

CULVERT QUANTITIES

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ITEM 511 - CLASS QC1 CONCRETE, RETAINING WALL/WINGWALL NOT INCLUDING FOOTING

Wingwall #1

plan area = $13.17 \times 1 = 13.17$ s.f.
avg. height = $(9.5 + 5.5)/2 = 7.5'$
Volume = $13.17 \times 7.5 / 27 = 3.66$ c.y.

Wingwall #2

plan area = $13.17 \times 1 = 13.17$ s.f.
avg. height = $(9.5 + 5.5)/2 = 7.5'$
Volume = $13.17 \times 7.5 / 27 = 3.66$ c.y.

Wingwall #3

plan area = $11.08 \times 1 = 11.08$ s.f.
avg. height = $(9.5 + 7)/2 = 8.25'$
Volume = $11.08 \times 8.25 / 27 = 3.39$ c.y.

Wingwall #4

plan area = $11.08 \times 1 = 11.08$ s.f.
avg. height = $(9.5 + 7)/2 = 8.25'$
Volume = $11.08 \times 8.25 / 27 = 3.39$ c.y.

TOTAL CONCRETE, RET WALL/WINGWALL= 14.1 c.y. (USE 15 CY)

ITEM 511 - CLASS QC1 CONCRETE, FOOTING

Left Side

* CADD Area

*plan area = 271.8 s.f.
Volume = $271.8 \times 1.5 / 27 = 15.10$ c.y.

*shear key area = 54.25 s.f.
Volume = $54.25 \times 2.5 / 27 = 5.02$ c.y.

*x-sectional

Lip area = 3.15 s.f.
Volume = $3.15 \text{ s.f.} \times 12' / 27 = 1.40$ c.y.

subtotal = 21.5 c.y.

Right Side

*plan area = 271.8 s.f.
Volume = $271.8 \times 1.5 / 27 = 15.10$ c.y.

*shear key area = 54.25 s.f.
Volume = $54.25 \times 2.5 / 27 = 5.02$ c.y.

*x-sectional

Lip area = 3.15 s.f.
Volume = $3.15 \text{ s.f.} \times 12' / 27 = 1.40$ c.y.

subtotal = 21.5 c.y.

TOTAL CONCRETE, FOOTING = 43.0 c.y. (USE 43 CY)

ITEM 511 - CLASS QC1 CONCRETE, HEADWALL

Left Headwall

Volume = $(12 + 1 + 1) \times 1.5 \times 1 / 27 = 0.78 \text{ c.y.}$

Right Headwall

Volume = $(12 + 1 + 1) \times 1.5 \times 1 / 27 = 0.78 \text{ c.y.}$ **TOTAL CONCRETE, HEADWALL =****1.6 c.y.****(USE 2 CY)****ITEM 512 - TYPE 2 WATERPROOFING**

Sides of Box including

1' overlap on each wingwall = $85' \times 2 \text{ sides} \times 8' \text{ (height of box)} = 1360 \text{ s.f.}$ **TOTAL TYPE 2 WATERPROOFING =****151 s.y.****ITEM 512 - SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)***** CADD Area**

	top	back	side	*exposed front	
Wingwall #1 =	$(13.76 \times 1) +$	$(13.76 \times 0.5) +$	$(0.5 \times 1) +$	$(*98.75 \text{ s.f.}) =$	119.89 s.f.
Wingwall #2 =	$(13.76 \times 1) +$	$(13.76 \times 0.5) +$	$(0.5 \times 1) +$	$(*98.75 \text{ s.f.}) =$	119.89 s.f.
Wingwall #3 =	$(11.36 \times 1) +$	$(11.36 \times 0.5) +$	$(0.5 \times 1) +$	$(*91.5 \text{ s.f.}) =$	109.04 s.f.
Wingwall #4 =	$(11.36 \times 1) +$	$(11.36 \times 0.5) +$	$(0.5 \times 1) +$	$(*91.5 \text{ s.f.}) =$	109.04 s.f.

	top	back	front	inside top of box	
Left Headwall =	$(14 \times 1) +$	$(14 \times 1.5) +$	$(14 \times 2.5) +$	$(12 \times 2) =$	94.00 s.f.
Right Headwall =	$(14 \times 1) +$	$(14 \times 1.5) +$	$(14 \times 2.5) +$	$(12 \times 2) =$	94.00 s.f.

Exposed Sides on Face of Box = $2 \times 2(6' \times 1') = 24.00 \text{ s.f.}$ Inside Walls of box = $2 \times 2(6' \times 2') = 48.00 \text{ s.f.}$ **TOTAL SEALING OF CONCRETE SURFACES (EPOXY-URETHANE) =****80 s.y.****ITEM 516 - 1" PREFORMED EXPANSION JOINT FILLER**Sum of the wingwall heights = $(2 \times 9.5) + (2 \times 9.5) = 38'$

wingwall widths = 1.0 ft.

TOTAL 1" PREFORMED EXPANSION JOINT FILLER =**38 s.f.****ITEM 503 - UNCLASSIFIED EXCAVATION (WINGWALL FOOTING)***** CADD Area**

Note: offset footings 1.0' to get pay quantity

*LT Side Footing Area (1' offset) = 367.43 s.f.

*RT Side Footing Area (1' offset) = 367.43 s.f.

Footing Depth = 1.5 ft.

Approximate existing soil

depth above footings = 1.88 ft.

Volume = $((1.5 + 1.88) \times 2) \times (367.43 + 367.43) / 27 = 184 \text{ c.y.}$

Shear Key excavation:

*Left side shear key area = 54.25 s.f.

*Right side shear key area = 54.25 s.f.

shear key depth = 2.5 ft.

Volume of Shear Key excavation = $(54.25 + 54.25) \times 2.5 / 27 = 10 \text{ c.y.}$ **TOTAL UNCLASSIFIED EXCAVATION =****194 c.y.**

ITEM 518 - POROUS BACKFILL WITH GEOTEXTILE FABRIC

Wingwall 1:
Volume = $[(1085.65 - 1080.15) - 1.5' + (1089.65 - 1080.15) - 1.5] / 2 \times 13.17' \times 1.5' / 27 = 4.39 \text{ c.y.}$

Wingwall 2:
Volume = $[(1085.3-1079.8) - 1.5' + (1089.3-1079.8) - 1.5] / 2 \times 13.17' \times 1.5' / 27 = 4.39 \text{ c.y.}$

Wingwall 3:
Volume = $[(1086.8-1079.8) - 1.5' + (1089.3-1079.8) - 1.5] / 2 \times 11.08' \times 1.5' / 27 = 4.16 \text{ c.y.}$

Wingwall 4:
Volume = $[(1087.15-1080.15) - 1.5' + (1089.65-1080.15) - 1.5] / 2 \times 11.08' \times 1.5' / 27 = 4.16 \text{ c.y.}$

TOTAL POROUS BACKFILL WITH GEOTEXTILE FABRIC = 17 c.y.

FOR UNSUITABLE SOIL UNDERCUT:

NOTE: MEASUREMENTS DONE IN 114126_DC001.dgn IN THE DESIGN SPACE:

ITEM 304 - AGGREGATE BASE

FOOTER XS AREA = 18.5 SF
FOOTER LENGTH = 29.17 FT
FOOTER VOLUME = 539.58 CF = 19.99 CY
19.99 CY x 2 FOOTERS = 39.98 CY

BOX XS AREA = 11.46' SF
BOX LENGTH - WHAT'S INCLUDED WITH FOOTERS = 36.33 FT
BOX VOLUME = 416.34 CF = 15.42 CY

TOTAL = 55.40 CY (**USE 56 CY**)

ITEM 203 - EXCAVATION

SAME CALC. AS 304 - USE 56 CY

ITEM 204 - GEOTEXTILE FABRIC

FOOTER XS PERIMETER = 17.25 FT
FOOTER LENGTH = 29.17 FT
FOOTER AREA = 503.18 SF
FOOTER END AREA = 18.5 x 2 = 37 SF
TOTAL PER FOOTER = 540.18 SF = 60 SY

60 SY x 2 FOOTERS = **120 SY**