WESTON Ref. No.

UNITED STATES ENVIRONMENTAL PROTECTION AG
REGION 1
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

01-0290
SDMS 287748

February 11, 1999

Mr. Andrew T. Silfer, P.E.
General Electric Company
100 Woodlawn Avenue
Pittsfield, Massachusetts 01201

RE: Conditional Approval of GE's *Proposal for Supplemental Source Control Containment/Recovery Measures*, January 1999, by Blaslund, Bouck & Lee, Inc.

GE submitted the above-referenced report to EPA on January 13, 1999. On February 3, 1999, representatives of GE, (and their contractors), Massachusetts DEP, and the EPA (and their contractors) held a meeting to discuss the submittal. Based on a review of the submittal and on the discussions held during the February 3, 1999 meeting, EPA conditionally approves the above-referenced submittal subject to the following:

Performance Standards and Revised Monitoring Procedures

EPA's December 16, 1998, conditional approval letter of GE's *Source Control and Preliminary Containment Barrier Design for East Street Area 2*, November 18, 1998 directed GE to propose performance standards and if necessary, revised monitoring procedures. In the January 1999 submittal, GE did not propose performance standards. Therefore, GE shall propose performance standards and revised monitoring procedures by March 1, 1999. The performance standards for the containment barrier shall fulfill the objectives of achieving no discharge of LNAPL or residual LNAPL to the Housatonic River, no sheens on the River, no bank seeps, and no measurable LNAPL in the perimeter monitoring wells located outside the proposed sheetpiling.

The revised measurement/monitoring procedures to determine compliance with the performance standards shall include the following:

1. Weekly monitoring of two new wells located outside the proposed sheetpiling for measurable LNAPL (Note: GE only proposed one new well, on the western side of the sheetpiling). The location of the new wells shall be subject to approval by EPA. The weekly monitoring shall be for both NAPL and water levels.
2. A proposal to incorporate relevant monitoring wells installed as part of the source control investigative activities to the monitoring program described in Section 3.4 of the submittal.
3. The continuance of future monitoring activities as described in section 3.4 of the submittal, including weekly monitoring for sheens and bank seeps.

In addition, EPA may require additional monitoring methods, such as sediment sampling in the vicinity of the sheetpile, after the riverbank/sediment excavation specified in the *Removal Action Work Plan - Upper ½-Mile Reach of Housatonic River* is performed.

If the performance standards are not met, GE shall propose corrective actions and implement those actions upon EPA approval. The performance standards for sheens and bank seeps will not become effective until the proposed riverbank/sediment excavation specified in the *Removal Action Work Plan - Upper ½-Mile Reach of Housatonic River* is performed.

Section 3. Description of Supplemental LNAPL Control Measures

EPA concurs with the lateral extent of the proposed sheetpiling and with the upper elevation of the sheetpiling being set at 977 feet above mean sea level. With regard to the depth of embedment of the proposed sheetpiling, the design needs to be based on the maximum depth of excavation of riverbank soils and sediments adjacent to the sheetpiling. In the submittal, GE did not propose this maximum depth. However, in the February 3, 1999 meeting, GE, and their consultants, BBL, stated that the sheetpile, as proposed, is sufficient to allow for the excavation of riverbank soils to an elevation of 967.5 feet above mean sea level.

EPA approves of the sheetpiling as designed subject to the following conditions:

1. GE agrees that, if necessary, the sheetpile will support excavation of riverbank soils adjacent to the sheetpiling to a depth of 967.5, even if field conditions or other information warrants bracing of the sheetpile, the installation of tiebacks, or any other engineering control.

2. The results of the additional sampling collected pursuant to GE's January 29, 1999 *Proposal for Further Investigations Pursuant to Supplemental Source Control Containment/Recovery Measures* confirms that excavation of sediments and riverbank soils below elevation 967.5 is not required to achieve the objectives specified above in this conditional approval letter. See comments on GE's January 29, 1999 submittal below.

3. GE responds to the technical questions on the sheetpile design calculations provided below and reconfirms that the sheetpile design can support riverbank soil excavation to a depth of 967.5 feet above mean sea level. GE's response shall certify that the calculations were approved by a licensed professional engineer.

<u>Technical questions on the sheetpile design calculations</u>

1. Figure 3 from Navfac DM-7.2 (Pg. 7.2 - 64) which was used by BBL to select the active and passive lateral earth pressure coefficients (KA and KP) for the sheet pile design assumes a frictionless interface between the steel sheet piling and the soils which contact it. As noted in

Table 1 from this same reference, the friction angle (δ) between silty sand and sheet piling is 14°, well above the value of zero consistent with a frictionless interface assumption. A more appropriate source for selecting the values of KA and KP for this design would be Figure 6 of this same reference which incorporates both wall friction (δ) and a sloping backfill configuration (β) into the chart. Please comment and revise as appropriate.

2. Based on an inspection of the boring logs presented in Attachment A of the BBL report, Boring E2SC-03I appears to be the most critical boring (i.e., loosest and therefore weakest granular subsurface soils) in the area of the sheet pile wall. It therefore would have been prudent to base the wall design on the subsurface conditions encountered in this boring. Based on an inspection of this boring log, it appears that an average N value of between 6 and 7 blows per foot is representative of the subsurface conditions encountered in this boring between elevations 977 feet (i.e., top of wall) and 957 feet (i.e., the current design bottom of wall). Available correlations between N and the angle of internal friction (Ø) of a granular soil suggest that a Ø angle of 26° to 27° is appropriate for this average N value condition (e.g., $Ø = \sqrt{20N} + 15°$[1] produces a Ø angle of 25.9° for N = 6 and a Ø angle of 26.8° for N = 7). This in turn would result in a greater value of KA and a lesser value of KP for the sheet pile design as compared to the values selected by BBL which were based on a Ø of 30°. That is, a more conservative design (i.e., deeper embedment depth and heavier required structural properties of the sheet piling) than that formulated by BBL would result from use of these more representative and conservative lateral earth pressure coefficients. Please comment and revise as appropriate.

3. Because of the lack of detail regarding the calculation of the maximum moment (from which the sheet piling section was selected) in the computer spreadsheets which document the design, A design chart presented in the Navfac DM7.2 design manual (i.e., Figure 24) has been used to "cross-check" the 7 foot free wall height design. The design chart and related calculations are attached for reference. As shown in the calculations, the required embedment depth of the wall assuming a Factor of Safety (FS) of 1.2 (i.e., the same FS used by BBL) is 17.2 feet as compared to 12 feet as determined by BBL. In addition, the calculated maximum moment which occurs in the section is 16,533 ft-lb/ft as determined from the design chart as compared to 6,973 ft-lb/ft as determined by BBL. This in turn reduces the FS against "breakage" of the sheet piling as defined by BBL (i.e., SALLOW/S) from 6.9 to 2.9 for the Waterloo WZ75 section selected for the construction. **(Note: In the February 3, 1999 meeting, GE and BBL stated that the design would allow for a 9 ½ foot free wall height. This comment still applies.)** Please explain this apparent discrepancy and revise as appropriate.

4. Several of the boring logs in the vicinity of the sheet piling alignment indicate the presence of high blow count miscellaneous fill materials at shallow depths which would have to be

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[1] Kishida, H. "Ultimate Bearing Capacity of Piles Driven into Loose Sand", Soils and Foundations, Vol. 7, No. 3, 1967, pgs. 20-29.

penetrated to fully embed the sheet piling. For example, N values of 28 and 25 blows per foot were encountered in Boring E2SC-03I within the 6 to 10 foot depth interval. These materials could result in hard driving conditions while most of the pile length is above ground and therefore laterally unsupported. This in turn could "buckle" a light duty sheet piling section such as the Waterloo WZ75. Has this potential been evaluated and have alternatives such as using the heavier Waterloo section or using jetting procedures if necessary in these localized dense zones to advance the sheets been considered in the constructability evaluation of the project?

5. The deflected shape of a cantilever sheet piling in granular soil is as shown in Part "a" of the attached Figure 1. This deflected shape causes a combination of active and passive lateral earth pressures to be developed against the wall which results in the assumed lateral earth pressure diagram shown in Part "c" of this same Figure for design of the sheet piling. This assumed deflected shape should have been used by BBL for the "Bending Deflection and Grout Cracking Evaluation" analysis rather than the 3 section deflected shape shown on Page 8 of the Appendix C calculations. This in turn would result in the selection of different lengths and loadings of the cantilever beams which were analyzed to determine the critical (i.e., maximum) deflections from which the analysis was completed. Please comment.

Section 3.3.3 Site Preparation and Section 3.3.4 Removal of Soils and Sediments Adjacent to the Containment Barrier

GE shall install erosion control matting or geotextile fabric on the exposed/cut slopes to prevent erosion into the Housatonic River. GE shall inspect and maintain the silt curtain, silt fence, hay bales and erosion control matting daily during construction activities and weekly until the riverbank/sediment excavation proposed in the *Removal Action Work Plan - Upper ½-Mile Reach of Housatonic River* is performed. GE shall not remove any of the above-mentioned erosion control measures without approval from EPA. GE shall extend and maintain booms in the River to cover the entire 450-foot stretch of cut banks. The booms shall not be removed until the proposed riverbank/sediment excavation specified in the *Removal Action Work Plan - Upper ½-Mile Reach of Housatonic River* is performed.

Section 3.3.5 Sheetpile Alignment and Installation

GE shall protect the top of the steel containment barrier to prevent debris from entering the sheetpile joints prior to grouting. The protection shall be placed as soon as practicable, as the sheetpiling is installed.

Section 3.3.7 Site Restoration

Although restoration activities will not be performed pursuant to this Work Plan, GE shall incorporate the following into the *Removal Action Work Plan - Upper ½-Mile Reach of Housatonic River*.

4. Figure 9. GE shall consider the installation of a heavy-duty woven geotextile or geogrid for placement beneath proposed riprap.

5. Appendix D, Sheet 4, Containment Barrier Technical Drawings, Notes - a note shall be added stating that the top of the sheetpile cutoff wall will be covered with riprap at the completion of work. Another note shall be added requiring that the riprap toe protection be well graded, composed of angular stones and be smooth and uniform in appearance when completed. Chinking of the surface of the riprap with appropriately sized stone will be necessary to obtain the smooth, uniform appearance. Oversize stone should be rejected, as well as riprap which contains an objectionable amount of fines.

6. GE shall include in the *Removal Action Work Plan - Upper ½-Mile Reach of Housatonic River* mitigation measures for the permanent loss of bank habitat and stream cover resulting from the proposed bank soil removal.

Section 4. Further Evaluation of DNAPL

The geophysical cross sections do not provide sufficient detail to base the evaluation of DNAPL beneath Hibbard Park on a single boring. Therefore, GE shall advance a minimum of three borings to the top of till along the southern riverbank. These borings shall be sampled in the same manner as the East Street Area 2 Source Control borings/monitoring wells across the river. The location of the borings shall be agreed upon by GE and EPA.

GE shall also propose performance standards and measurement methods for DNAPL in the DNAPL Recovery Evaluation and Report.

Appendix D, Sheet 5, West Headwall

GE shall submit a revised detail for Appendix D, Sheet 5, Containment Barrier Technical Drawings for the "West Headwall" that addresses EPA's concerns regarding the configuration of the sheetpiling wall in front of, and adjacent to, the headwall. Specifically, the detail shall show how the alignment of the sheetpile will change adjacent to the headwall. The integration of the sheetpile wall with the headwall shall be achieved without resulting in permanently exposed sheetpiles along this portion of the riverbank. Some of the concepts discussed at the February 3, 1999 meeting were:

7. The use of "L" sections of sheetpile to allow for a 90° bend in the sheetpile around the headwall.
8. Installation of rock gabions along areas of the sheetpile wall which would otherwise be exposed.
9. Installation of appropriate scour protection measures at the 90° bend in the sheetpile (if installed).
10. Modification of the headwall and associated spillway.

GE's January 29, 1999, *Proposal for Further Investigations Pursuant to Supplemental Source Control Containment/Recovery Measures*

EPA approves the proposed sampling plan subject to the following conditions:

1. GE surveys in the vertical and horizontal location of the sampling points.
2. GE collects samples to the maximum depth possible with the sampling procedures proposed and analyzes all samples, regardless of the visual observation of the samples (e.g., staining, sheens), for PCBs and TPHs.
3. GE performs a shake test for NAPL on all samples.
4. GE attempts to obtain riverbank samples down to at least elevation 967.
5. GE collects soil samples beginning at a depth of two feet below ground surface for the bank soil unless the water table is within the top two feet. If the water table is encountered in the top two feet, GE shall collect samples beginning at the water table.
6. GE shall have the samples analyzed with a turn-around-time of five days or less.

Figure 10, Anticipated Implementation Schedule

GE shall submit a proposal specifying the depth of excavation of riverbank soils (including cross-sections identifying the elevation in feet above mean sea level) located between the proposed sheetpiling and the River. Included in this proposal shall be proposed performance standards and revised monitoring procedures, the results of the riverbank/sediment sampling, GE's (or BBL's) statement that excavation to elevation 967.5 can be performed with the proposed sheetpile design, responses to EPA's questions on sheetpiling calculations, and a revised construction schedule. GE shall submit this proposal by March 1, 1999. GE shall initiate the installation of the borings on the Hibbard Playground property, subject to obtaining timely access, within 30 days of receipt of this letter.

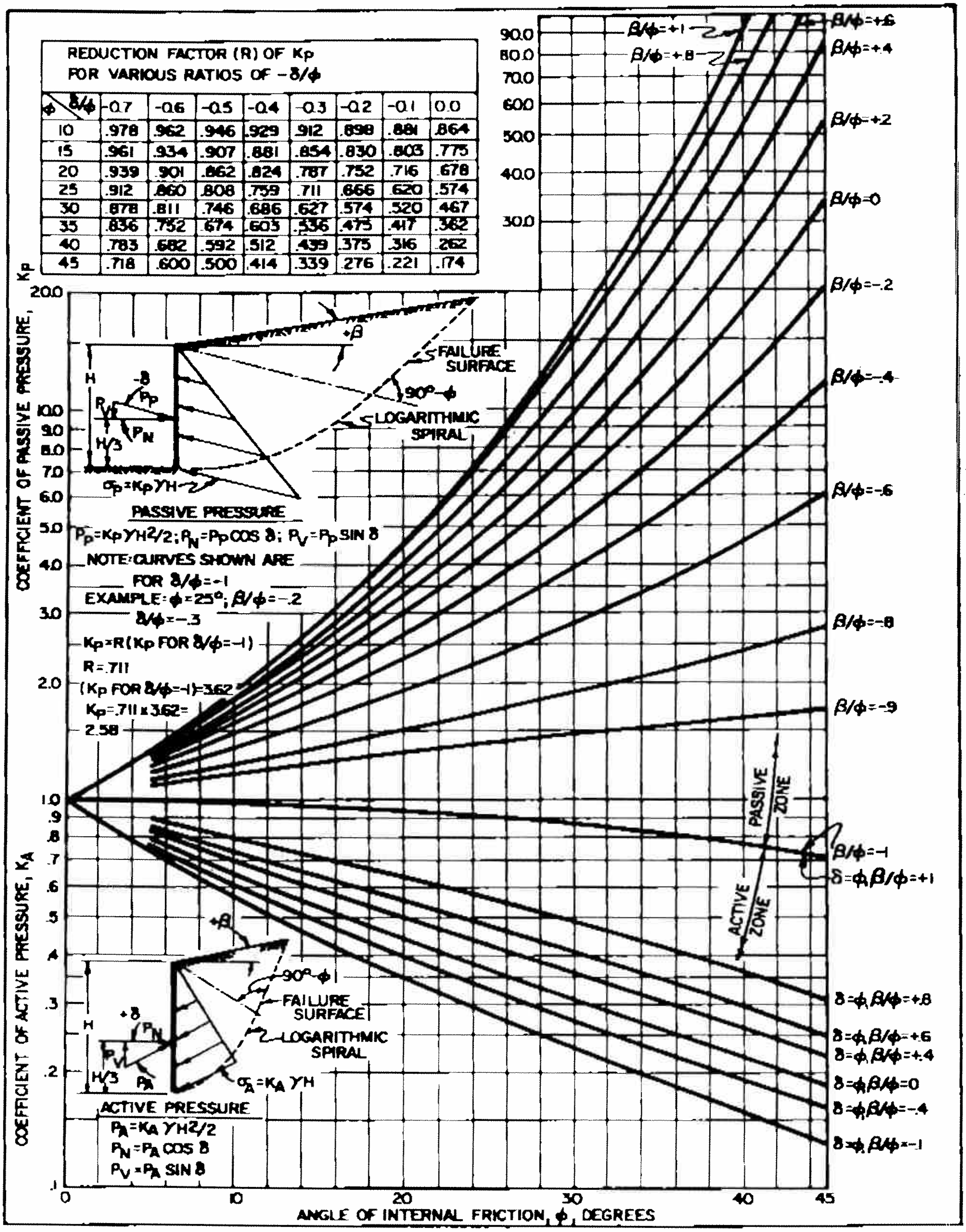
If you have any questions, please contact me at (617) 918-1282

Sincerely,

Dean Tagliaferro
On-Scene Coordinator

cc: John Ciampa, GE
Lyn Cutler, DEP
John Ziegler, MA DEP
John Kilborn, EPA
Steve Acree, US EPA

Dawn Veilliex, Roy F. Weston
Joel Lindsay, Roy F. Weston
John Kullberg, USACE
Charles Fredette, CT DEP
Margaret Meehan, EPA
Ken Finkelstein, NOAA
Ken Carr, US Fish and Wildlife
Mayor Doyle, City of Pittsfield
Pittsfield Conservation Commission
Pittsfield City Council, c/o Tom Hickey
Site File



REDUCTION FACTOR (R) OF Kp FOR VARIOUS RATIOS OF $-\delta/\phi$

ϕ \ δ/ϕ	-0.7	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
10	.978	.962	.946	.929	.912	.898	.881	.864
15	.961	.934	.907	.881	.854	.830	.803	.775
20	.939	.901	.862	.824	.787	.752	.716	.678
25	.912	.860	.808	.759	.711	.666	.620	.574
30	.878	.811	.746	.686	.627	.574	.520	.467
35	.836	.752	.674	.603	.536	.475	.417	.362
40	.783	.682	.592	.512	.439	.375	.316	.262
45	.718	.600	.500	.414	.339	.276	.221	.174

FIGURE 6
Active and Passive Coefficients with Wall Friction
(Sloping Backfill)

442-802 0 - 84 - 2

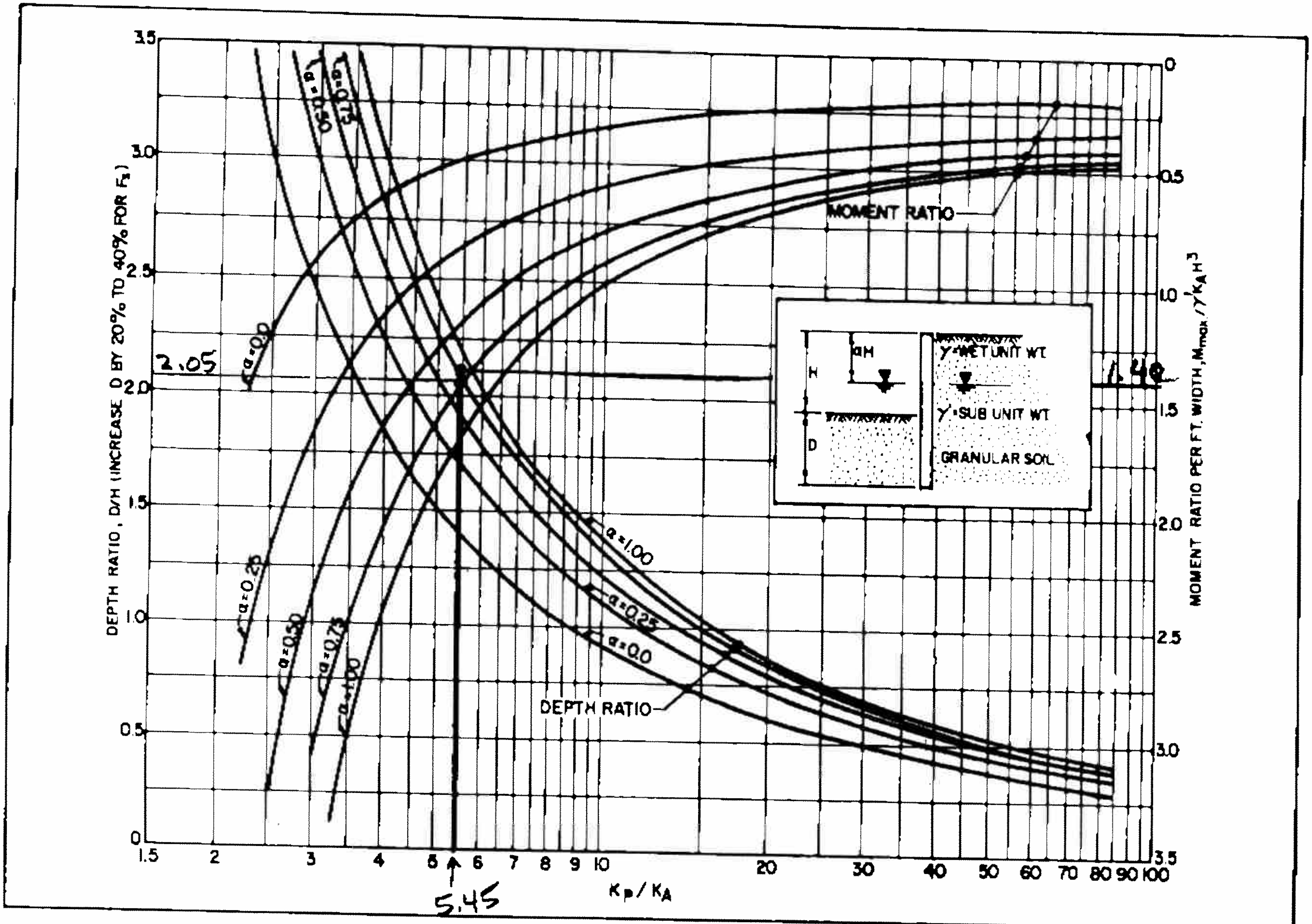


FIGURE 24
Cantilever Steel Sheet Pile Wall in Homogeneous Granular Soil

WESTON
MANAGERS DESIGNERS/CONSULTANTS

SHEET ____ of ____

CLIENT/SUBJECT GE - PITTSFIELD, MASS. W.O. NO. ____

TASK DESCRIPTION ____ TASK NO. ____

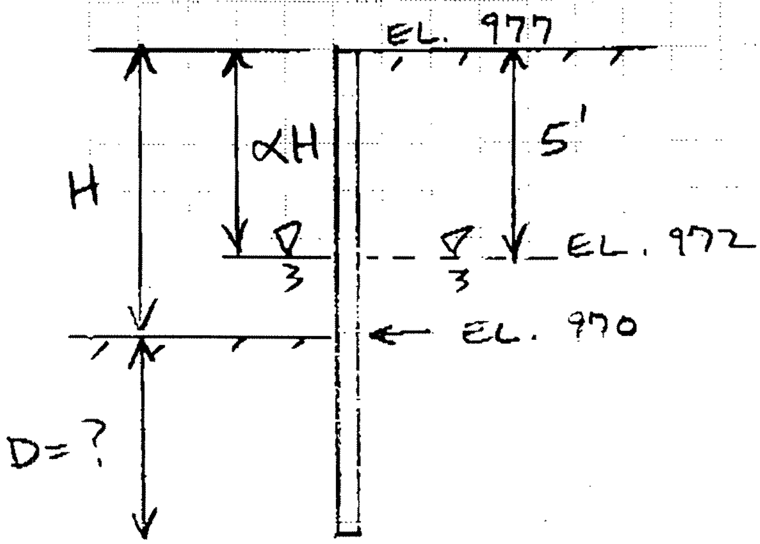
PREPARED BY WLD DEPT ____ DATE 1/26/99

MATH CHECK BY ____ DEPT ____ DATE ____

METHOD REV. BY ____ DEPT ____ DATE ____

APPROVED BY ____ DEPT ____ DATE ____

$K_A = .55$
$K_P = 3.00$ } BBL VALUES



$H = 7'$

$\alpha H = 5'$

$\alpha = 5'/H = 5'/7' = .71$

$K_P/K_A = 3.00/.55 = 5.45$

FROM FIG. 24 OF NAVFAC DM 7.2 (COPY ATTACHED):

1.) $D/H = 2.05 \rightarrow D = 2.05H = 2.05(7')$
$= 14.35'$
$\times 1.2$ (FS)
$17.2'$

2.) $M_{max}/\gamma' K_A H^3 = 1.40$

125 pcf − 62.4 p

$\therefore M_{max} = 1.40\,\gamma' K_A H^3 = 1.40(62.6\text{ pcf})(.55)(7')^3$

$= 16533$ FT-LB/$_I$

WESTON
MANAGERS DESIGNERS/CONSULTANTS

SHEET 2 of ____

CLIENT/SUBJECT ______________ W.O. NO. ______

TASK DESCRIPTION ______________ TASK NO. ______

PREPARED BY ________ DEPT ______ DATE ______

MATH CHECK BY ________ DEPT ______ DATE ______

METHOD REV. BY ________ DEPT ______ DATE ______

APPROVED BY ________ DEPT ______ DATE ______

THEN: $S = \frac{M_{max}}{f_y}$ ← YIELD STRESS OF STEEL = 36000 psi

(S ← MIN. REQD. SECTION MODULUS OF SELECTED SECTION)

$$S = \frac{\left(16533 \frac{FT\text{-}LB}{FT}\right)\left(12\ IN/FT\right)}{\left(36000\ LB/IN^2\right)}$$

$$= 5.51\ IN^3/FT$$

$S_{ALLOW} = 15.9\ IN^3/FT$ FOR WATERLOO WZ 75 SECTION

(S_{ALLOW} ← ACTUAL SECTION MODULUS OF SELECTED SECTION)

$$\therefore FS = \frac{S_{ALLOW}}{S} = \frac{15.9\ IN^3/FT}{5.51\ IN^3/FT}$$

$$= 2.9$$

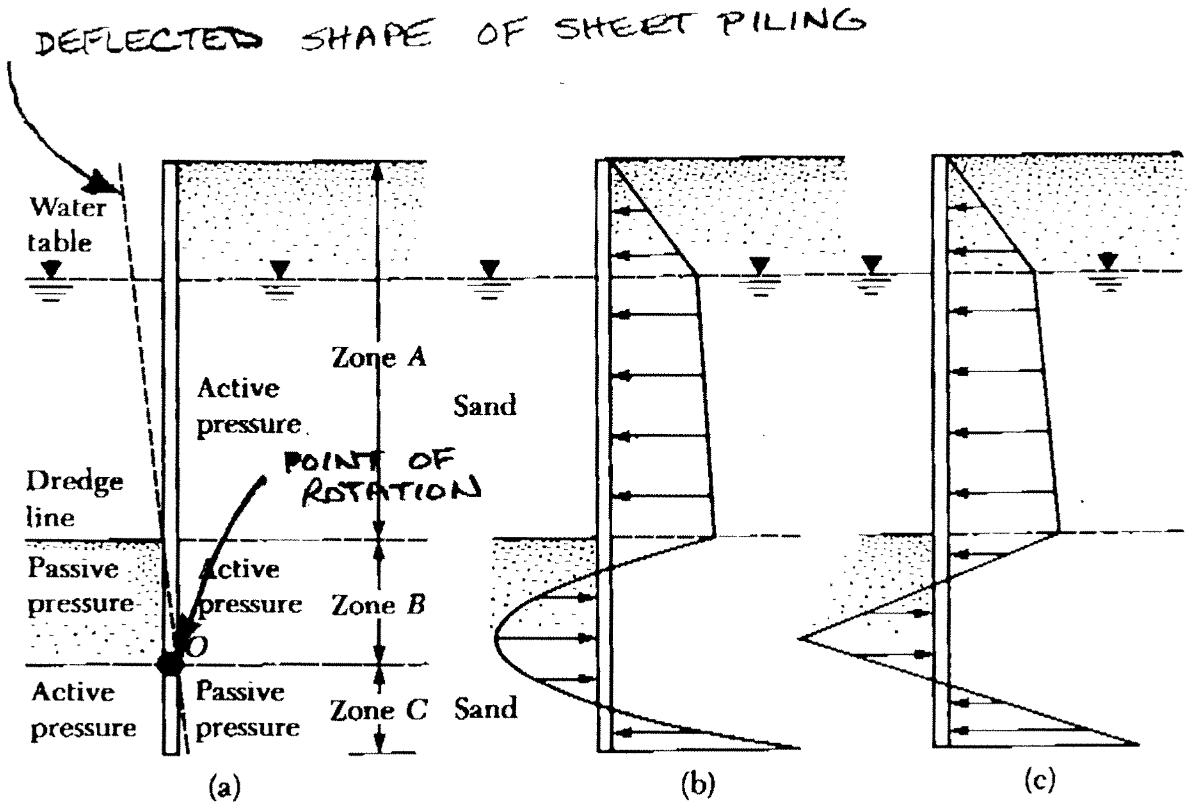


Figure 6.6 Cantilever sheet pile penetrating sand

REF: DAS, B.M.; "PRINCIPLES OF FOUNDATION ENGINEERING"; 2ND ED.

FIGURE 1

TABLE 1
Ultimate Friction Factors and Adhesion for Dissimilar Materials

Interface Materials	Friction factor, tan δ	Friction angle, δ degrees
Mass concrete on the following foundation materials:		
Clean sound rock..................................	0.70	35
Clean gravel, gravel-sand mixtures, coarse sand...	0.55 to 0.60	29 to 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel....................	0.45 to 0.55	24 to 29
Clean fine sand, silty or clayey fine to medium sand.......................................	0.35 to 0.45	19 to 24
Fine sandy silt, nonplastic silt..................	0.30 to 0.35	17 to 19
Very stiff and hard residual or preconsolidated clay..	0.40 to 0.50	22 to 26
Medium stiff and stiff clay and silty clay........	0.30 to 0.35	17 to 19
(Masonry on foundation materials has same friction factors.)		
Steel sheet piles against the following soils:		
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls..........................	0.40	22
Clean sand, silty sand-gravel mixture, single size hard rock fill.................................	0.30	17
Silty sand, gravel or sand mixed with silt or clay	0.25	14
Fine sandy silt, nonplastic silt..................	0.20	11
Formed concrete or concrete sheet piling against the following soils:		
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls..........................	0.40 to 0.50	22 to 26
Clean sand, silty sand-gravel mixture, single size hard rock fill.................................	0.30 to 0.40	17 to 22
Silty sand, gravel or sand mixed with silt or clay	0.30	17
Fine sandy silt, nonplastic silt..................	0.25	14
Various structural materials:		
Masonry on masonry, igneous and metamorphic rocks:		
Dressed soft rock on dressed soft rock..........	0.70	35
Dressed hard rock on dressed soft rock..........	0.65	33
Dressed hard rock on dressed hard rock..........	0.55	29
Masonry on wood (cross grain).....................	0.50	26
Steel on steel at sheet pile interlocks...........	0.30	17

Interface Materials (Cohesion)	Adhesion C_a (psf)
Very soft cohesive soil (0 - 250 psf)	0 - 250
Soft cohesive soil (250 - 500 psf)	250 - 500
Medium stiff cohesive soil (500 - 1000 psf)	500 - 750
Stiff cohesive soil (1000 - 2000 psf)	750 - 950
Very stiff cohesive soil (2000 - 4000 psf)	950 - 1,300