



Site Engineering

for Landscape Architects

THIRD EDITION

Steven Strom, ASLA, and Kurt Nathan, PE

This book is printed on acid-free paper.Ⓢ

Copyright © 1998 by Steven Strom and Kurt Nathan. All rights reserved.

Published simultaneously in Canada.

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 750-4744. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, (212) 850-6011, fax (212) 850-6008, E-Mail: PERMREQ@WILEY.COM.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering professional services. If professional advice or other expert assistance is required, the services of a competent professional person should be sought.

Library of Congress Cataloging-in-Publication Data:

Strom, Steven.

Site engineering for landscape architects / Steven Strom, Kurt Nathan. — 3rd ed.

p. cm.

Includes bibliographical references and index.

ISBN 0471-29196-X

1. Building sites. 2. Landscape architecture. I. Nathan, Kurt. II. Title.

TH375.S77 1997

624—dc21

97-37445

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

Contents

Preface xi

Acknowledgments xiii

1 Contours and Form 1

- Definition 1
- Constructing a Section 3
- Contour Signatures and Landform 3
- Characteristics of Contour Lines 7
- Exercises 8

2 Interpolation and Slope 11

- Topographic Data 11
- Interpolation 12
- Calculating Slope 18
- Slopes Expressed as Ratios and Degrees 20
- Exercises 21

3 Slope Formula Application 23

- Slope Analysis 23
- Slopes for Surface Drainage 25

Terrace Grading 28

Path Layout with a

Maximum Gradient 33

Grading of Roads 34

Grading by Proportion 39

Visualizing Topography from
Contour Lines 41

Swales to Divert Runoff 41

Exercises 42

4 Grading Constraints 47

Environmental Constraints 47

Functional Constraints 51

Summary of Critical Constraints 57

Exercises 58

5 Grading Design and Process 59

Grading Design 59

Grade Change Devices 64

Grading Process 70

Applying the Grading Process	72
Grading Plan Graphics	78
Exercises	81
5 Earthwork	89
Definitions	89
Construction Sequence for Grading	90
Grading Operations	91
Computation of Cut and Fill Volumes	93
Exercises	110
7 Grading, Landform, and Architecture:	
Case Studies	113
Introduction	113
Gasworks Park	113
Olympic Park	114
Westpark	120
University of Urbino	124
Exercise	128
3 Storm Water Management	131
Storm Runoff	131
Hydrologic Cycle	132
Nature of the Problem	132
Management Philosophy	133
Storm Water Management	
Strategies	135
Principles and Techniques	137
Controlling Erosion and Sedimentation	148
Summary	154
Exercises	154
9 Determining Rates and Volumes of Storm Runoff: The Rational and Modified Rational Methods	155
Introduction	155
Rational Method	155
Modified Rational Method	167
Volumes of Runoff, Storage, and Release	171

Required Storage for Detention or Retention Ponds by the Modified Rational Method	174
Summary	176
Exercises	176
10 Natural Resources Conservation Service Methods of Estimating Runoff Rates, Volumes, and Required Detention Storage	179
Introduction	179
Rainfall	180
Procedures of TR55	181
Volume for Detention Storage	192
Summary	194
Exercises	194
11 Designing and Sizing Storm Water Management Systems	197
Management Systems	197
Design and Layout of	
Drainage Systems	201
Applications	203
Subsurface Drainage	222
Summary	227
Exercises	227
12 Horizontal Road Alignment	231
Types of Horizontal Curves	231
Circular Curve Elements	232
Circular Curve Formulas	233
Degree of Curve	235
Stationing	236
Horizontal Sight Distance	239
Construction Drawing Graphics	241
Horizontal Alignment Procedures	241
Superelevation	244
Exercises	245
13 Vertical Road Alignment	247
Vertical Curve Formula	248
Equal Tangent Curves	248

Calculating the Locations of High and Low Points	249
Unequal Tangent Curves	253
Construction Drawing Graphics	256
Vertical Sight Distances	257
Road Alignment Procedure	258
Exercises	261
14 Grading, Storm Water Management, and Road Alignment: Case Studies	265
Introduction	265
Earthworks Park	265
Merrill Lynch Corporate Campus	268

Morris Arboretum	275
Exercise	279

Appendix I: Table of Metric Equivalents	281
Appendix II: Drawing Scales and Metric Notation	283
Scales	283
Dimensioning	284

Glossary	285
Bibliography	291
Permissions	294
Index	295