

RETAINING WALLS

(RW)

GENERAL NOTES

Specifications: -SHA Specifications dated July, 2008
 -Revisions thereof and additions thereto and Special Provisions for Materials and Construction

AASHTO LRFD Bridge Design Specifications, 5th edition, 2010.

Concrete Design: LRFD, $f'c = 3.0$ ksi.

Reinforcing Steel Design: $f_y = 60.0$ ksi.

Concrete: All structure concrete shall be Mix. No. 3 (3500 psi) except as noted below under reinforcing steel.

Reinforcing Steel: Reinforcing steel shall conform to A 615, Grade 60. All splices, not shown, shall be lapped as per Bar Lap Charts. Minimum cover for any bar shall be 2" unless otherwise noted, with the exception of bars at the bottom and sides of all footings which shall have 3" minimum cover.

If the front face of a retaining wall less than 10 feet from the edge of paved surfaces, epoxy coated reinforcement shall be used in the front face of the stem and Mix. No. 6 (4500 psi) concrete shall be used for the stem.

ONLY GRADE 60 CAN BE USED.

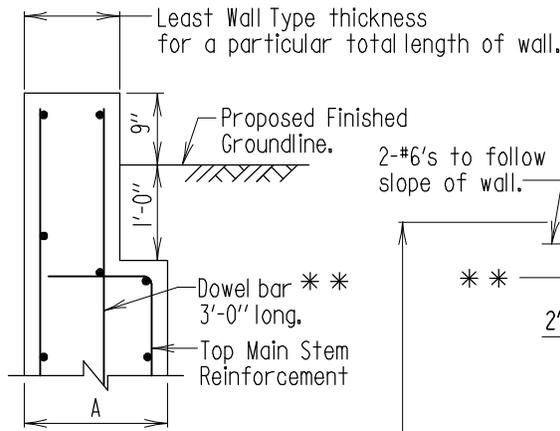
Design Parameters: Earth pressure calculated based on Coulomb Theory.

Angle of Internal Friction:
 33 degrees for excellent soil
 30 degrees for good and poor soils (and all walls on pile footings)

For Wall Types E and F, passive earth pressure from top of footing to bottom of shear key was utilized in the design. In these cases, the top of footing shall have a minimum of 30" cover.

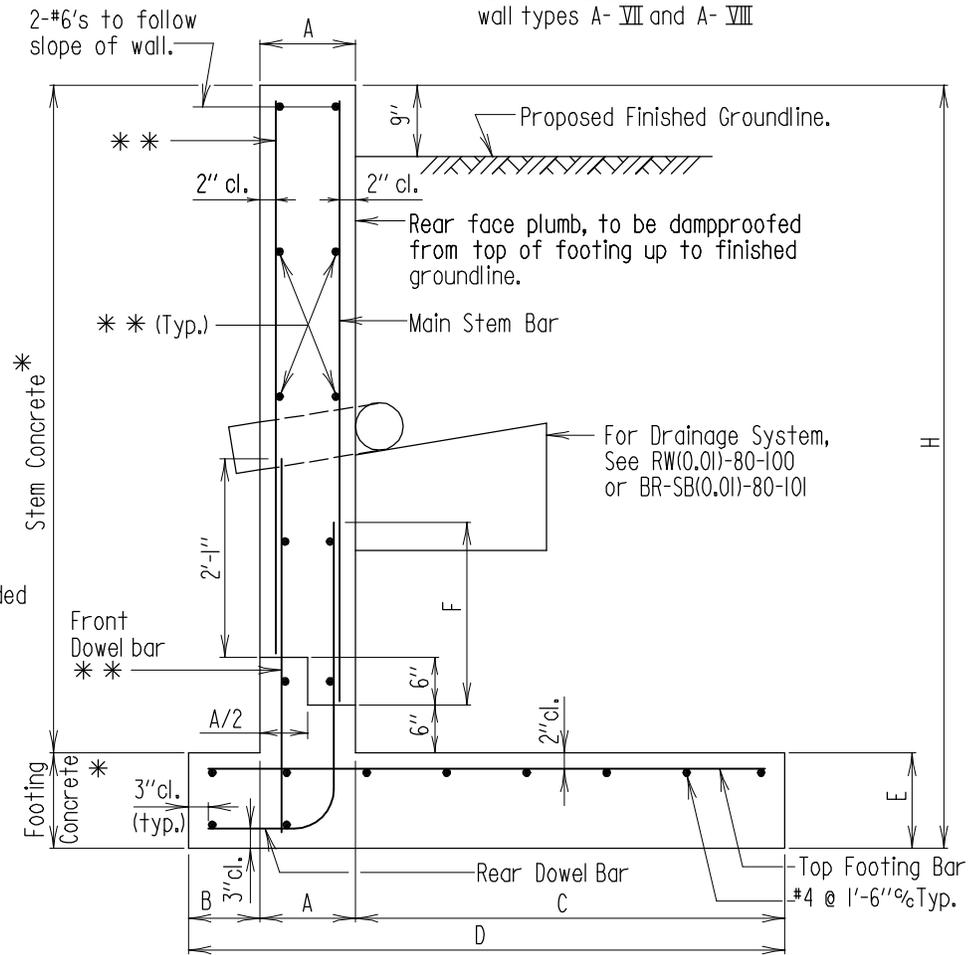
Safe bearing pressures are factored resistances.

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">APPROVAL</th> </tr> <tr> <td colspan="2" style="text-align: center;"> <i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 7/8/83 </td> </tr> <tr> <th colspan="2" style="text-align: center;">REVISIONS</th> </tr> <tr> <th style="text-align: center;">SHA</th> <th style="text-align: center;">FHWA</th> </tr> <tr> <td style="text-align: center;">7-16-02</td> <td></td> </tr> <tr> <td style="text-align: center;">10-9-07</td> <td></td> </tr> <tr> <td style="text-align: center;">FHWA APPROVAL</td> <td style="text-align: center;">1-18-12</td> </tr> <tr> <td style="text-align: center;">DATE:</td> <td style="text-align: center;">3-21-14</td> </tr> </table>	APPROVAL		<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 7/8/83		REVISIONS		SHA	FHWA	7-16-02		10-9-07		FHWA APPROVAL	1-18-12	DATE:	3-21-14	<p>STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES</p> <p>STANDARD RETAINING WALL GENERAL NOTES</p> <p>STANDARD NO. RW-101</p>	 <p>SHEET <u> </u> OF <u> </u></p>
APPROVAL																		
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 7/8/83																		
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DETAIL A
Scale: None
(See note 2 below)

* * #4 @ 1'-6" c/c for wall types A-I thru A-IV
 #4 @ 1'-0" c/c for wall types A-V and A-VI
 #5 @ 1'-0" c/c for wall types A-VII and A-VIII



TYPICAL SECTION
Scale: 1/2" = 1'-0"

* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure Contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.

Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
A-I	6'-0"	1'-0"	9"	2'-0"	3'-9"	1'-0"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
A-II	8'-0"	1'-0"	9"	3'-3"	5'-0"	1'-0"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
A-III	10'-0"	1'-0"	9"	4'-6"	6'-3"	1'-3"	2'-7"	#6 @ 1'-0" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
A-IV	12'-0"	1'-0"	9"	5'-6"	7'-3"	1'-3"	2'-7"	#6 @ 6" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
A-V	14'-0"	1'-3"	1'-0"	6'-0"	8'-3"	1'-6"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
A-VI	16'-0"	1'-6"	1'-0"	6'-9"	9'-3"	1'-6"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
A-VII	18'-0"	1'-9"	1'-3"	7'-3"	10'-3"	1'-6"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
A-VIII	20'-0"	2'-3"	1'-6"	7'-9"	11'-3"	1'-6"	4'-7"	#8 @ 6" c/c	#8 @ 1'-0" c/c	#8 @ 6" c/c

Notes:

1. An "Excellent Soil Condition" is that foundation material that can support a safe bearing pressure of 5 ksf and has an angle of friction of 33°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown; or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if traffic is present on the level area adjacent to the wall.

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DATE: 6-21-85	12-4-13

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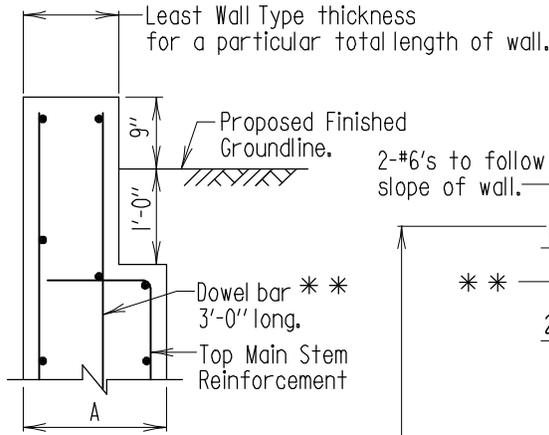
TYPE A RETAINING WALL SECTION
(FOR EXCELLENT SOIL CONDITION AND
TWO FOOT SURCHARGE)

STANDARD NO. RW-102

SHEET OF

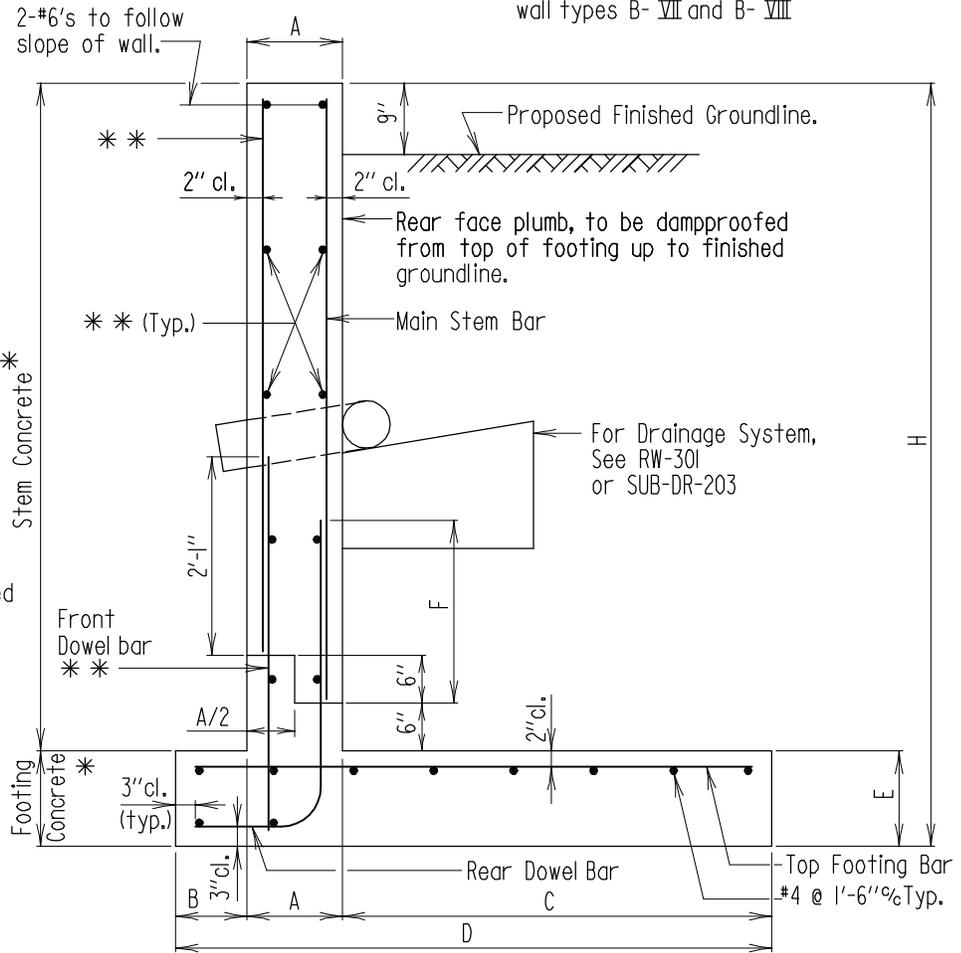


RETAINING WALLS



DETAIL A
Scale: None
(See note 2 below)

** #4 @ 1'-6" c/c for wall types B-I thru B-IV
#4 @ 1'-0" c/c for wall types B-V and B-VI
#5 @ 1'-0" c/c for wall types B-VII and B-VIII



TYPICAL SECTION
Scale: 1/2" = 1'-0"

* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure Contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.

Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
B-I	6'-0"	1'-0"	9"	2'-6"	4'-3"	1'-0"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
B-II	8'-0"	1'-0"	9"	3'-6"	5'-3"	1'-0"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
B-III	10'-0"	1'-0"	1'-0"	4'-6"	6'-6"	1'-3"	2'-7"	#6 @ 6" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
B-IV	12'-0"	1'-0"	1'-0"	5'-6"	7'-6"	1'-3"	2'-7"	#6 @ 6" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
B-V	14'-0"	1'-3"	1'-3"	6'-0"	8'-6"	1'-6"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
B-VI	16'-0"	1'-6"	1'-6"	6'-9"	9'-9"	1'-6"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
B-VII	18'-0"	1'-9"	1'-9"	7'-3"	10'-9"	1'-9"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
B-VIII	20'-0"	2'-3"	2'-3"	8'-6"	13'-0"	1'-9"	4'-7"	#8 @ 6" c/c	#8 @ 1'-0" c/c	#8 @ 6" c/c

Notes:

1. A "Good Soil Condition" is that foundation material that can support a safe bearing pressure of 4 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown; or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if traffic is present on the level area adjacent to the wall.

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TYPE B RETAINING WALL SECTION
(FOR GOOD SOIL CONDITION AND
TWO FOOT SURCHARGE)

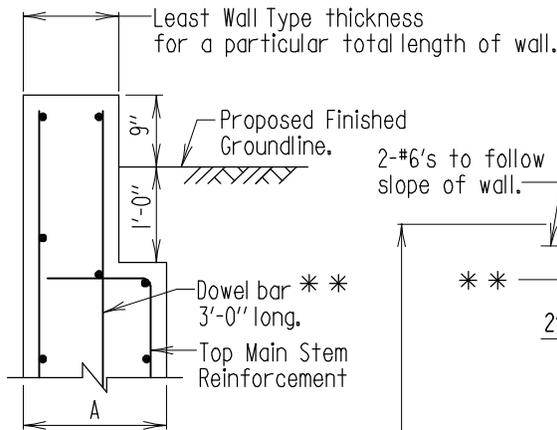
STANDARD NO. RW-103

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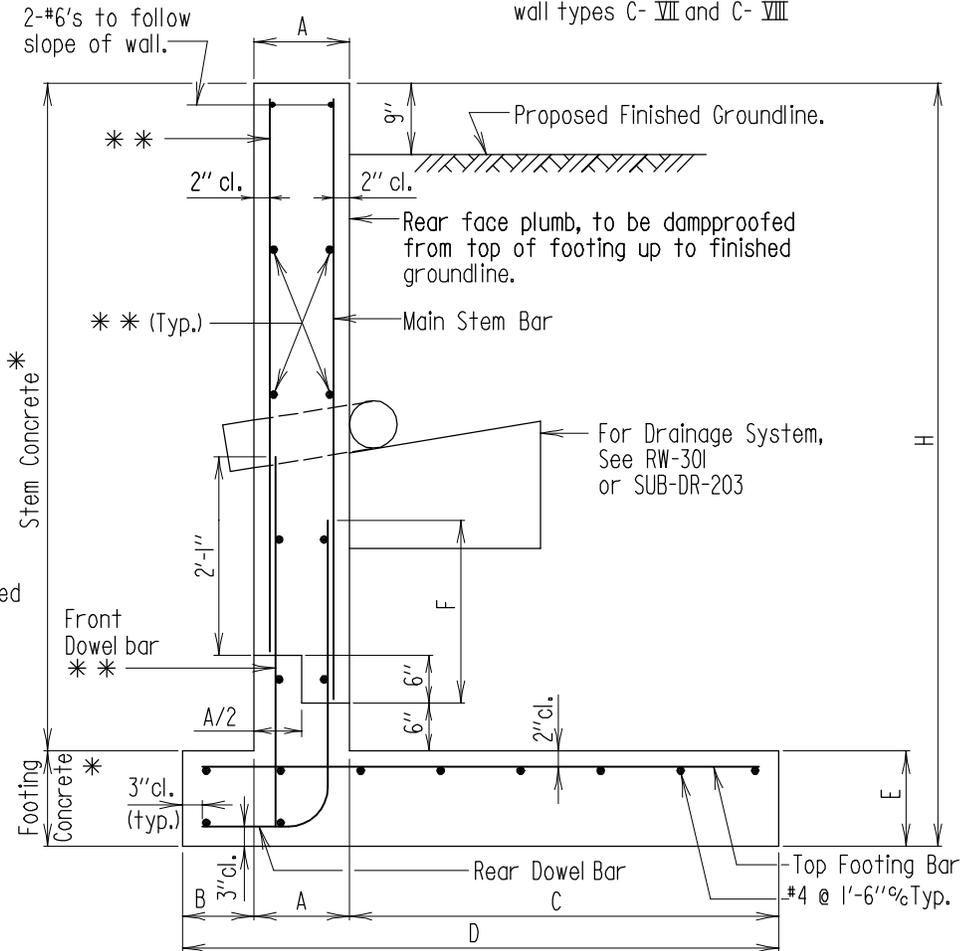


RETAINING WALLS



DETAIL A
Scale: None
(See note 2 below)

** #4 @ 1'-6" c/c for wall types C-I thru C-IV
 #4 @ 1'-0" c/c for wall types C-V and C-VI
 #5 @ 1'-0" c/c for wall types C-VII and C-VIII



TYPICAL SECTION
Scale: 1/2" = 1'-0"

* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure Contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.

Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
C-I	6'-0"	1'-0"	9"	2'-6"	4'-3"	1'-0"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
C-II	8'-0"	1'-0"	9"	3'-6"	5'-3"	1'-0"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
C-III	10'-0"	1'-0"	1'-0"	4'-6"	6'-6"	1'-3"	2'-7"	#6 @ 6" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
C-IV	12'-0"	1'-0"	1'-0"	5'-6"	7'-6"	1'-3"	2'-7"	#6 @ 6" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
C-V	14'-0"	1'-3"	1'-6"	6'-0"	8'-9"	1'-6"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
C-VI	16'-0"	1'-6"	2'-3"	6'-9"	10'-6"	1'-6"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
C-VII	18'-0"	2'-3"	3'-0"	7'-3"	12'-6"	1'-9"	3'-6"	#7 @ 6" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
C-VIII	20'-0"	2'-3"	4'-0"	8'-9"	15'-0"	1'-9"	4'-7"	#8 @ 6" c/c	#8 @ 1'-0" c/c	#8 @ 6" c/c

Notes:

1. A "Poor Soil Condition" is that foundation material that can support a safe bearing pressure of 3 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown; or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if traffic is present on the level area adjacent to the wall.

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DATE: 6-8-90	12-4-13

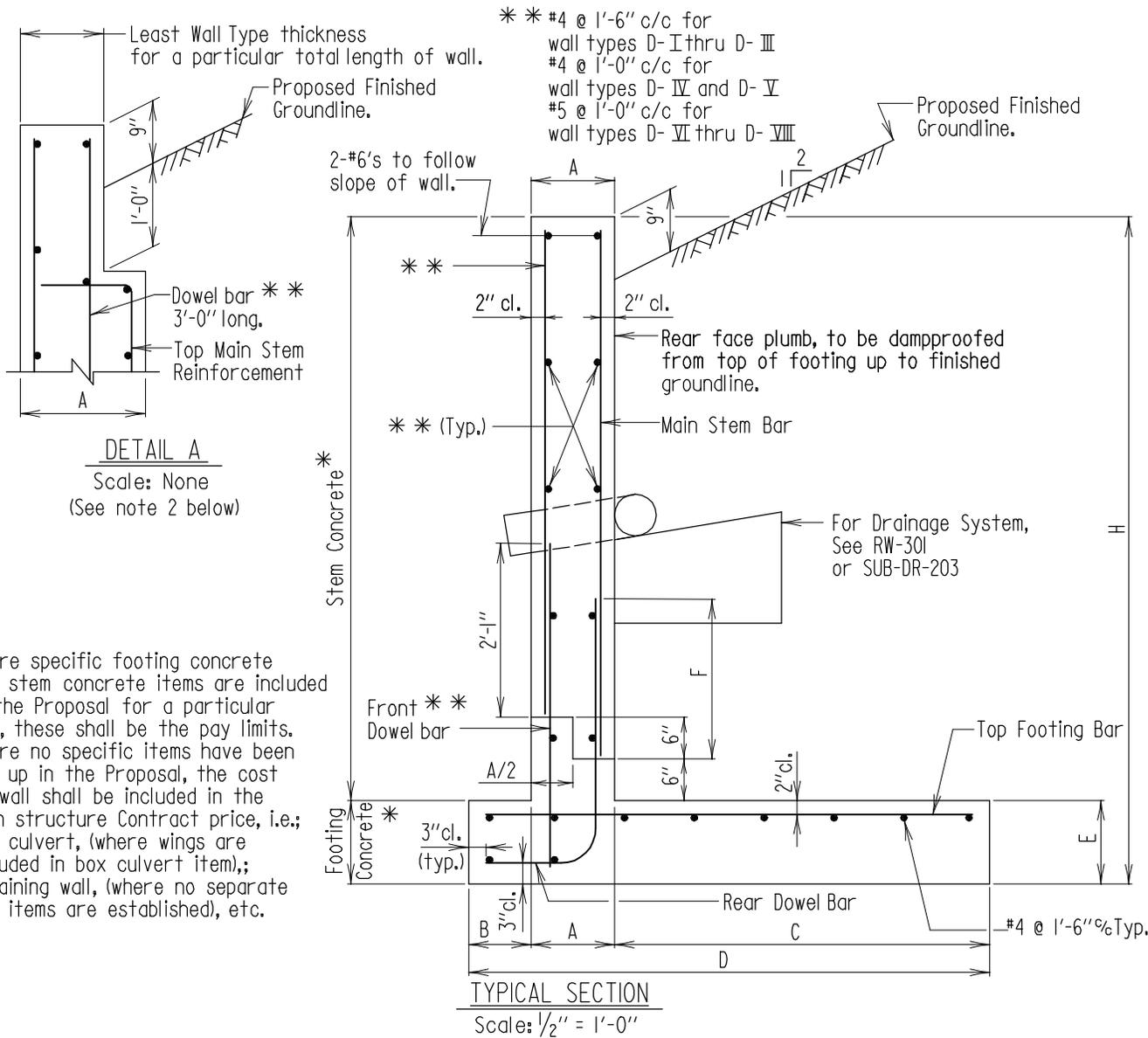
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TYPE C RETAINING WALL SECTION
 (FOR POOR SOIL CONDITION AND
 TWO FOOT SURCHARGE)

STANDARD NO. RW-104

SHEET OF



* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure Contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.

Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
D-I	6'-0"	1'-0"	1'-3"	2'-6"	4'-9"	1'-0"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
D-II	8'-0"	1'-0"	1'-6"	4'-3"	6'-9"	1'-3"	2'-2"	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c	#5 @ 1'-0" c/c
D-III	10'-0"	1'-0"	1'-6"	6'-0"	8'-6"	1'-6"	2'-7"	#6 @ 1'-0" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
D-IV	12'-0"	1'-6"	1'-6"	7'-0"	10'-0"	1'-6"	2'-7"	#6 @ 1'-0" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
D-V	14'-0"	1'-9"	1'-9"	8'-3"	11'-9"	1'-6"	3'-6"	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
D-VI	16'-0"	1'-9"	1'-9"	10'-0"	13'-6"	1'-9"	4'-7"	#8 @ 6" c/c	#8 @ 1'-0" c/c	#8 @ 6" c/c
D-VII	18'-0"	2'-0"	2'-3"	11'-0"	15'-3"	2'-0"	5'-9"	#9 @ 6" c/c	#9 @ 1'-0" c/c	#9 @ 6" c/c
D-VIII	20'-0"	2'-6"	2'-6"	12'-6"	17'-3"	2'-6"	5'-9"	#9 @ 6" c/c	#9 @ 1'-0" c/c	#9 @ 6" c/c

Notes:

- An "Excellent Soil Condition" is that foundation material that can support a safe bearing pressure of 5 ksf and has an angle of friction of 33°.
- If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
- Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown; or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
- These walls are valid if the sloping backfill levels off and traffic is present on the level area.

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FHWA APPROVAL	1-18-12
DATE:	12-4-13

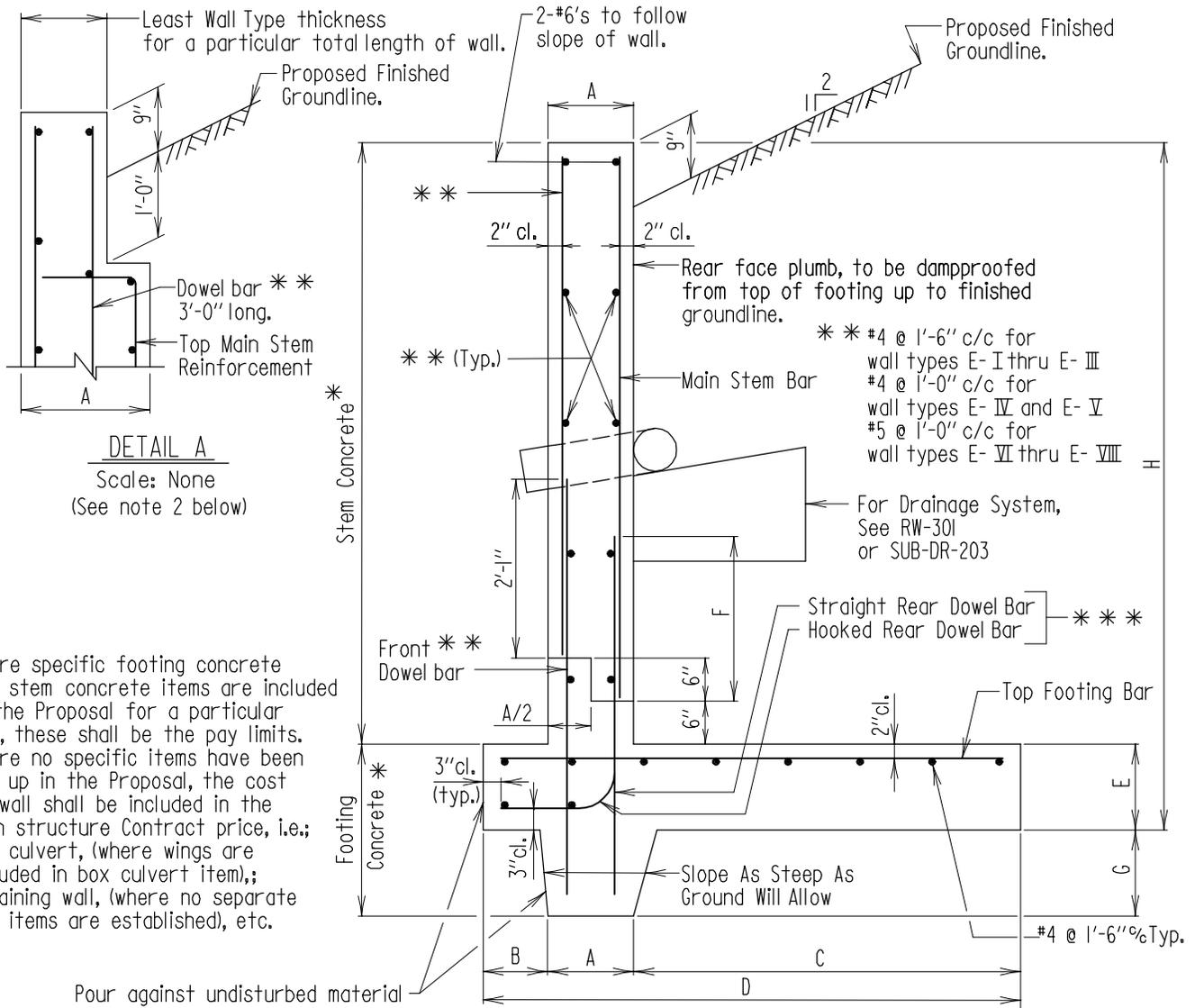
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TYPE D RETAINING WALL SECTION
(FOR EXCELLENT SOIL CONDITION
AND SLOPING GROUNDLINE)

STANDARD NO. RW-105

SHEET OF



DETAIL A
Scale: None
(See note 2 below)

TYPICAL SECTION
Scale: 1/2" = 1'-0"

* * * Alternate Hooked Bars with Straight Bars

* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure Contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.

Wall Type	H	A	B	C	D	E	F	G	Straight Rear Dowel Bar	Hooked Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
E-I	6'-0"	1'-0"	1'-9"	4'-6"	7'-3"	1'-0"	2'-2"	1'-0"	#5 @ 2'-0" c/c	#5 @ 2'-0" c/c	#5 @ 1'-0" c/c	#5 @ 6" c/c
E-II	8'-0"	1'-0"	1'-9"	4'-9"	7'-6"	1'-0"	2'-2"	1'-0"	#5 @ 2'-0" c/c	#5 @ 2'-0" c/c	#5 @ 1'-0" c/c	#5 @ 6" c/c
E-III	10'-0"	1'-0"	1'-9"	5'-6"	8'-3"	1'-0"	2'-7"	2'-0"	#6 @ 1'-0" c/c	#6 @ 1'-0" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
E-IV	12'-0"	1'-3"	2'-0"	7'-3"	10'-6"	1'-6"	3'-6"	2'-0"	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
E-V	14'-0"	1'-6"	2'-6"	7'-6"	11'-6"	1'-9"	3'-6"	3'-0"	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
E-VI	16'-0"	1'-9"	3'-0"	8'-6"	13'-3"	2'-0"	4'-7"	3'-0"	#8 @ 1'-0" c/c	#8 @ 1'-0" c/c	#8 @ 1'-0" c/c	#8 @ 6" c/c
E-VII	18'-0"	2'-3"	3'-6"	10'-3"	16'-0"	2'-3"	5'-9"	3'-0"	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 6" c/c
E-VIII	20'-0"	2'-9"	4'-3"	12'-0"	19'-0"	2'-6"	5'-9"	3'-0"	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 6" c/c

Notes:

- A "Good Soil Condition" is that foundation material that can support a safe bearing pressure of 4 ksf and has an angle of friction of 30°.
- If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
- Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown; or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
- These walls are valid if the sloping backfill levels off and traffic is present on the level area.

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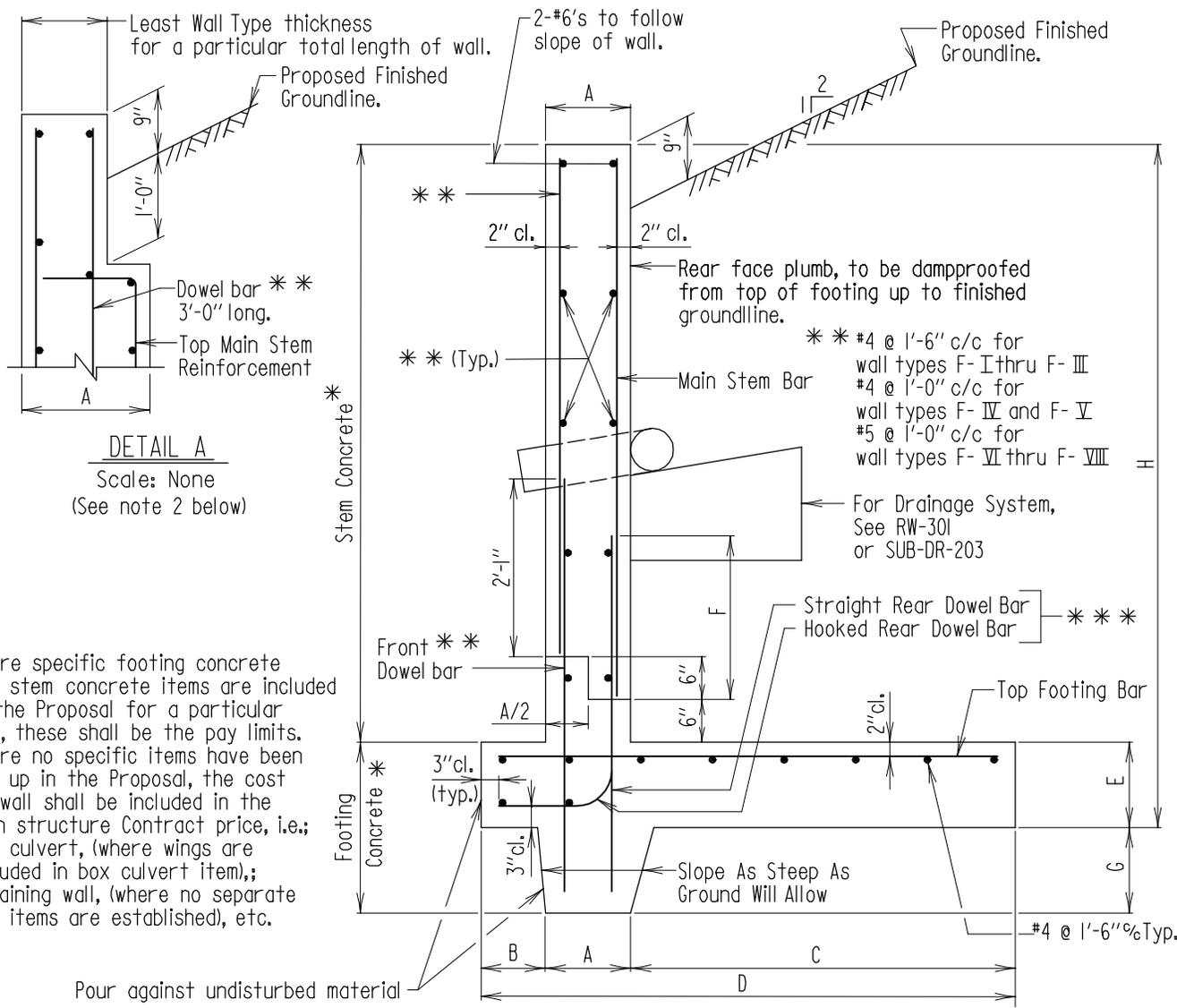
TYPE E RETAINING WALL SECTION
(FOR GOOD SOIL CONDITION
AND SLOPING GROUNDLINE)

STANDARD NO. RW-106

SHEET OF



RETAINING WALLS



DETAIL A
Scale: None
(See note 2 below)

TYPICAL SECTION
Scale: 1/2" = 1'-0"

*** Alternate Hooked Bars with Straight Bars

* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure Contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.

Wall Type	H	A	B	C	D	E	F	G	Straight Rear Dowel Bar	Hooked Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
F-I	6'-0"	1'-0"	1'-9"	4'-6"	7'-3"	1'-0"	2'-2"	1'-0"	#5 @ 2'-0" c/c	#5 @ 2'-0" c/c	#5 @ 1'-0" c/c	#5 @ 6" c/c
F-II	8'-0"	1'-0"	1'-9"	4'-9"	7'-6"	1'-0"	2'-2"	1'-0"	#5 @ 2'-0" c/c	#5 @ 2'-0" c/c	#5 @ 1'-0" c/c	#5 @ 6" c/c
F-III	10'-0"	1'-0"	1'-9"	5'-6"	8'-3"	1'-0"	2'-7"	2'-0"	#6 @ 1'-0" c/c	#6 @ 1'-0" c/c	#6 @ 1'-0" c/c	#6 @ 6" c/c
F-IV	12'-0"	1'-3"	2'-0"	7'-3"	10'-6"	1'-6"	3'-6"	2'-0"	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
F-V	14'-0"	1'-6"	3'-0"	7'-6"	12'-0"	1'-9"	3'-6"	3'-0"	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 1'-0" c/c	#7 @ 6" c/c
F-VI	16'-0"	1'-9"	4'-0"	8'-6"	14'-3"	2'-0"	4'-7"	3'-0"	#8 @ 1'-0" c/c	#8 @ 1'-0" c/c	#8 @ 1'-0" c/c	#8 @ 6" c/c
F-VII	18'-0"	2'-3"	5'-0"	10'-3"	17'-6"	2'-3"	5'-9"	3'-0"	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 6" c/c
F-VIII	20'-0"	2'-9"	6'-3"	12'-0"	21'-0"	2'-6"	5'-9"	3'-0"	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 1'-0" c/c	#9 @ 6" c/c

Notes:

1. A "Poor Soil Condition" is that foundation material that can support a safe bearing pressure of 3 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown; or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if the sloping backfill levels off and traffic is present on the level area.

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DATE: 7/16/02	
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STATE OF MARYLAND
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TYPE F RETAINING WALL SECTION
(FOR POOR SOIL CONDITION
AND SLOPING GROUNDLINE)

STANDARD NO. RW-107

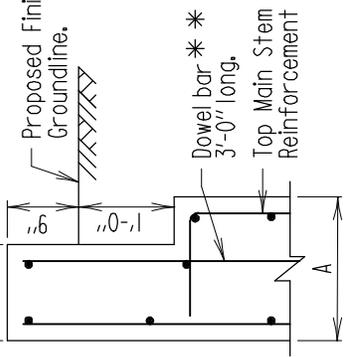
SHEET OF



RETAINING WALLS

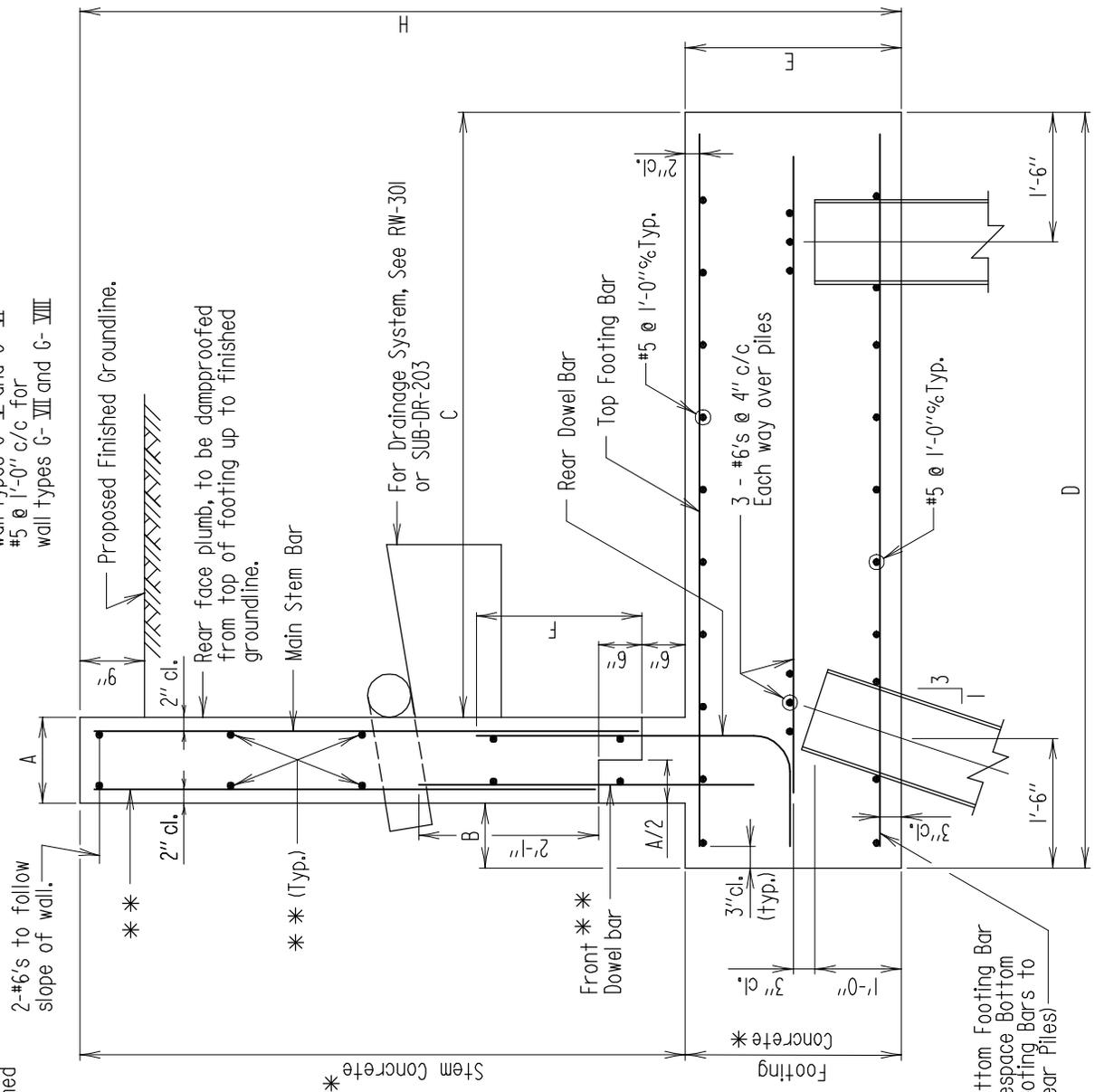
- * #4 @ 1'-6" c/c for wall types G-I thru G-IV
- * #4 @ 1'-0" c/c for wall types G-V and G-VI
- * #5 @ 1'-0" c/c for wall types G-VII and G-VIII

Least Wall Type thickness for a particular total length of wall.



DETAIL A
Scale: None
(See note no. 1 Sheet 2)

* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.



TYPICAL SECTION
Scale: 1/2" = 1'-0"

FHWA APPROVAL
DATE:

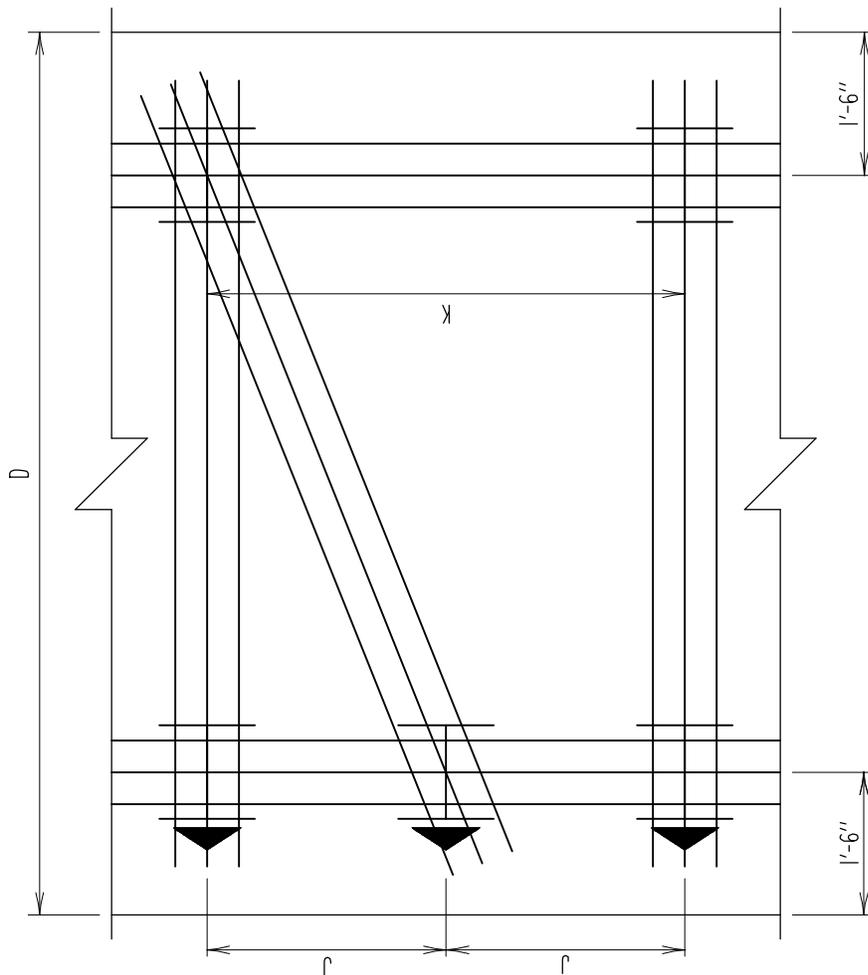
APPROVAL	
L.S. Freedom DIRECTOR OFFICE OF STRUCTURES	
DATE: 7/16/02	
REVISIONS	
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11-13-07	
12-4-13	

STANDARD NO. RW-108

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES



SHEET 1 OF 2



TYPICAL PILE PLAN
Scale: 1/2" = 1'-0"

- Notes:
1. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
 2. Contractor has option of lapping stem reinforcement with toe reinforcement and/or dowels as shown; or by extending the toe and/or dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
 3. H piles shown for illustration purpose only. For pile type, see Pile Layout on pertinent Contract Drawing.
 4. Pile spacings are maximum. For actual pile spacing, see Pile Layout on pertinent contract drawing.
 5. These walls are valid if traffic is present on the level area adjacent to the wall.
 6. Capacities include resistance factors (LRFD only).

Wall Type	PILE CAPACITY - DESIGN LOAD																												
	25 TONS	40 TONS	55 TONS	70 TONS	70 TONS	70 TONS																							
G-I	6'-0"	1'-0"	0'-9"	4'-3"	6'-0"	2'-3"	2'-3"	5 @ 1'-0"	5 @ 1'-0"	5 @ 1'-0"	2'-2"	F	Bottom Footing Bar	#5 @ 1'-0"	#5 @ 1'-0"	5'-0"	10'-0"	5'-0"	5'-0"	10'-0"	J	K	J	K	5'-0"	10'-0"	5'-0"	10'-0"	10'-0"
G-II	8'-0"	1'-0"	0'-9"	4'-3"	6'-0"	2'-3"	2'-3"	5 @ 1'-0"	5 @ 1'-0"	5 @ 1'-0"	2'-2"	F	Bottom Footing Bar	#5 @ 1'-0"	#5 @ 1'-0"	5'-0"	10'-0"	5'-0"	5'-0"	10'-0"	J	K	J	K	5'-0"	10'-0"	5'-0"	10'-0"	10'-0"
G-III	10'-0"	1'-0"	0'-9"	4'-3"	6'-0"	2'-3"	2'-3"	5 @ 1'-0"	5 @ 1'-0"	5 @ 6"	2'-2"	F	Bottom Footing Bar	#5 @ 1'-0"	#5 @ 6"	5'-0"	10'-0"	5'-0"	5'-0"	10'-0"	J	K	J	K	5'-0"	10'-0"	5'-0"	10'-0"	10'-0"
G-IV	12'-0"	1'-0"	1'-0"	4'-3"	6'-3"	2'-3"	2'-3"	7 @ 1'-0"	7 @ 1'-0"	7 @ 6"	3'-0"	F	Bottom Footing Bar	#7 @ 1'-0"	#7 @ 6"	5'-0"	10'-0"	5'-0"	5'-0"	10'-0"	J	K	J	K	5'-0"	10'-0"	5'-0"	10'-0"	10'-0"
G-V	14'-0"	1'-3"	1'-6"	4'-3"	7'-0"	2'-3"	2'-3"	7 @ 1'-0"	7 @ 1'-0"	7 @ 6"	3'-0"	F	Bottom Footing Bar	#7 @ 1'-0"	#7 @ 6"	5'-0"	10'-0"	5'-0"	5'-0"	10'-0"	J	K	J	K	5'-0"	10'-0"	5'-0"	10'-0"	10'-0"
G-VI	16'-0"	1'-6"	1'-9"	4'-3"	7'-6"	2'-6"	2'-6"	7 @ 1'-0"	7 @ 1'-0"	7 @ 6"	3'-6"	F	Bottom Footing Bar	#7 @ 1'-0"	#7 @ 6"	5'-6"	10'-0"	5'-6"	5'-6"	10'-0"	J	K	J	K	5'-6"	10'-0"	5'-6"	10'-0"	10'-0"
G-VII	18'-0"	1'-9"	2'-3"	4'-3"	8'-3"	2'-6"	2'-6"	8 @ 1'-0"	8 @ 1'-0"	8 @ 6"	3'-6"	F	Bottom Footing Bar	#8 @ 1'-0"	#8 @ 6"	6'-0"	10'-0"	6'-0"	6'-0"	10'-0"	J	K	J	K	6'-0"	10'-0"	6'-0"	10'-0"	10'-0"
G-VIII	20'-0"	2'-0"	2'-6"	4'-3"	8'-9"	2'-9"	2'-9"	8 @ 1'-0"	8 @ 1'-0"	8 @ 6"	4'-7"	F	Bottom Footing Bar	#8 @ 1'-0"	#8 @ 6"	6'-0"	10'-0"	6'-0"	6'-0"	10'-0"	J	K	J	K	6'-0"	10'-0"	6'-0"	10'-0"	10'-0"

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DATE: 7/16/02	
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DATE:	

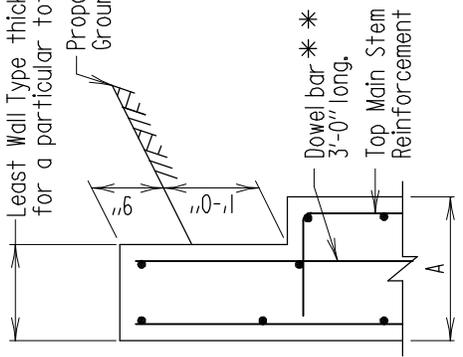
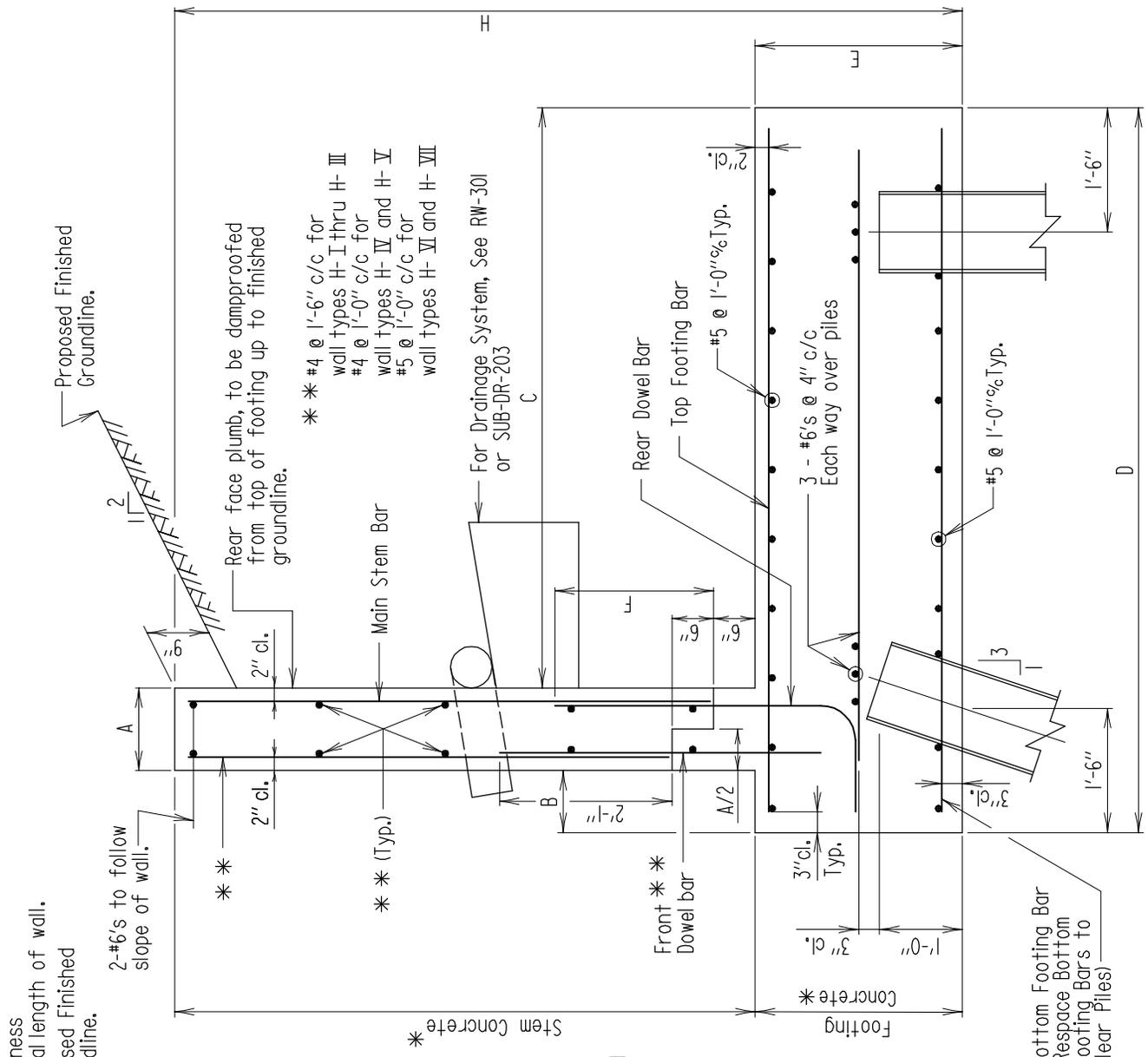
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VERIFIED
11-13-2007
LRFD

TYPE G RETAINING WALL SECTION (FOR PILE FOOTING AND TWO FOOT SURCHARGE)

STANDARD NO. RW-108

SHEET 2 OF 2



DETAIL A

Scale: None
(See note no. 1 Sheet 2)

* #4 @ 1'-6" c/c for wall types H-I thru H-III
 * #4 @ 1'-0" c/c for wall types H-IV and H-V
 * #5 @ 1'-0" c/c for wall types H-VI and H-VII

For Drainage System, See RW-301 or SUB-DR-203

* Where specific footing concrete and stem concrete items are included in the Proposal for a particular wall, these shall be the pay limits. Where no specific items have been set up in the Proposal, the cost of wall shall be included in the main structure contract price, i.e.; box culvert, (where wings are included in box culvert item); retaining wall, (where no separate pay items are established), etc.

TYPICAL SECTION
 Scale: 1/2" = 1'-0"

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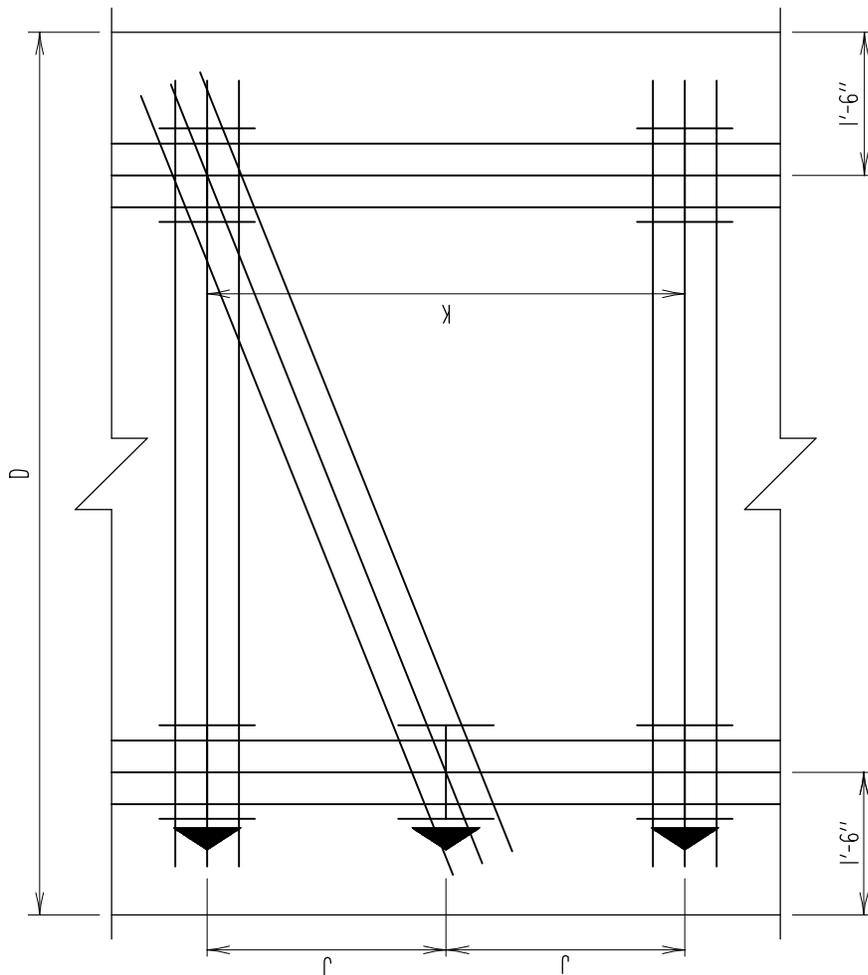
TYPE H RETAINING WALL SECTION (FOR PILE FOOTING AND SLOPING GROUNDLINE)

STANDARD NO. RW-109

SHEET 1 OF 2

OLD NO. RW(6.10)-02-344(L)

RETAINING WALLS



TYPICAL PILE PLAN
Scale: 1/2" = 1'-0"

- Notes:
1. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
 2. Contractor has option of lapping stem reinforcement with toe reinforcement and/or dowels as shown; or by extending the toe and/or dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
 3. These walls are valid if the sloping backfill levels off and traffic is present on the level area.
 4. H piles shown for illustration purpose only. For pile type, see Pile Layout on pertinent Contract Drawing.
 5. Pile spacings are maximum. For actual pile spacing, see Pile Layout on pertinent Contract Drawing.
 6. Capacities include resistance factors (LRFD only).

Wall Type	PILE CAPACITY - DESIGN LOAD																							
	H	A	B	C	D	E	Rear Dowel Bar	Main Stem Bar	Top Footing Bar	Bottom Footing Bar	F	25 TONS	40 TONS	55 TONS	70 TONS									
H-I	6'-0"	1'-0"	9"	4'-3"	6'-0"	2'-3"	#5 @ 1'-0"	#5 @ 1'-0"	#5 @ 6"	#5 @ 1'-0"	2'-2"	5'-0"	10'-0"	10'-0"	5'-0"	10'-0"	J	K	J	K				
H-II	8'-0"	1'-0"	1'-6"	4'-3"	6'-9"	2'-3"	#6 @ 1'-0"	#6 @ 1'-0"	#6 @ 6"	#6 @ 1'-0"	3'-0"	3'-6"	7'-0"	10'-0"	10'-0"	5'-0"	10'-0"	5'-0"	10'-0"	5'-0"	10'-0"			
H-III	10'-0"	1'-0"	2'-0"	4'-3"	7'-3"	2'-6"	#7 @ 1'-0"	#7 @ 1'-0"	#7 @ 6"	#7 @ 1'-0"	3'-6"		4'-0"	8'-0"	8'-0"	4'-0"	8'-0"	4'-0"	8'-0"	4'-0"	8'-0"			
H-IV	12'-0"	1'-3"	2'-6"	4'-3"	8'-0"	2'-6"	#8 @ 1'-0"	#8 @ 1'-0"	#8 @ 6"	#8 @ 1'-0"	4'-7"			4'-0"	8'-0"	4'-0"	8'-0"	4'-0"	8'-0"	4'-0"	8'-0"			
H-V	14'-0"	1'-9"	3'-0"	4'-3"	9'-0"	2'-6"	#8 @ 1'-0"	#8 @ 1'-0"	#8 @ 6"	#8 @ 1'-0"	4'-7"				3'-0"	6'-0"	6'-0"	3'-9"	6'-0"	3'-9"	7'-6"			
H-VI	16'-0"	2'-0"	3'-6"	4'-3"	9'-9"	2'-6"	#8 @ 1'-0"	#8 @ 1'-0"	#8 @ 6"	#8 @ 1'-0"	4'-7"											3'-0"	6'-0"	
H-VII	18'-0"	2'-6"	4'-0"	4'-3"	10'-9"	2'-6"	#8 @ 1'-0"	#8 @ 1'-0"	#8 @ 6"	#8 @ 1'-0"	4'-7"													6'-0"

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TYPE H RETAINING WALL SECTION (FOR PILE FOOTING AND SLOPING GROUNDLINE)

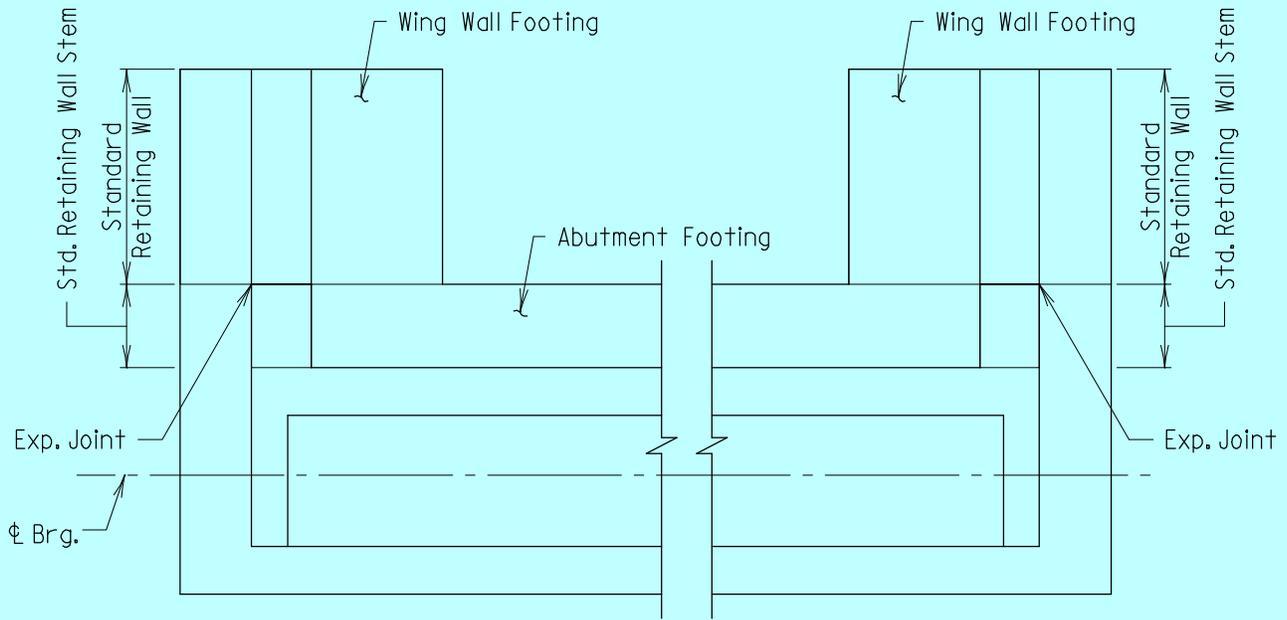
STANDARD NO. RW-109

SHEET 2 OF 2

OLD NO. RW(6.10)-02-344(L)

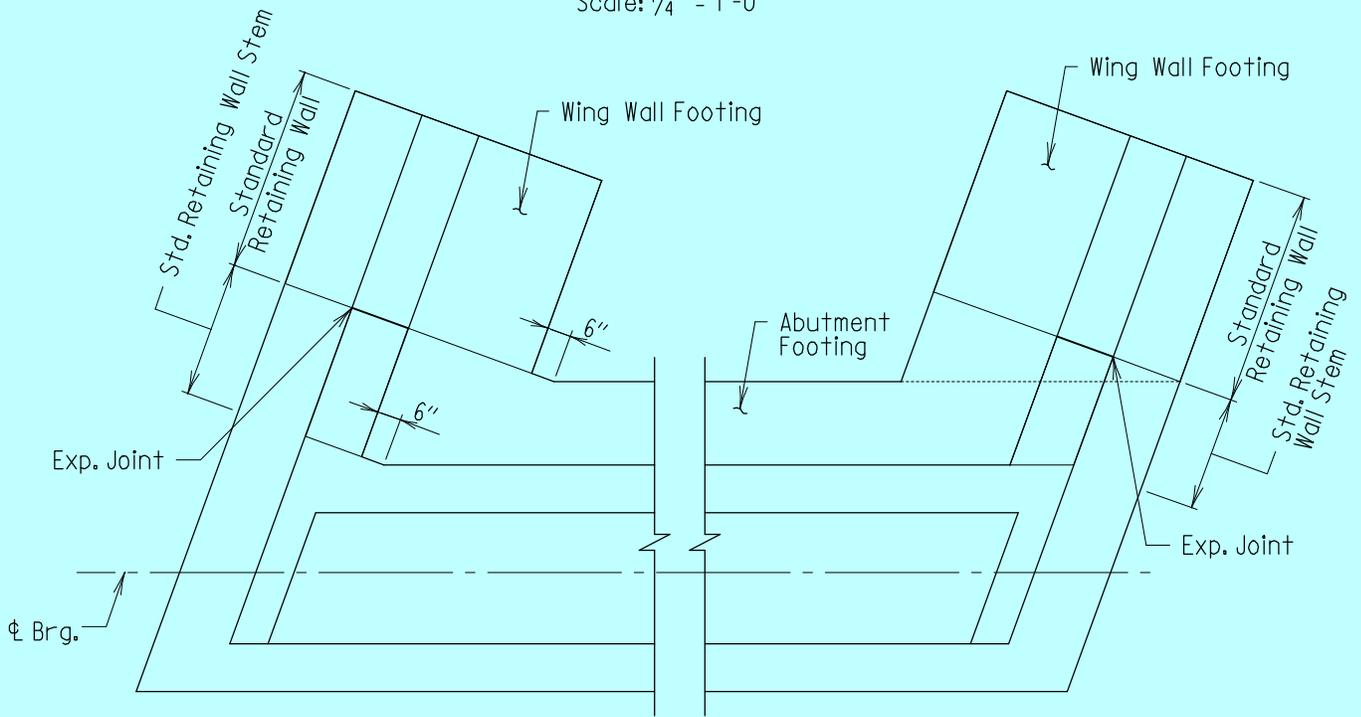
RETAINING WALLS

GUIDE FOR ABUTMENT AND WING WALL FOOTING INTERSECTION



90° ABUTMENT

Scale: 1/4" = 1'-0"



SKEWED ABUTMENT

Scale: 1/4" = 1'-0"

Note:
For additional details of expansion joint refer to SUB-WW-101

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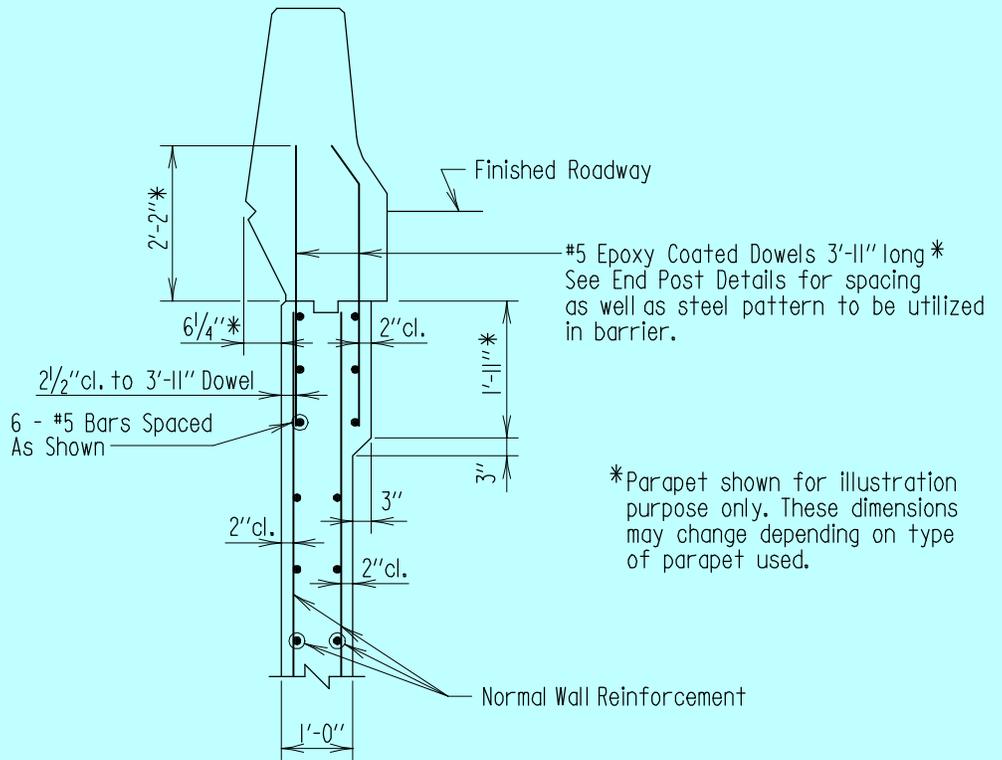
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STANDARD RETAINING WALL
STANDARD DETAILS

FHWA APPROVAL
DATE:

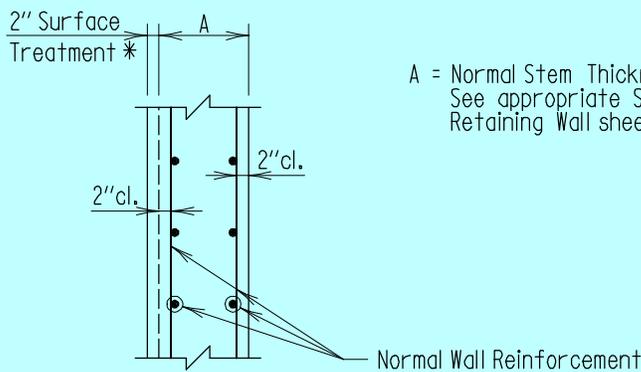
STANDARD NO. RW-201

SHEET 1 OF 2



GUIDE FOR PARAPET ATTACHMENT FOR WALLS WITH 1'-0" STEM THICKNESS

Scale: 3/8" = 1'-0"



A = Normal Stem Thickness,
See appropriate Standard Retaining Wall sheet

* Thickness may vary depending on type of surface treatment used.

GUIDE FOR WALLS WITH AESTHETIC SURFACE TREATMENT

Scale: 3/8" = 1'-0"

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<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 7/16/02	
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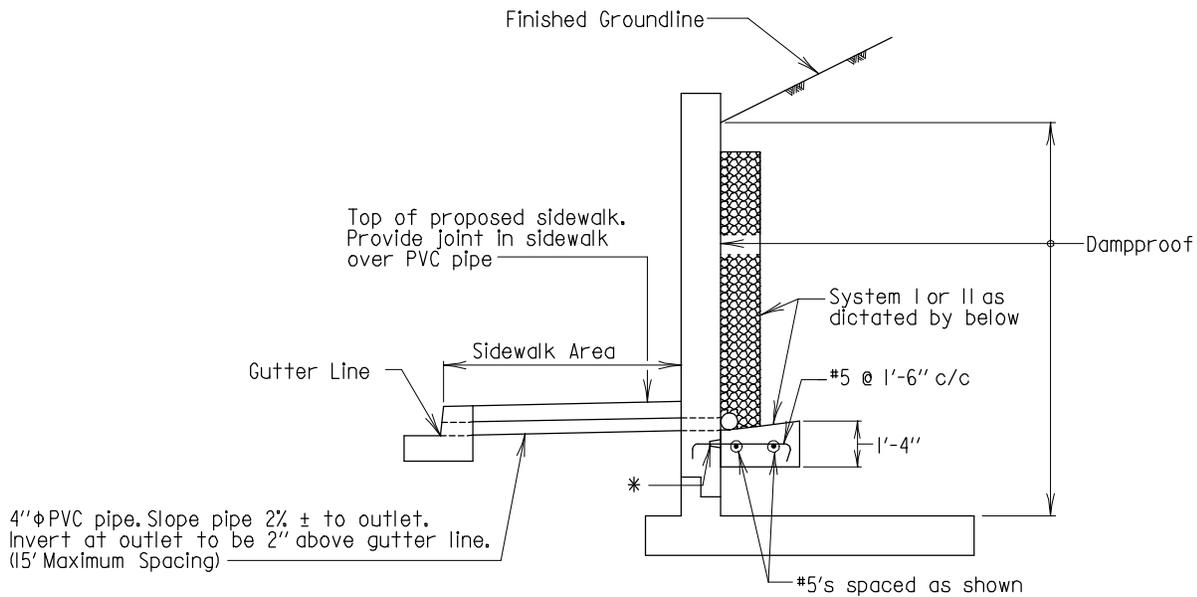
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STANDARD RETAINING WALL
STANDARD DETAILS

FHWA APPROVAL
DATE:

STANDARD NO. RW-201

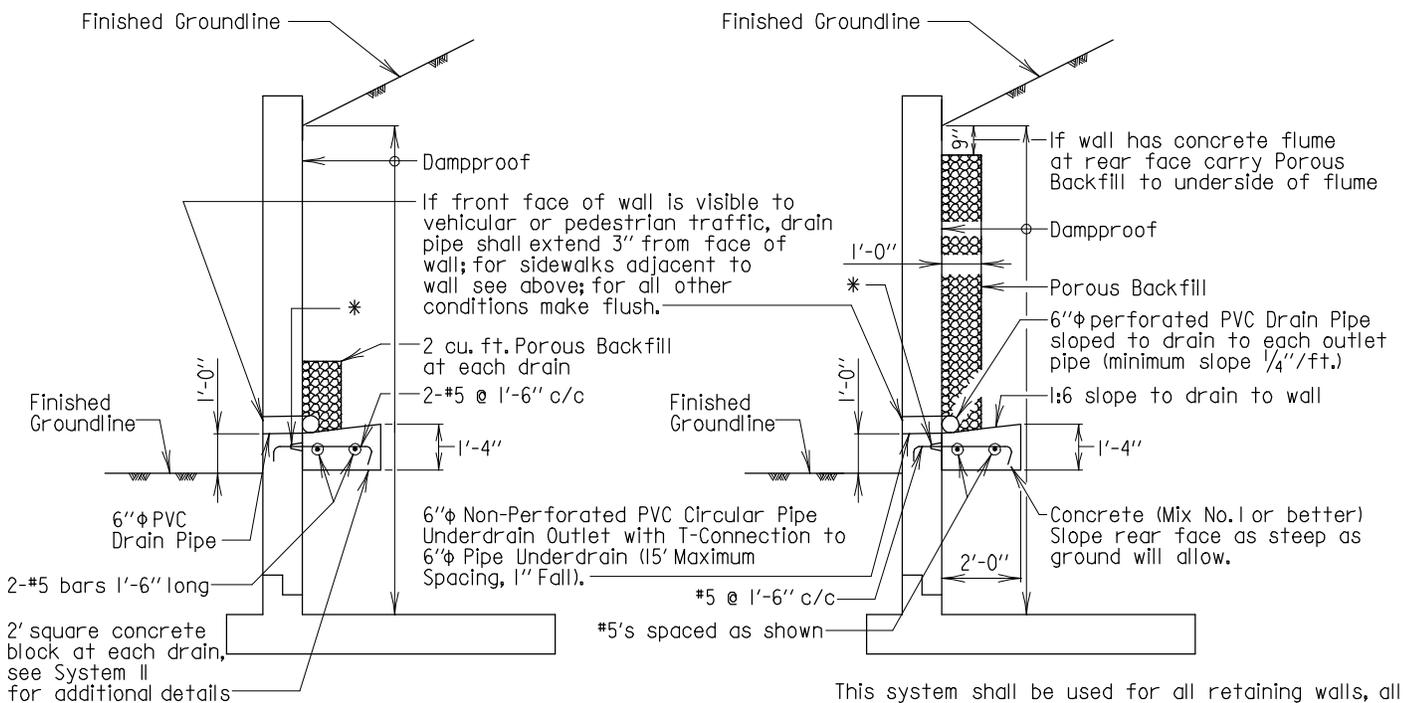
SHEET 2 OF 2



DRAIN AT SIDEWALK

Scale : None

* #5 Threaded Rebar Dowel Coupler at 1'-6" c/c.



This system shall be used for all box culvert wing walls and other wing walls that are both less than 30' long and less than 16' high (height of wall from bottom of footing to top of highest section). One drain shall be placed at center of wall for all walls less than 15' long. For walls between 15' and 30' long, two drains shall be placed, one at each third point.

SYSTEM I

Scale : None

SYSTEM II

Scale : None

- Note:
- Exact elevation of drain to be determined by Engineer in field.
 - Porous backfill (refer to Section 469).
 - Use this standard for bridges with wing walls that are not parallel to the highway. For bridges with wing walls parallel to the highway see Std. No. SUB-DR-203 sheet 5 of 5 for details.

FHWA APPROVAL	12-14-98
DATE: 6-20-80	1-22-01

APPROVAL	
L.S. Friedman DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/25/80	
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SHA	FHWA
11-17-97	
4-22-98	
12-14-98	
1-22-01	

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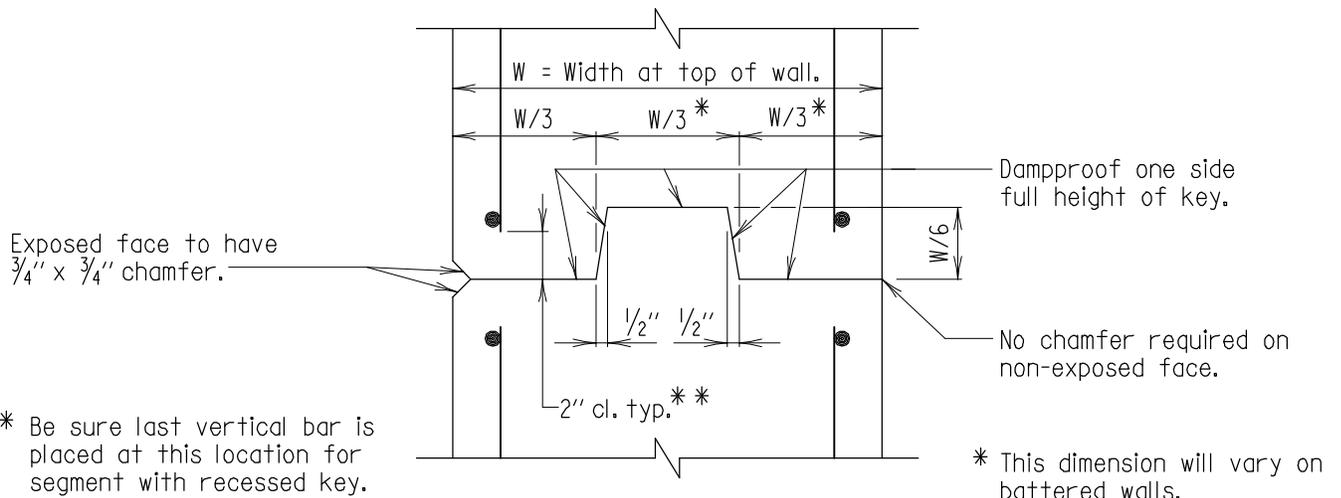
RETAINING WALL AND WING WALL
DRAINAGE SYSTEMS

STANDARD NO. RW-301

SHEET 1 OF 1

OLD NO. RW(0.01)-80-100

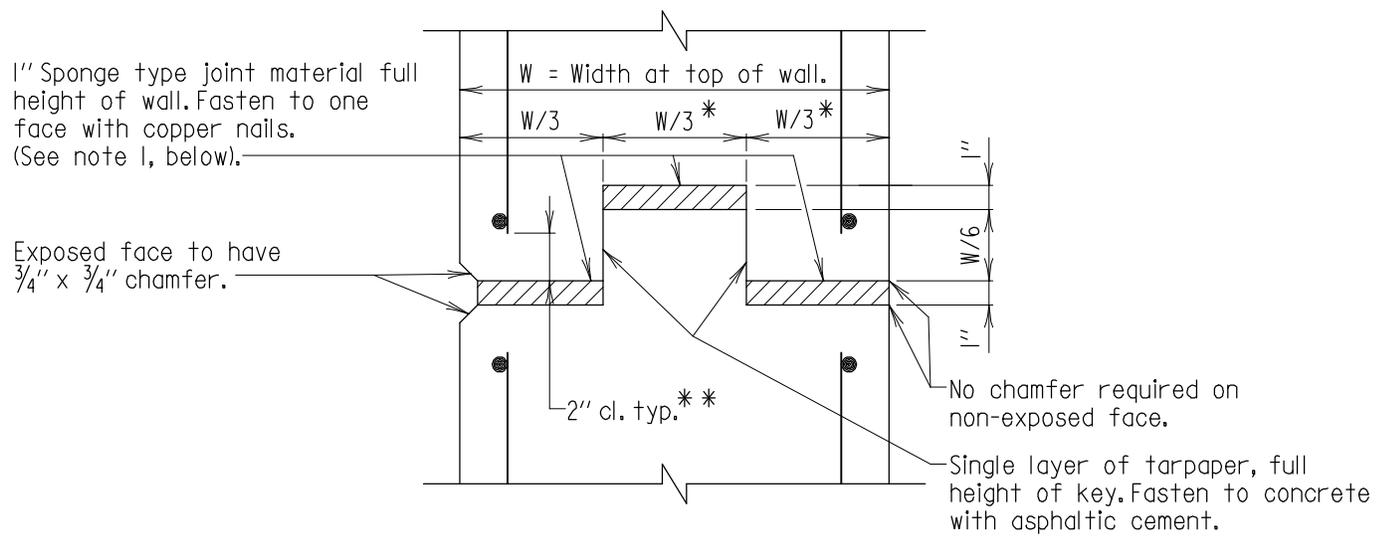
RETAINING WALLS



** Be sure last vertical bar is placed at this location for segment with recessed key.

* This dimension will vary on battered walls.

**SECTION
STEM CONTRACTION JOINT**
Scale: 1 1/2" = 1'-0"



1" Sponge type joint material full height of wall. Fasten to one face with copper nails. (See note 1, below).

Exposed face to have 3/4" x 3/4" chamfer.

No chamfer required on non-exposed face.

Single layer of tarpaper, full height of key. Fasten to concrete with asphaltic cement.

**SECTION
STEM EXPANSION JOINT**
Scale: 1 1/2" = 1'-0"

- Notes:
1. Joint locations shall be as shown on contract drawing. If no locations are given concrete retaining walls shall have contraction joints a maximum of every 30'-0"; and expansion joints, with 1" sponge type material (see 911.02), a maximum of every 90'-0"
 2. Stop key 9" below top of wall.
 3. Reinforcing steel shall not pass through contraction or expansion joint.
 4. For battered walls, with stems greater than 12 feet height, key dimensions noted thus *, shall be based on wall thickness at mid height.
 5. All keys are nominal size.
 6. Only place contraction and expansion joints in stems (no joint in footer).

APPROVAL	
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DATE: 4/19/84	
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1-4-94	
7-16-02	
FHWA APPROVAL	3-22-06
DATE: 5-3-84	5-4-06

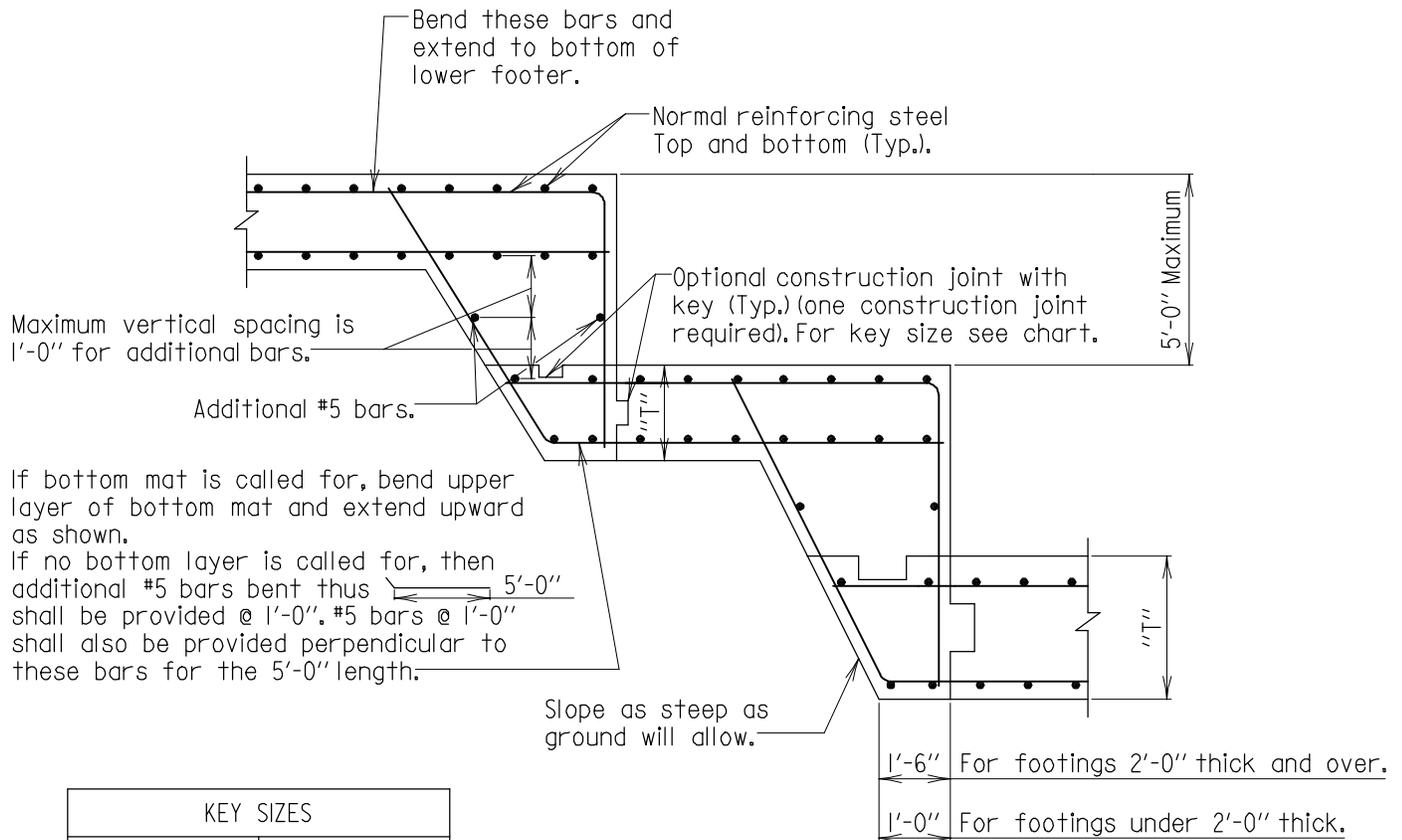
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CONCRETE RETAINING WALL
CONTRACTION AND EXPANSION JOINTS

STANDARD NO. RW-401

SHEET OF

RETAINING WALLS



Maximum vertical spacing is 1'-0" for additional bars.

Additional #5 bars.

If bottom mat is called for, bend upper layer of bottom mat and extend upward as shown.

If no bottom layer is called for, then additional #5 bars bent thus 5'-0" shall be provided @ 1'-0". #5 bars @ 1'-0" shall also be provided perpendicular to these bars for the 5'-0" length.

Slope as steep as ground will allow.

1'-6" For footings 2'-0" thick and over.

1'-0" For footings under 2'-0" thick.

KEY SIZES	
T	Key
1'-0" to 1'-5"	2" x 4"
1'-6" to 1'-11"	3" x 6"
2'-0" to 2'-5"	4" x 8"
2'-6" to 3'-0"	5" x 10"

TYPICAL SECTION

Scale: 3/8"=1'-0"

Notes:

- All keys are nominal size.

APPROVAL	
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DATE: 11/4/83	
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7-18-94	
9-24-96	
FHWA APPROVAL	7-16-02
DATE: 12-9-83	8-28-02

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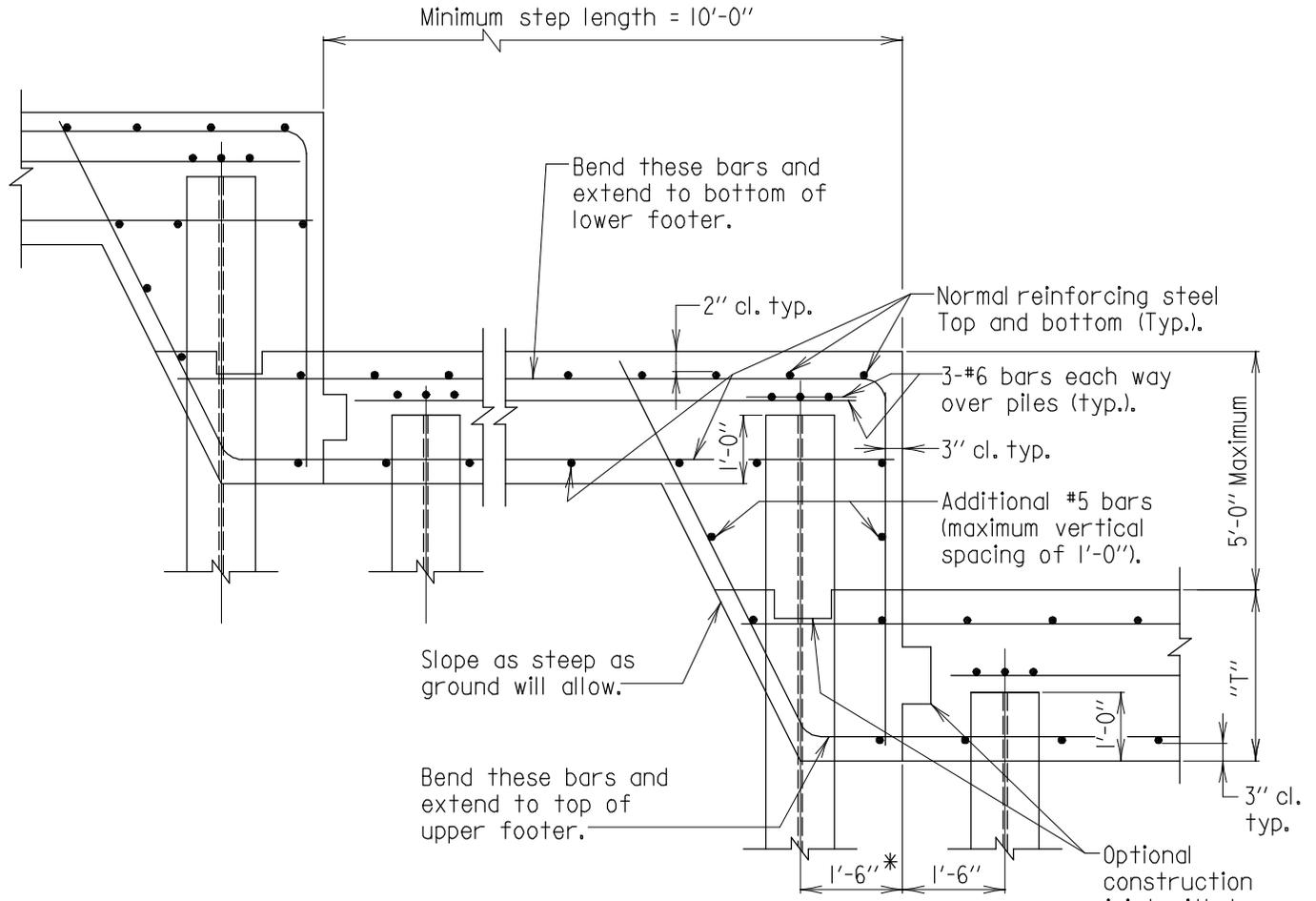
STEPPED FOOTING DETAIL

STANDARD NO. RW-402

SHEET 1 OF 1

OLD NO. RW(6.12)-83-155

RETAINING WALLS



* To center line of pile and to end of lower footer.

KEY SIZES	
T	Key
2'-0" to 2'-5"	4" x 8"
2'-6" to 3'-0"	5" x 10"

TYPICAL SECTION
Scale: 3/8" = 1'-0"

- Notes:
1. Steel H piles shown. Other pile types similar.
 2. See Plan of Footing for orientation of piles.

APPROVAL	
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DATE: 5/16/89	
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7-18-94	
FHWA APPROVAL	9-24-96
DATE: 6-8-90	7-16-02

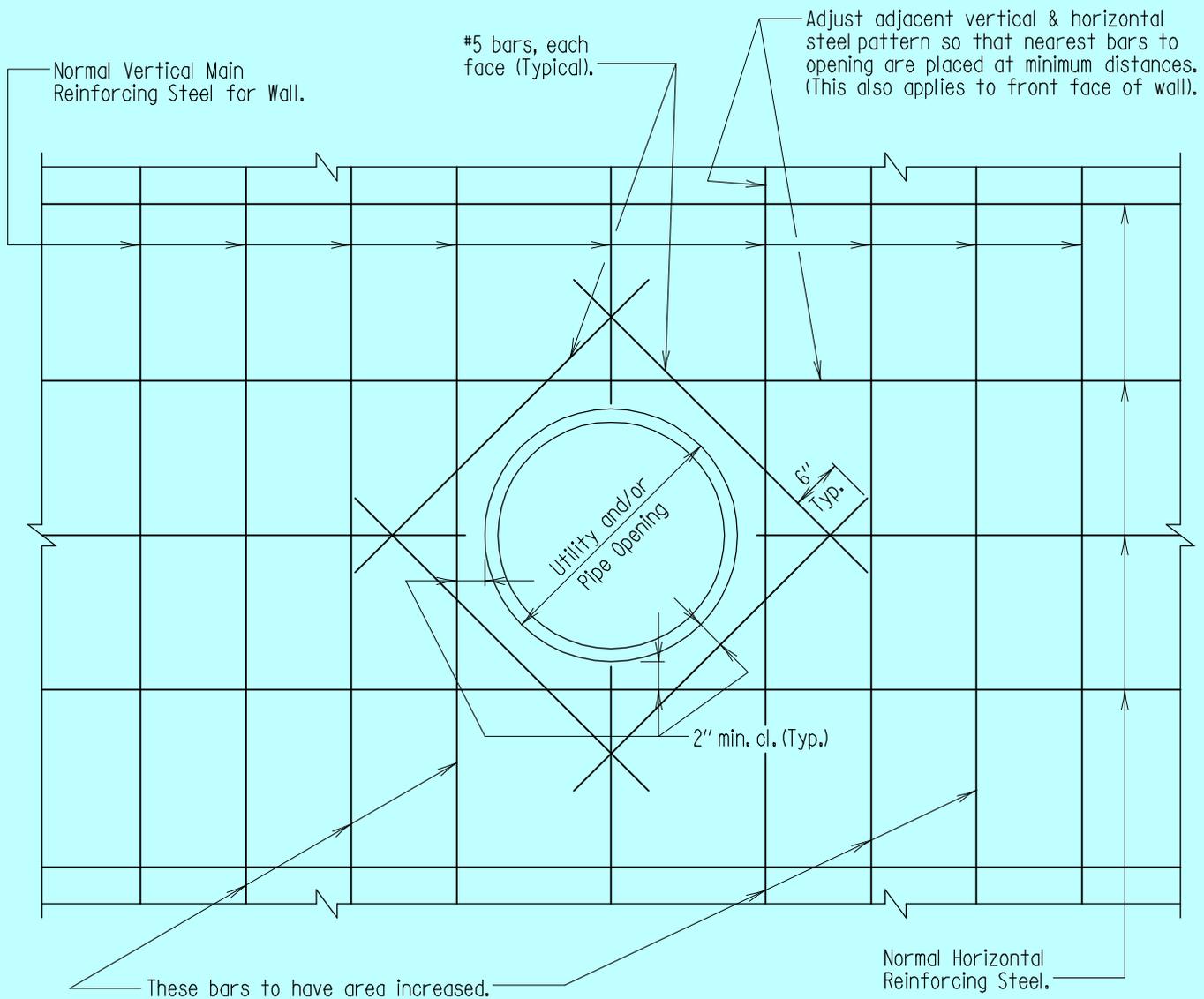
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STEPPED FOOTING DETAIL WITH PILES

STANDARD NO. RW-403

SHEET OF

RETAINING WALLS



ELEVATION
Scale: None

Note:

1. Increase the size of each of the first three normal main vertical reinforcing steel bars, on each side of the wall opening. New bar size shall be such that each increase in bar area shall at least equal $\frac{1}{6}$ the total area of the main reinforcing steel that has been cut.
2. When pipe size is over 3'-0", sufficient horizontal bars shall be added over and below opening to transfer load to adjacent full sections of wall.
3. In no case shall concrete cover be less than 2".

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7-2-93	
FHWA APPROVAL	
DATE: 12-12-79	

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REINFORCEMENT ADJUSTMENT
AT UTILITY AND/OR PIPE OPENING IN WALL

STANDARD NO. RW-501 SHEET 1 OF 1

RETAINING WALLS