ft)	Tt	Tw	Tb	Ti	#cells	Lc(ft)	Cover	Blhw	Hlhw	Brhw	Hrhw	Blcw	Hlcw	Brcw	Hrcw	SL(deg.)	SR(deg.)
PHASE 3	BC1	10	3	12	12	12	na	1	32	2	16	21	16	21	12	24	12	24	0	0

LEFT SIDE WINGWALLS DATA TABLE (inches unless shown otherwise) — Table Date 7-01-09

STRUCTURE /BRIDGE NUMBER	LEFT END WINGWALL									LEFT BEGIN ENDWALL								
	Rt	Rw	Rh	Rd	SW(deg.)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	Rt	Rw	Rh	Rd	SW(deg.)	β(deg)	He(ft)	Hs(ft)	Lw(ft)
BC1	15	16	60	14	90	26.57	4.75	4.75	10.42	15	16	60	14	90	26.57	4.75	4.75	10.42

RIGHT SIDE WINGWALLS DATA TABLE (inches unless shown otherwise) — Table Date 7-01-09

STRUCTURE /BRIDGE NUMBER	RIGHT END WINGWALL									RIGHT BEGIN ENDWALL								
	Rt	Rw	Rh	Rd	SW(deg.)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	Rt	Rw	Rh	Rd	SW(deg.)	β(deg)	He(ft)	Hs(ft)	Lw(ft)
BC1	15	16	60	14	90	26.57	4.75	4.75	10.42	15	16	60	14	90	26.57	4.75	4.75	10.42

ESTIMATED CONCRETE QUANTITIES (CY) — Table Date 7-01-09

STRUCTURE /BRIDGE NUMBER	BOX								LEFT END WINGWALL			LEFT BEGIN WINGWALL			RIGHT END WINGWALL			RIGHT BEGIN WINGWALL			Culvert Total
	Left Cutoff Wall	Right Cutoff Wall	Bottom Slab	Walls	Top Slab	Left Head Wall	Right Head Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	
BC1	0.44	0.44	15.56	7.11	14.22	0.44	0.44	38.73	3.41	2.76	6.18	3.41	2.76	6.18	3.41	2.76	6.18	3.41	2.76	6.18	63.45

MAIN STEEL REINFORCEMENT SPACING (inches) — Table Date 7-01-09

STRUCTURE /BRIDGE NUMBER	BOX															HEADWALLS		CUTOFF WALLS	
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115, 116...	803	806	809	812
BC1	8	8	8	8	8	8	na	12	12	12	12	12	12	12	na	10	10	15	15

WINGWALL STEEL REINFORCEMENT SPACING (inches) — Table Date 7-01-09

STRUCTURE /BRIDGE NUMBER	LEFT END WINGWALL							LEFT BEGIN WINGWALL							RIGHT END WINGWALL							RIGHT BEGIN WINGWALL						
	401 407(8)	402 (403)	404 (405)	406	409	410	411	501 507(8)	502 (503)	504 (505)	506	509	510	511	601 607(8)	602 (603)	604 (605)	606	609	610	611	701 707(8)	702 (703)	704 (705)	706	709	710	711
BC1	10	12	12	12	10	10	10	10	12	12	12	10	10	10	10	12	12	12	10	10	10	10	12	12	12	10	10	10

WINGWALL NOTE: Bar designations in "( )" are only required for variable height wingwalls.

MAIN STEEL REINFORCING SIZE — TABLE BY MES

STRUCTURE /BRIDGE NUMBER	BOX															HEADWALLS		CUTOFF WALLS	
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	803	806	809	812
BC1	5	5	5	5	5	5	na	4	4	4	4	4	4	4	na	3	3	3	3

WINGWALL STEEL REINFORCING SIZE — TABLE BY MES

STRUCTURE /BRIDGE NUMBER	LEFT END WINGWALL							LEFT BEGIN WINGWALL							RIGHT END WINGWALL							RIGHT BEGIN WINGWALL						
	401	402	404	406	409	410	411	501	502	504	506	509	510	511	601	602	604	606	609	610	611	701	702	704	706	709	710	711
BC1	5	4	4	4	3	3	3	5	4	4	4	3	3	3	5	4	4	4	3	3	3	5	4	4	4	3	3	3

NOTES:

1. Environmental Class : 1
2. Reinforcing Steel, Grade : 60
3. Concrete Class : II f'c = : 3.4 ksi
4. Soil Properties:
   Friction Angle : 32
   Modulus of Subgrade Reaction : 9
   Nominal Bearing Resistance : 2,000psi
5. Total Estimated Quantity of Reinforcing Steel : n/a lbs
6. Work this Drawing with Design Standards Index No. 289 and Sheet Nos. : 1, 2, 3 & 5
7. n/a

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAR 17 2011
SOUTHWEST DISTRICT TAMPA

ENGINEER'S NOTES:

1. THE DESIGN HAS BEEN PERFORMED USING THE FDOT LRFD BOX CULVERT DESIGN SOFTWARE.
2. SINCE NO SOIL DATA WAS PROVIDED THIS DESIGN CONSIDERS THE FOLLOWING SOIL CONDITIONS:
   2.1. MAXIMUM BEARING CAPACITY OF 2,000PSF;
   2.2. ENVIRONMENTAL CLASS 1 OR SLIGHTLY AGGRESSIVE SOIL
5. REINFORCING STEEL SHALL BE GRADE 60 DEFORMED BILLET STEEL
6. MINIMUM 2 INCH STEEL COVER REQUIRED, 3 INCHES WHERE SURFACE WILL BE IN CONTACT WITH SOIL.
7. ALL STEEL INTERSECTIONS SHALL BE TIED.
8. MINIMUM SPLICE LENGTH SHALL BE 30 INCHES.
9. MINIMUM BENDING RADIUS IS 5 INCHES.
10. CONCRETE SHALL BE CLASS II - 3,400 PSI 28 DAY MINIMUM STRENGTH.
11. THE CONTRACTOR IS PERMITTED TO USE CONCRETE WITH A MAXIMUM 7 INCH SLUMP WITH THE USE OF A HIGH RANGE WATER REDUCER.
12. NO CHANGES MAY BE MADE TO THIS DESIGN WITHOUT CONSULTING THE DESIGN ENGINEER INCLUDING BUT NOT LIMITED TO ADDITIONAL STEEL, LARGER STEEL THAN SPEC'D, STRONGER CONCRETE THAN SPEC'D AND THICKER CROSS-SECTIONS.

Mark E. Schroder, P.E.
Florida License #67585
DATE: JAN 11 2011

DATE: 12/10/10
REVISION: 11 Revised for County Permit

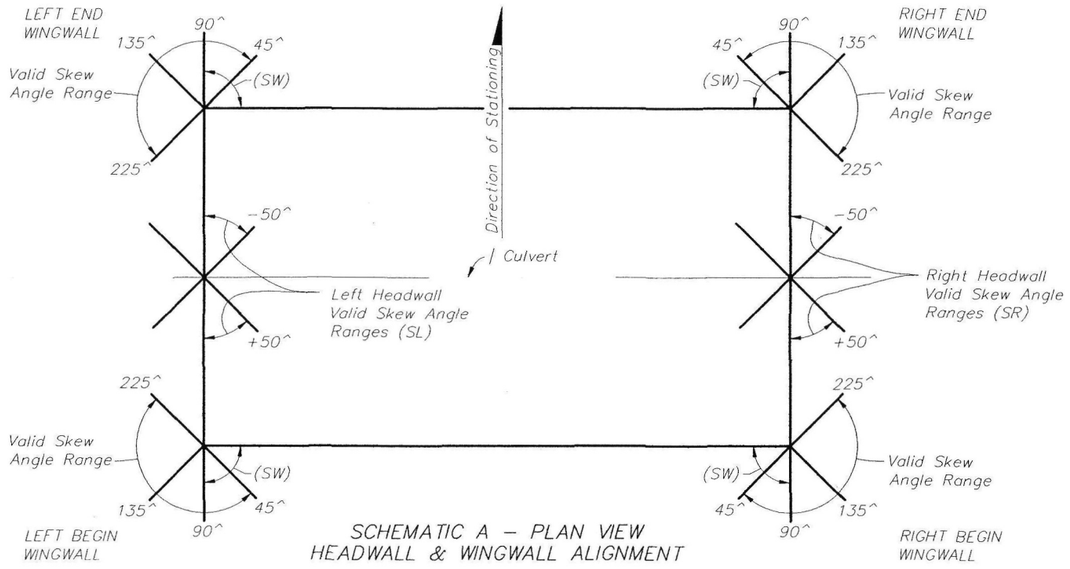
DATE: 12/1/10
DRAWN BY: MES
JOB NUMBER: 10-154

Kings Bay Engineering
FL Certificate #28555
9478 W Marquette Lane
Crystal River, FL 34428
(352) 564-8017

TITLE: BOX CULVERT DATA

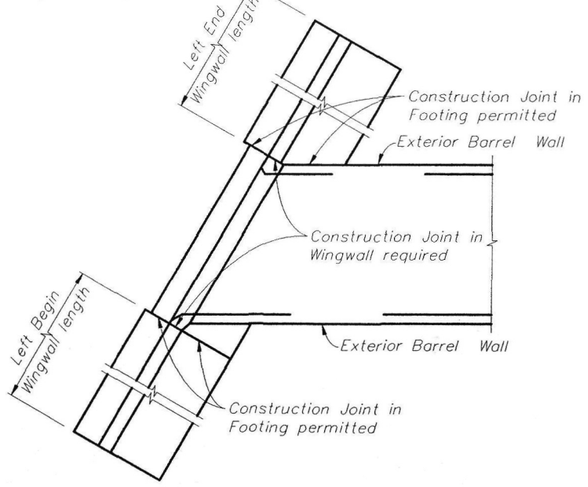
JOB NAME: CC CENTRAL LANDFILL
PHASE III EXPSNSION PROJECT

SHEET 2 OF 7



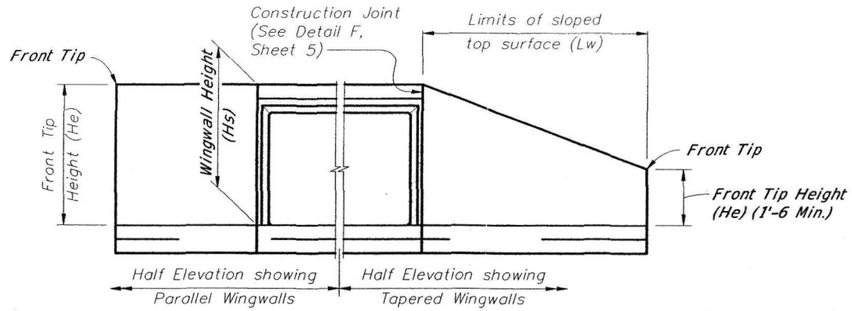
SCHEMATIC A – PLAN VIEW
HEADWALL & WINGWALL ALIGNMENT

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic B.



PART PLAN SHOWING PARALLEL WINGWALLS
AND LOCATION OF CONSTRUCTION JOINTS

NOTE:
Construction Joints in wingwalls and footings are located as follows: For non-skewed wingwalls they are located adjacent to the exterior face of the exterior barrel wall; when the ⏊ of wingwall and ⏊ of exterior barrel wall results in an acute angle see Left End Wingwall above, and when the angle is obtuse see Left Begin Wingwall above and Detail C (Sheet 5).



END ELEVATION
OF CULVERT

GENERAL NOTES:

DESIGN SPECIFICATIONS: AASHTO LRFD Bridge Design Specifications, 3rd Edition.

LIVE LOAD: HL-93.

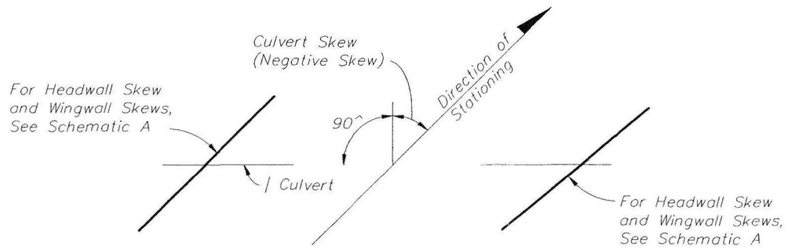
CONSTRUCTION LOADING: It is the construction Contractor's responsibility to provide for supporting construction loads that exceed AASHTO HL-93, and any construction load applied prior to 2 feet of compacted fill placed above the top slab.

SURFACE FINISH: All concrete surfaces shall receive a general surface finish.

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 7.

REINFORCING STEEL: ASTM A615, see the Box Culvert Data Tables in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.



SCHEMATIC B – PLAN VIEW
CULVERT ALIGNMENT

NOTE: For Culvert Skew see Contract Plans.

TABLE 1 – MINIMUM BAR SPLICE LENGTHS FOR LONGITUDINAL REINFORCING

BAR SIZE	SPLICE (CLASS B) CLASS II (3400 psi)	SPLICE (CLASS B) CLASS IV (5500 psi)	BAR SIZE	SPLICE (CLASS B) CLASS II (3400 psi)	SPLICE (CLASS B) CLASS IV (5500 psi)
#3	1'-0	1'-0	#8	3'-6	2'-9
#4	1'-4	1'-4	#9	4'-5	3'-6
#5	1'-8	1'-8	#10	6'-7	4'-5
#6	1'-11	1'-11	#11	7'-10	6'-5
#7	2'-8	2'-3			

TABLE 1 NOTE: Splice lengths are based on an AASHTO Class B tension lap splice for the Specification Section 346 concrete class shown.

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MAR 17 2011
SOUTHWEST DISTRICT
TAMPA

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DATE: JAN 11 2011

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DATE: 12/10/10
REVISION: 1) Issued for County Permit

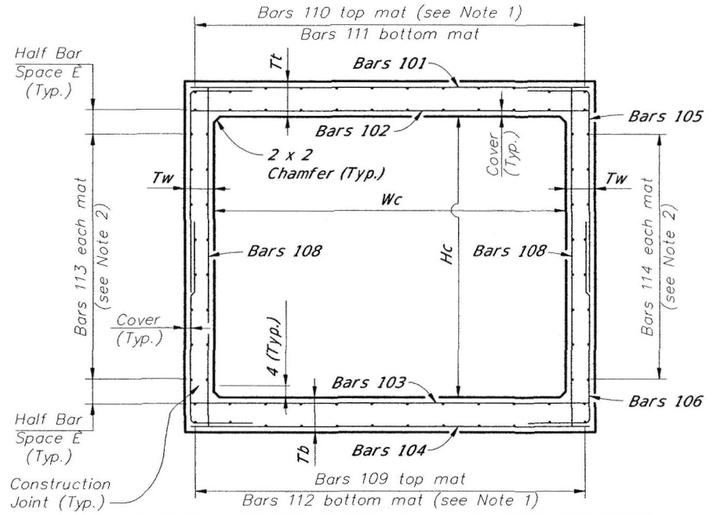
Kings Bay Engineering
FL Certificate #28555
3478 W Marquette Lane
Crystal River, FL 34428
(352) 564-8017

DATE: 12/1/10
DRAWN BY: MES
JOB NUMBER: 10-154

TITLE: BOX CULVERT - INDEX 289, SHEET 1

JOB NAME: CC CENTRAL LANDFILL
PHASE III EXPSNSION PROJECT

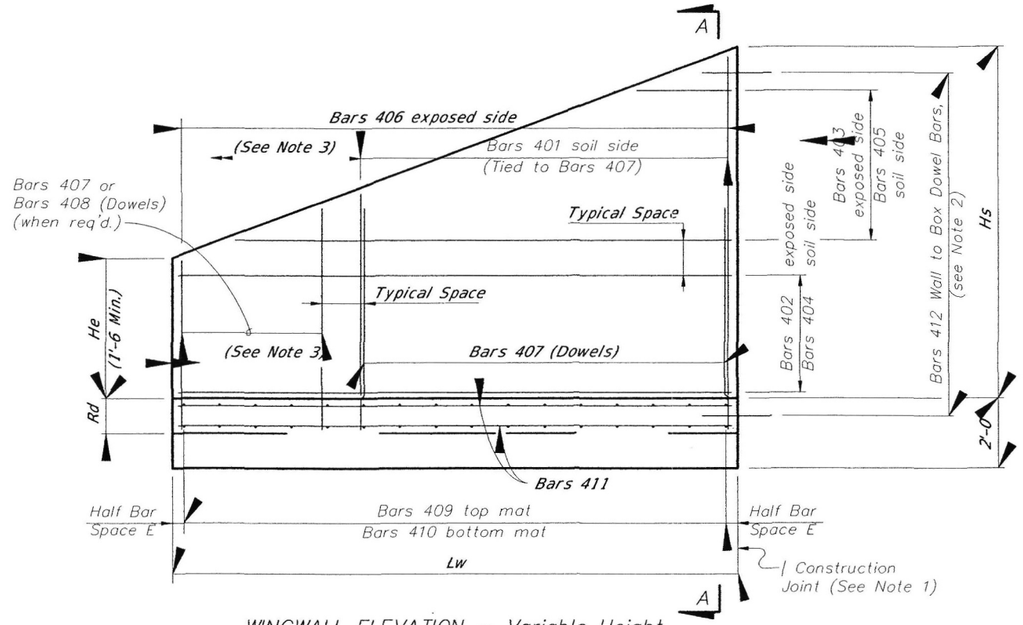
SHEET 3 OF 7



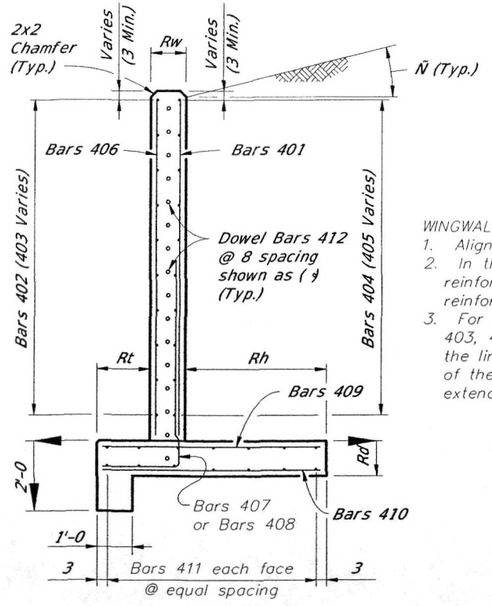
TYPICAL SECTION THRU SINGLE BARREL CULVERT

CULVERT BARREL NOTES:

1. *Space Bars 110 and 112 with a bar in each corner, and at the ℄ of interior walls (for multiple barrel culverts only), and the remaining bars placed at equal spacing shown in the Contract Plans. Adjust last bar spacing when required.*
2. *Place Bars 113 and 114 at spacing shown in the Contract Plans evenly between Bars 109 and 111.*
3. *Locate the first transverse bar from the ends of the culvert at one half the bar spacing, but provide the minimum reinforcement cover and not greater than 4 clear.*



WINGWALL ELEVATION – Variable Height
(Left End shown – other corners similar)



WINGWALL SECTION A–A

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WINGWALL NOTES:

1. *Align construction joint perpendicular to wingwall.*
2. *In the vicinity of the construction joint, field bend reinforcement as necessary to maintain minimum reinforcement cover.*
3. *For constant height wingwalls, variable length Bars 403, 405 & 408 are not required, and as such the limits of Bars 401 & 407 extend the full length of the wingwall, and the limits of Bars 402 & 404 extend to the full height of the wingwall.*

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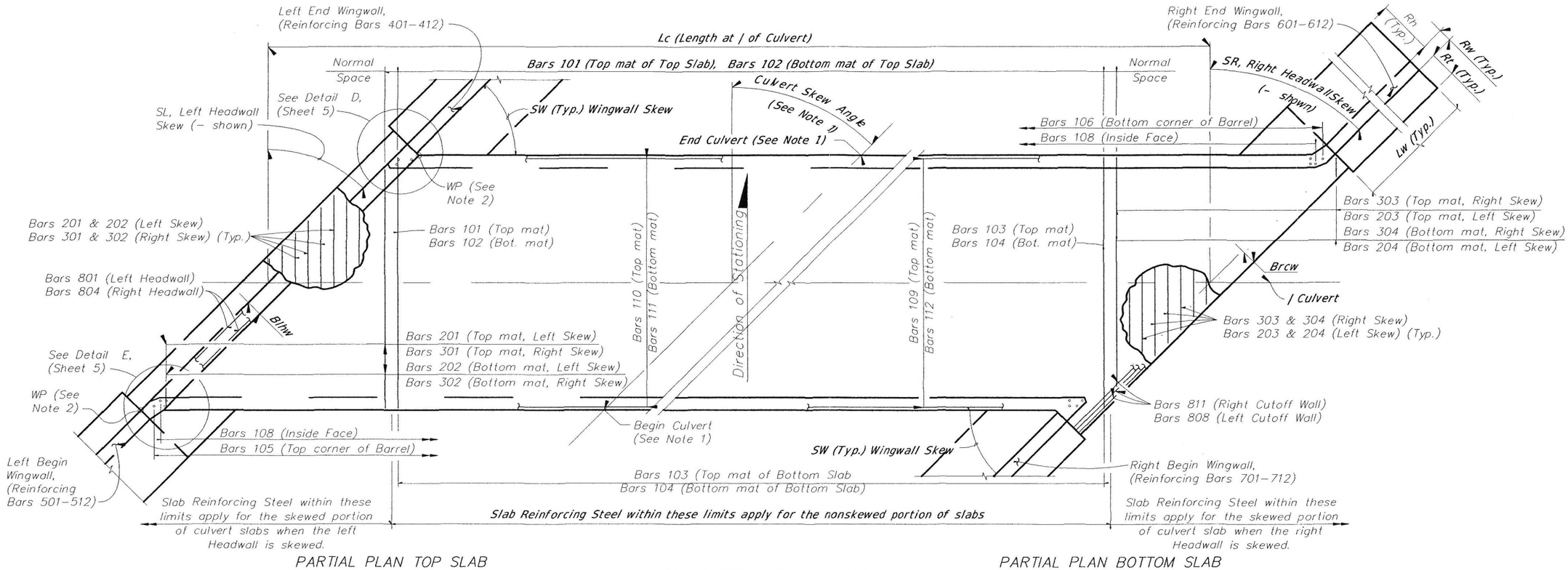
JOB NUMBER: 10-154

TITLE: BOX CULVERT - INDEX 289, SHEET 2

JOB NAME: CC CENTRAL LANDFILL
PHASE III EXPSNSION PROJECT

SHEET 4 OF 7

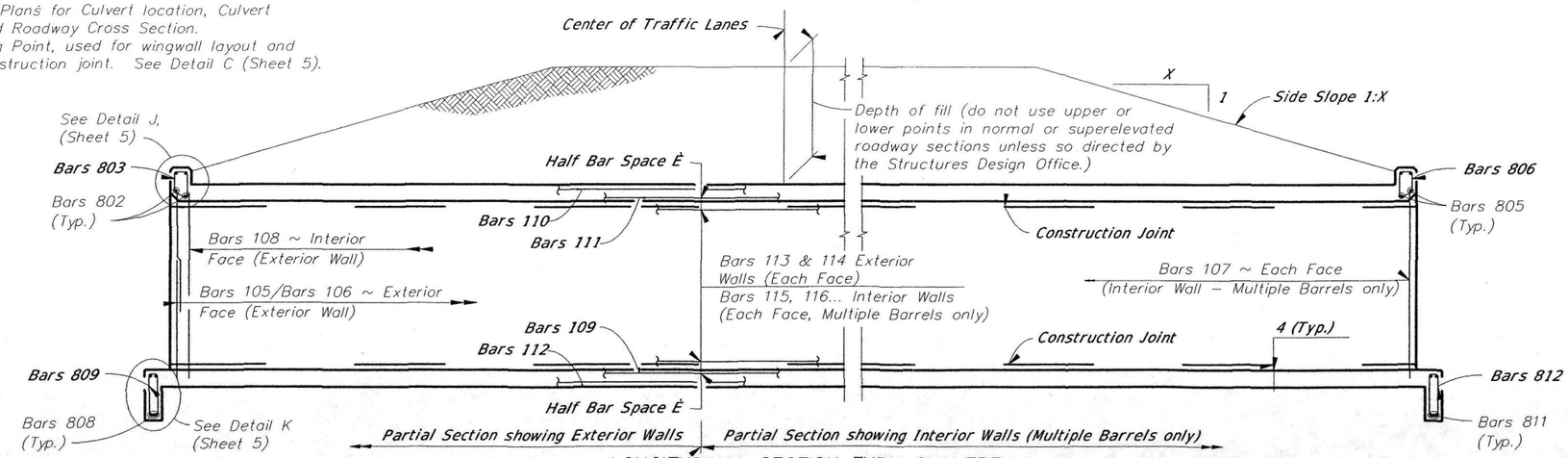


PARTIAL PLAN TOP SLAB
(Left Side, Left Skew)

PARTIAL PLAN BOTTOM SLAB
(Right Side, Right Skew)

NOTES:
1. See Contract Plans for Culvert location, Culvert Skew Angle and Roadway Cross Section.
2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail C (Sheet 5).

SINGLE BARREL BOX CULVERT
(Skewed Culvert With Parallel Wingwalls Shown)



LONGITUDINAL SECTION THRU CULVERT
(Transverse Top & Bottom Slab Reinforcing Not Shown For Clarity)

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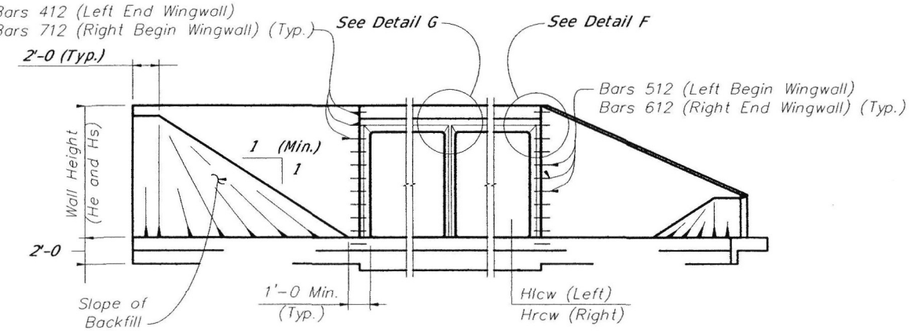
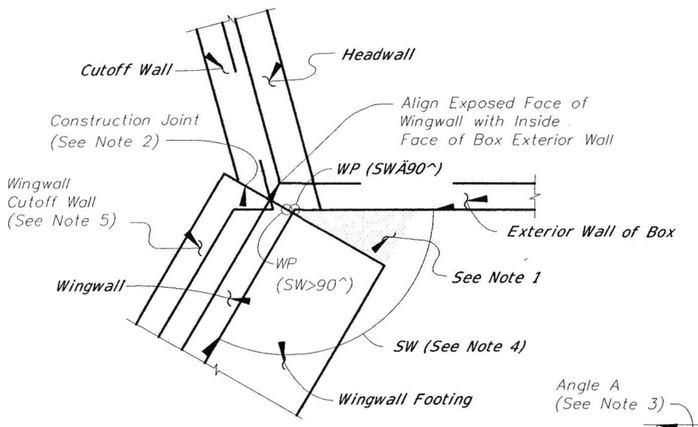
TITLE: BOX CULVERT - INDEX 289, SHEET 3

JOB NAME: CC CENTRAL LANDFILL
PHASE III EXPSNSION PROJECT

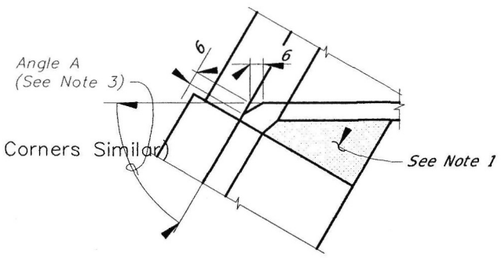
SHEET 5 OF 7



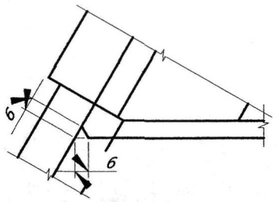
END ELEVATION
(Showing Constant Height AndVariable Height Wingwalls)



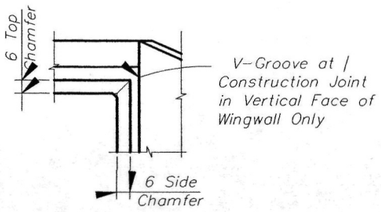
DETAIL C – PLAN VIEW
TO BOX CONNECTION(Left Begin Corner Shown, Other Corners Similar)



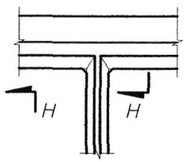
DETAIL E



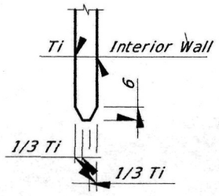
DETAIL D



DETAIL F



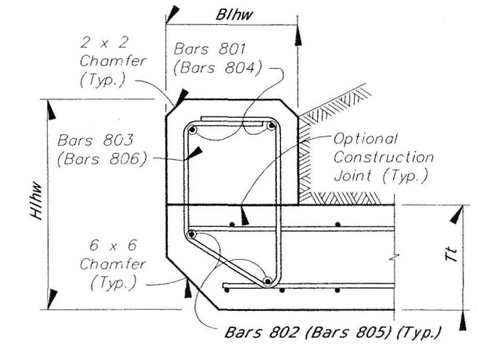
DETAIL G



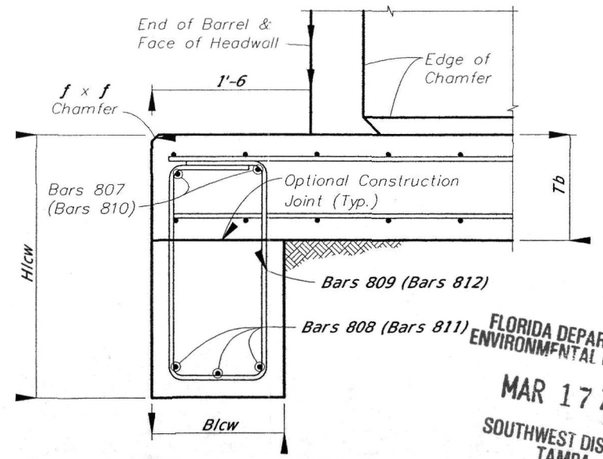
SECTION H–H

CROSS REFERENCE:
See Sheet 3 for locations of Details D, E, J & K.
See Sheet 4 for locations of Detail C.

NOTES:
1. For small angles, the Contractor may elect to fill the area between the box and the wingwall footing with unreinforced concrete. For wingwall skew angles less then 90 degrees, field bend wingwall reinforcement as necessary while maintaining cover. No additional payment will be made for this work.
2. Location of Construction Joint determined by WP at theoretical intersection of:
   – Soil side face of Headwall and outside face of Box Exterior Wall, for SWÄ90^;
   – Outside face of Wingwall and outside face of Box Exterior Wall, for SW>90^.
3. Provide 6 chamfer when angle A is greater than 45^. Maintain minimum wall thickness. Field adjust reinforcing to maintain cover.
4. Wingwall Skew Angles (SW) are measured from the adjacent box exterior wall to the wingwall.
5. Turn or extend Wingwall Cutoff Wall as necessary to meet Box Cutoff Wall.
6. Provide additional reinforcement in the top of the top slab below traffic railings to ensure a minimum area of 0.80 sq. in./ft. transverse reinforcing.



DETAIL J
LEFT HEADWALL SECTION(Right Headwall similar)



DETAIL K
LEFT CUTOFF WALL SECTION(Right Cutoff Wall similar)

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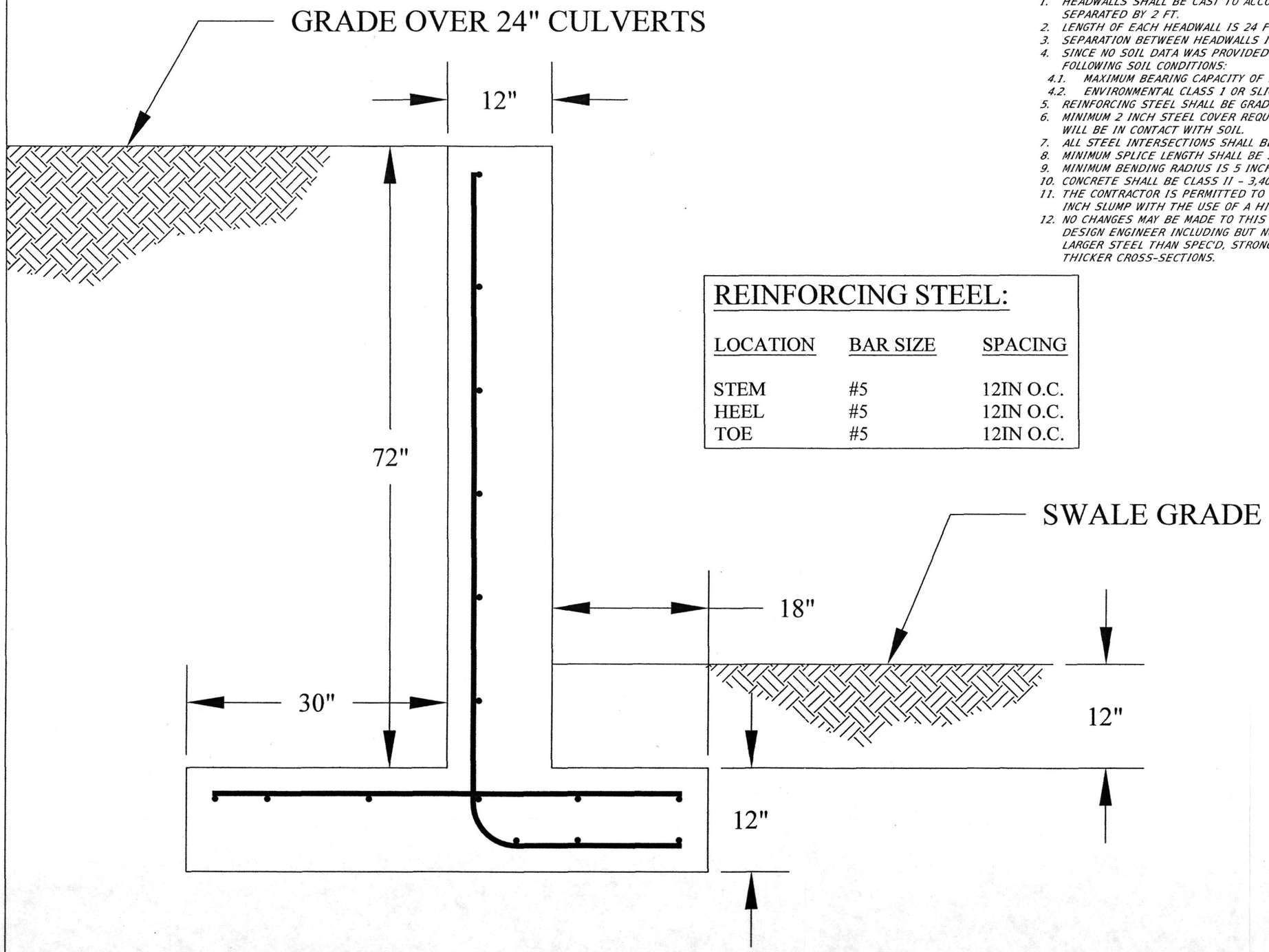
TITLE: BOX CULVERT - INDEX 289, SHEET 5

JOB NAME: CC CENTRAL LANDFILL
PHASE III EXPSNSION PROJECT

SHEET 6 OF 7



ENGINEER'S NOTES:

1. HEADWALLS SHALL BE CAST TO ACCOMMODATE 2 24" RCP CULVERTS SEPARATED BY 2 FT.
2. LENGTH OF EACH HEADWALL IS 24 FT.
3. SEPARATION BETWEEN HEADWALLS IS 35 FT.
4. SINCE NO SOIL DATA WAS PROVIDED THIS DESIGN CONSIDERS THE FOLLOWING SOIL CONDITIONS:
   - 4.1. MAXIMUM BEARING CAPACITY OF 2,000PSF;
   - 4.2. ENVIRONMENTAL CLASS 1 OR SLIGHTLY AGGRESSIVE SOIL
5. REINFORCING STEEL SHALL BE GRADE 60 DEFORMED BILLET STEEL
6. MINIMUM 2 INCH STEEL COVER REQUIRED, 3 INCHES WHERE SURFACE WILL BE IN CONTACT WITH SOIL.
7. ALL STEEL INTERSECTIONS SHALL BE TIED.
8. MINIMUM SPLICE LENGTH SHALL BE 30 INCHES.
9. MINIMUM BENDING RADIUS IS 5 INCHES.
10. CONCRETE SHALL BE CLASS II - 3,400 PSI 28 DAY MINIMUM STRENGTH.
11. THE CONTRACTOR IS PERMITTED TO USE CONCRETE WITH A MAXIMUM 7 INCH SLUMP WITH THE USE OF A HIGH RANGE WATER REDUCER.
12. NO CHANGES MAY BE MADE TO THIS DESIGN WITHOUT CONSULTING THE DESIGN ENGINEER INCLUDING BUT NOT LIMITED TO ADDITIONAL STEEL, LARGER STEEL THAN SPEC'D, STRONGER CONCRETE THAN SPEC'D AND THICKER CROSS-SECTIONS.

REINFORCING STEEL:

LOCATION	BAR SIZE	SPACING
STEM	#5	12IN O.C.
HEEL	#5	12IN O.C.
TOE	#5	12IN O.C.

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TITLE: 24" RCP HEADWALL DETAILS

JOB NAME: CC CENTRAL LANDFILL
PHASE III EXPSNSION PROJECT

SHEET 7 OF 7