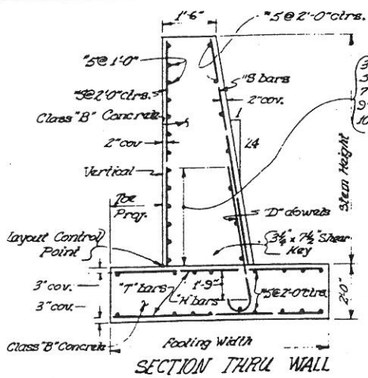
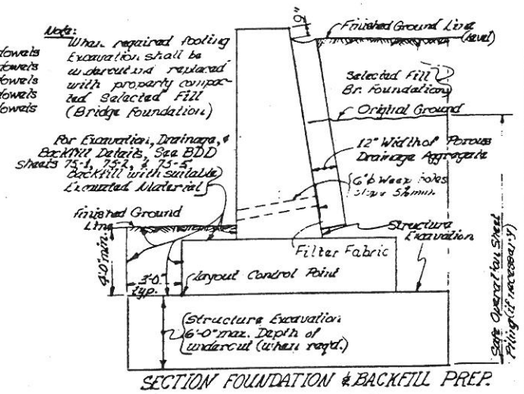


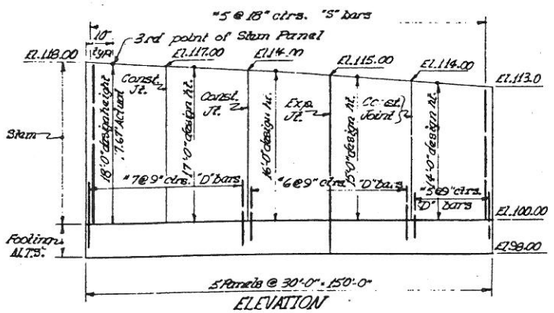
SECTION THRU WALL

Note: When required footing excavation shall be widened and replaced with properly compacted Selected Fill (Bridge Foundation)

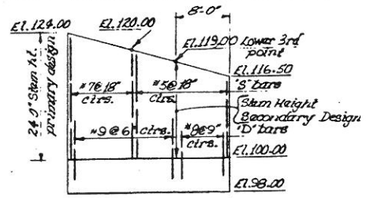
3'-0" - "5 dowels
5'-0" - "6 dowels
7'-0" - "7 dowels
9'-0" - "8 dowels
10'-0" - "9 dowels



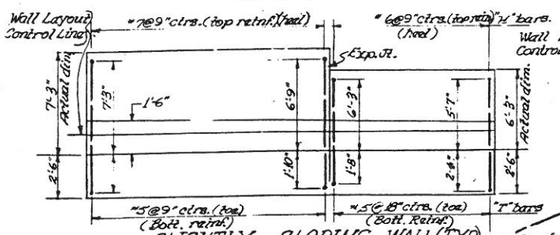
SECTION FOUNDATION & BACKFILL PREP.



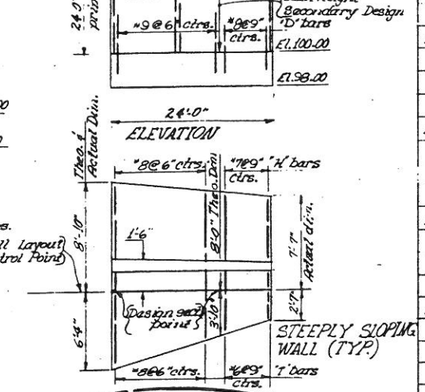
ELEVATION



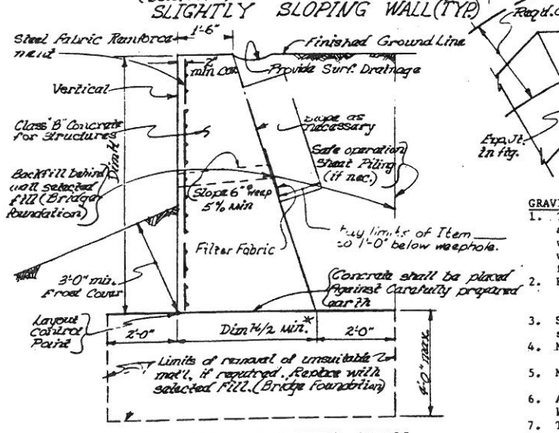
ELEVATION



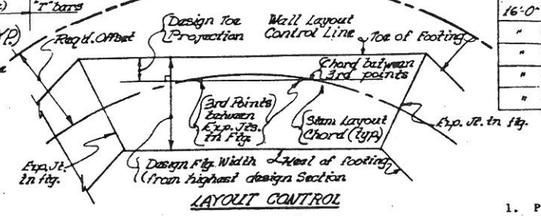
SLIGHTLY SLOPING WALL (TYP.)



STEEPLY SLOPING WALL (TYP.)



SECTION GRAVITY WALL



LAYOUT CONTROL

GRAVITY WALL NOTES

1. The gravity section at left may be used as an alternate to the cantilever section where it will be compatible with adjacent work and the wall height (Dimension "H") is a minimum of 4 feet and a maximum of 12 feet.
2. Required soil capacity:
   Allowable pressure = 1½ tons per sq. ft.
   Friction coefficient = 0.35
3. Steel fabric Reinforcement shall be placed as shown behind the full area of the Vertical form.
4. Maximum panel length between construction joints: 20'-0".
5. Maximum length between expansion joints 100'-0".
6. All joints shall be formed with an adequate shear key.
7. Two weep holes shall be provided in every panel, located at the quarter points.
8. The invert of the weep hole at the front of the wall shall be located 6" above the finished grade or 6" above low water for stream bridges whichever is higher.
9. Weep holes shall be covered by a 2.0' x 2.0' square of bedding filter fabric from the Department Approved List of Plastic Filter Fabric (Bedding). The filter fabric shall be securely attached in a manner approved by the Engineer, to the back face of the wall centered over the weep hole.

TABLE OF PROPORTIONS

DESIGN PARAMETERS						REINFORCEMENT							
Stem Height	Reqd. Min. Soil Press.	Design Coeff. of Frict.	Conc. Unit Quant.	Ftg. Width	Toe Proj.	"T" BARS S_{T_E}	"T" BARS S_{T_C}	"H" BARS S_{H_E}	"H" BARS S_{H_C}	"D" BARS S_{D_E}	"D" BARS S_{D_C}	"S" BARS S_{S_E}	"S" BARS S_{S_C}
6'-0"	1	0.50	0.66	4'-1"	0'-8"	"5	18"	"5	18"	"5	18"	"5	18"
"	1	0.35	0.74	5'-1"	0'-10"	"	"	"	"	"	"	"	"
7'-0	"	0.50	0.75	4'-5"	1'-4"	"	"	"	"	"	"	"	"
"	"	0.35	0.83	5'-6"	0'-10"	"	"	"	"	"	"	"	"
8'-0"	1½	0.50	"	4'-6"	0'-8"	"	"	"	"	"	"	"	"
"	1	"	0.88	5'-2"	1'-8"	"	"	"	"	"	"	"	"
"	"	0.35	0.96	6'-4"	1'-0"	"	"	"	"	"	"	"	"
9'-0"	1½	0.50	0.95	5'-2"	0'-10"	"	"	"	"	"	"	"	"
"	1"	"	0.99	5'-10"	2'-0"	"	"	"	"	"	"	"	"
"	"	0.35	1.09	7'-1"	1'-2"	"	"	"	"	"	"	"	"
10'-0"	1½	0.50	1.05	5'-8"	1'-6"	"	"	"	"	"	"	"	"
"	1	"	1.12	6'-7"	2'-4"	"	"	"	"	"	"	"	"
"	"	0.35	1.22	7'-11"	1'-6"	"	"	"	"	"	"	"	"
11'-0"	1½	0.50	1.18	6'-5"	"	"	"	"	"	"	"	"	"
"	1	0.50	1.24	7'-3"	2'-8"	"	"	"	"	"	"	"	"
"	1	0.35	1.36	8'-11"	2'-0"	"	"	"6	18"	"	"	"	"
12'-0"	1½	0.50	1.30	7'-0"	1'-8"	"5	18"	"6	"	"5	9"	"5	18"
"	1	"	1.37	8'-0"	3'-0"	"6	"	"5	"	"	"	"	"
"	1½	0.35	1.43	8'-9"	1'-6"	"5	"	"	9"	"	"	"	"
"	1	"	1.49	9'-7"	2'-2"	"	"	"6	18"	"	"	"	"
13'-0"	1½	0.50	1.40	7'-5"	"	"	"	"	"	"	"	"	"
"	1	"	1.49	8'-8"	3'-4"	"6	18"	"5	18"	"	"	"	"
"	1½	0.35	1.56	9'-6"	1'-8"	"5	18"	"6	9"	"	"	"	"
"	1	"	1.63	10'-6"	2'-10"	"	"	"5	"	"	"	"	"
14'-0"	1½	0.50	1.52	7'-11"	2'-4"	"6	"	"	"	"	"	"	"
"	1	"	1.63	9'-5"	3'-8"	"5	9"	"6	18"	"	"	"	"
"	1½	0.35	1.69	10'-4"	1'-10"	"	18"	"	9"	"	"	"	"
"	1	"	1.75	11'-1"	3'-0"	"6	"	"5	"	"	"	"	"
15'-0"	2	0.50	1.59	7'-11"	1'-8"	"5	"	"6	"	"6	9"	"5	18"
"	1½	"	1.66	8'-9"	2'-8"	"6	18"	"5	"	"	"	"	"
"	1	"	1.75	10'-1"	4'-0"	"	9"	"6	18"	"	"	"	"
"	1½	0.35	1.83	11'-1"	2'-0"	"5	18"	"7	9"	"	"	"	"
"	1	"	1.90	12'-1"	3'-4"	"	9"	"6	9"	"	"	"	"
16'-0"	2	0.50	1.72	8'-7"	1'-10"	"	18"	"7	"	"	"	"	"
"	1½	"	1.80	9'-8"	3'-0"	"	9"	"6	"	"	"	"	"
"	1	"	1.89	10'-10"	4'-4"	"6	9"	"5	"	"	"	"	"
"	1½	0.35	1.97	11'-11"	2'-2"	"5	18"	"7	"	"	"	"	"
"	1	"	2.06	13'-2"	3'-8"	"5	9"	"6	"	"	"	"	"

DESIGN PARAMETERS						REINFORCEMENT							
Stem Height	Reqd. Min. Soil Press.	Design Coeff. of Frict.	Conc. Unit Quant.	Ftg. Width	Toe Proj.	"T" BARS S_{T_E}	"T" BARS S_{T_C}	"H" BARS S_{H_E}	"H" BARS S_{H_C}	"D" BARS S_{D_E}	"D" BARS S_{D_C}	"S" BARS S_{S_E}	"S" BARS S_{S_C}
17'-0"	2	0.50	1.85	9'-2"	2'-0"	"6	18"	"7	9"	"7	9"	"5	18"
"	1½	"	1.91	10'-1"	3'-2"	"5	9"	"6	9"	"	"	"	"
"	1	"	2.04	11'-10	4'-10"	"7	9"	"5	"	"	"	"	"
"	1½	0.35	2.11	12'-8"	2'-4"	"6	18"	"8	9"	"	"	"	"
"	1	0.35	2.20	13'-11"	4'-6"	"6	9"	"6	"	"	"	"	"
18'-0"	2"	0.50	1.97	9'-9"	2'-6"	"5	"	"7	"	"	"	"	"
"	1½	"	2.06	11'-0"	3'-6"	"6	"	"	"	"	"	"	"
"	1	"	2.18	12'-7"	5'-2"	"7	"	"6	"	"	"	"	"
"	1½	0.35	2.25	13'-6"	2'-6"	"6	18"	"8	"	"	"	"	"
19'-0"	2½	0.50	2.04	9'-7"	1'-10"	"	18"	"9	"	"8	9"	"5	18"
"	2"	"	2.09	10'-3"	2'-8"	"5	9"	"8	"	"	"	"	"
"	1½	"	2.21	11'-10"	3'-10"	"6	"	"7	"	"	"	"	"
"	1	"	2.32	13'-3"	5'-6"	"8	"	"6	"	"	"	"	"
"	1½	0.35	2.39	14'-3"	3'-0"	"5	"	"9	9"	"	"	"	"
20'-0"	2½	0.50	2.19	10'-4"	2'-0"	"6	18"	"9	"	"	"	"	"
"	2	0.50	2.26	11'-4"	3'-0"	"	9"	"8	"	"	"	"	"
"	1½	0.50	2.33	12'-4"	4'-0"	"7	"	"	"	"	"	"	"
"	1	0.50	2.46	14'-0"	5'-10"	"8	9"	"7	9"	"	"	"	"
"	1½	0.35	2.53	15'-0"	3'-2"	"6	"	"9	9"	"	"	"	"
21'-0"	2½	0.50	2.32	11'-0"	2'-2"	"5	"	"10	"	"9	9"	"7	18"
"	2	"	2.38	11'-10"	3'-2"	"6	"	"9	"	"	"	"	"
"	1½	0.50	2.48	13'-2"	4'-4"	"7	"	"8	"	"	"	"	"
"	1	0.35	2.67	15'-8"	3'-4"	"6	"	"10	"	"	"	"	"
22'-0"	2½	0.50	2.47	11'-9"	2'-4"	"5	9"	"9	6"	"8	6"	"7	18"
"	2	"	2.52	12'-5"	4'-0"	"8	9"	"7	6"	"	"	"	"
"	1½	"	2.64	14'-1"	5'-10"	"9	"	"6	"	"	"	"	"
"	"	0.35	2.81	16'-5"	4'-0"	"7	"	"8	"	"	"	"	"
23'-0"	3	0.50	2.53	11'-5"	2'-0"	"5	"	"9	"	"	"	"	"
"	2½	"	2.60	12'-4"	2'-10"	"6	"	"	"	"	"	"	"
"	2	"	2.64	12'-10"	4'-2"	"8	"	"8	"	"	"	"	"
"	1½	"	2.78	14'-9"	6'-2"	"	6"	"7	"	"	"	"	"
"	"	0.35	2.95	17'-0"	4'-2"	"7	9"	"9	"	"			
24'-0"	3	0.50	2.65	11'-10"	2'-4"	"6	"	"10	"	"9	6"	"7	18"
"	2½	"	2.74	13'-0"	3'-6"	"7	"	"9	"	"	"	"	"
"	2	"	2.80	13'-9"	4'-6"	"9	"	"8	"	"	"	"	"
"	1½	"	2.90	15'-2"	6'-4"	"8	6"	"7	6"	"	"	"	"
"	2	0.35	3.02	16'-9"	3'-2"	"6	9"	"10	"	"	"	"	"
"	1½	"	3.13	18'-3"	4'-6"	"8	9"	"9	"	"	"	"	"

INSTRUCTIONS FOR USING TABLE

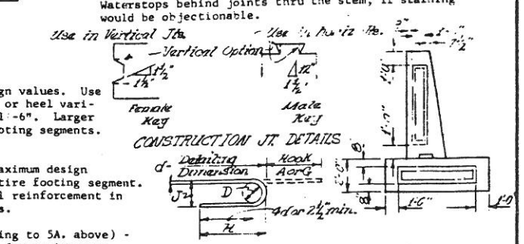
1. Plot retaining wall and borings in plan.
2. Consult Region Soils Engineer regarding foundation treatment and prior to setting footing elevations.
3. Subdivide wall into practical length footing segments (90' Maximum length and stem panels (30' Maximum length).
4. Based on topographic and profile data, compute the wall height at each joint thru stem.
5. Analyze variation in wall height along wall, select design sections in accordance with severity of wall slope:
   A. Height differential within stem panel 6'-0" or less - Use height at higher third point of panel for design.
   B. Height differential within stem panel greater than 6'-0" - Use greatest height in panel for primary design. Use height at lower third point of stem panel for secondary design, when feasible.
6. Enter Table of Proportions with stem height, allowable soil pressure, and sliding coefficient for each design section. List all results.
7. Check footing projects against clearance requirements.
8. Extrapolate actual footing dimensions from design values. Use largest design value throughout when either toe or heel variation within a footing segment does not exceed 1'-6". Larger variations will result in trapezoidal shaped footing segments.
9. Detail reinforcement:
   A. "H" Bars and "T" Bars -
      (1) Constant cross-section footing - Use maximum design section toe and heel reinforcement for entire footing segment.
      (2) Trapezoidal footing - Vary toe and heel reinforcement in accordance with individual design sections.
   B. "D" Dowels -
      (1) Slightly sloping panels (Design according to 5A. above) - Use design section dowel size and spacing for entire stem panel.
      (2) Steeply sloping panels (Design according to 5B. above) - Use two dowel sizes in panel. Vary according to table values for stem height.
   C. "S" Bars -
      (1) Wherever stem height is above 20'-0" - Use #7 bars at 1'-6" spacing.
      (2) Wherever stem height is 20'-0" or less - Use #5 bars at 1'-6" spacing.

LAYOUT CONTROL NOTES

Walls situated adjacent to a curved centerline of improvement should be detailed as a series of straight segmental walls. Where it is necessary that the wall layout control line be curved itself, one of the following layout methods shall be used:
Curved Walls (Radius greater than 450') - Layout on chords, unless horizontal clearance is critical. Locate footing as shown above by perpendicular offsets to a chord between the third points of the footing pour between expansion joints. Lay out stem panels on chords between the contraction joints.
Curved Walls (450' or less Radius) - Lay out both footing and stem on curve. If the distance between footing expansion joints is reduced so that it does not exceed one-fifth of the radius, lay out on chords may be used on radii shorter than 450'.

NOTES:

1. All cantilever retaining walls listed on this standard sheet have been designed by computer program no. B5000.
   Assumptions, limitations and design methods are in accordance with New York State Department of Transportation Standard Specifications for Highway Bridges.
2. Range of Designs:
   Design Stem height - From 6' to 24'. All footings 2'-0" thick.
   Minimum sliding coefficient of friction - 0.35.
   Minimum allowable soil pressure - From 1 ton per sq. foot to 3 tons per sq. foot. See Table of Proportions for allowable combinations of required minimum soil pressure and design coefficient of friction.
3. Walls which cannot be designed within the range of designs listed above must be referred to the Structures Design and Construction Subdivision for review. The applicability of the standard wall designs to a given situation shall be determined within the Region by the concurrence of both the structures designer and the soils engineer. In cases where doubt exists as to the relative economy of alternate designs, approval to vary from the standard wall design shall be requested from the Deputy Chief Engineer (Structures).
4. Assumed loadings:
   The placement of earth backfill is assumed to extend full depth behind the wall to a level within 9 inches of the top of the wall. No sheeting or intervening rock which would limit the effect of the backfill upon the wall is considered to exist.
   Earth unit weight - 120 lbs. per cubic foot.
   Active earth pressure - 30 psf.; no passive pressure.
   Heel surcharge pressure - 240 psf.
   Toe surcharge pressure - 120 psf.
   Concrete unit weight - 150 lbs. per cubic foot.
   No other loads atop wall.
5. Reinforcement:
   Allowable tensile stress - 20,000 psi.
   Allowable bond stress - 300 psi.
   Ratio of elastic modull(n) - 10
   Assumed clear cover to reinforcing bars:
   Stem - 2" Footing 3"
6. Concrete:
   Allowable design compressive stress - 1,200 psi.
   Allowable shear - 90 psi.
7. Design Safety Factors:
   Sliding - 1.5; No shear keys between footing and soil are required.
   Overturning - 2.0; Walls are assumed to be properly braced for wind loads during construction.
8. The concrete unit quantities shown are approximate per lineal foot values which are intended solely for the purpose of facilitating preliminary cost estimates.
9. For notes on alternate wall sections and weep holes, "GRAVITY WALL NOTES"
10. Waterstops:
    In accordance with BDD 73-20, use Type "E" or "D" Waterstops behind joints thru the stem, if staining would be objectionable.



DOWEL BENDING DETAILS						
Bar Size	Hook AsG	J	Hmax(approx)	D	Detail Dim.	Weight/ea.
#5	7"	5"	5"	2½"	4'-9"	5.56
#6	8"	6"	6"	4½"	6'-9"	11.14
#7	10"	7"	7"	5½"	8'-9"	19.59
#8	1'-1"	10"	9"	8"	10'-9"	31.59
#9	1'-3"	11½"	10½"	9"	11'-9"	44.20

DET.
Rick Ciappa

NEW YORK STATE DEPARTMENT OF TRANSPORTATION	CANTILEVER AND GRAVITY WALLS	FIG. 20-A & 20-B