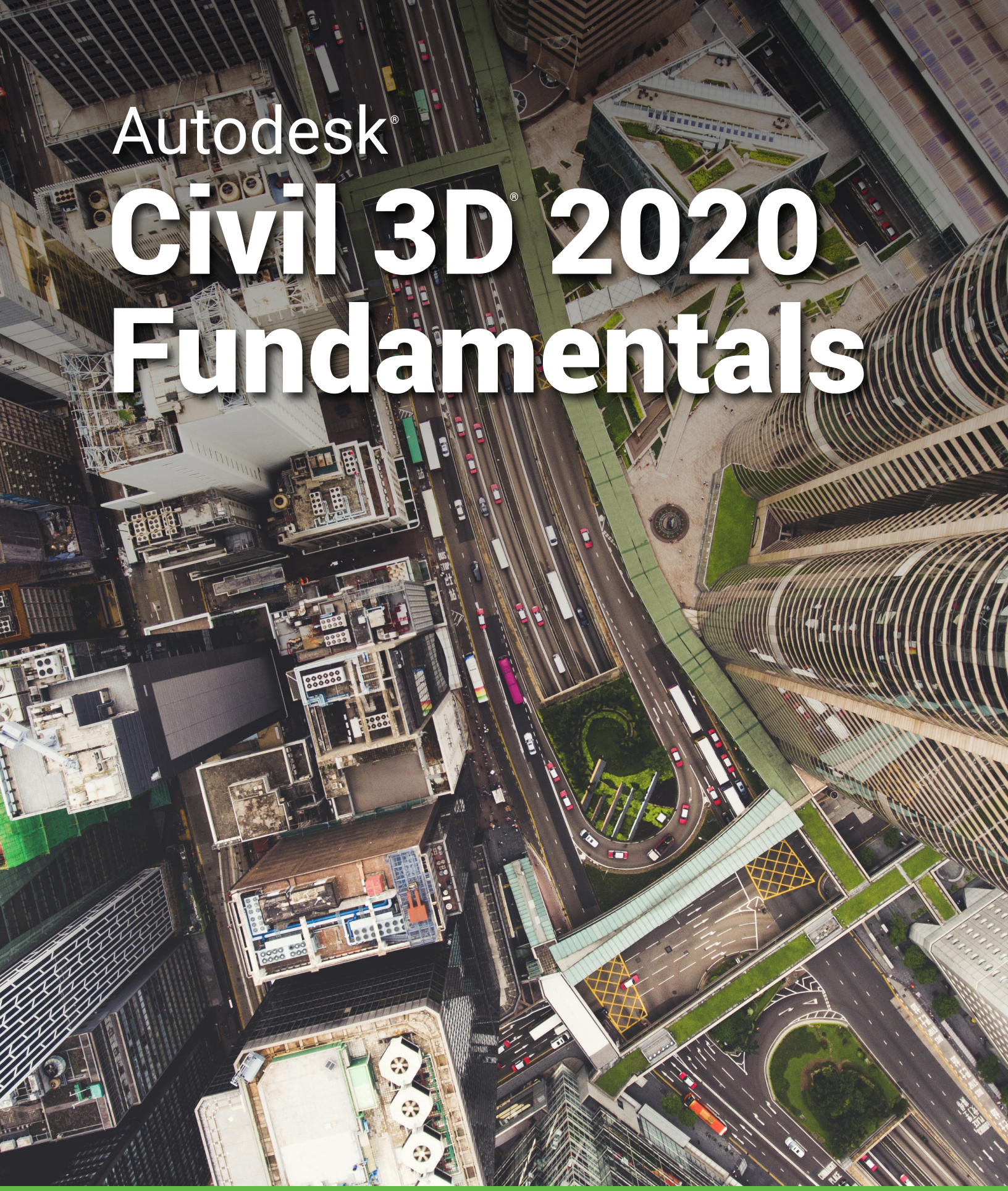
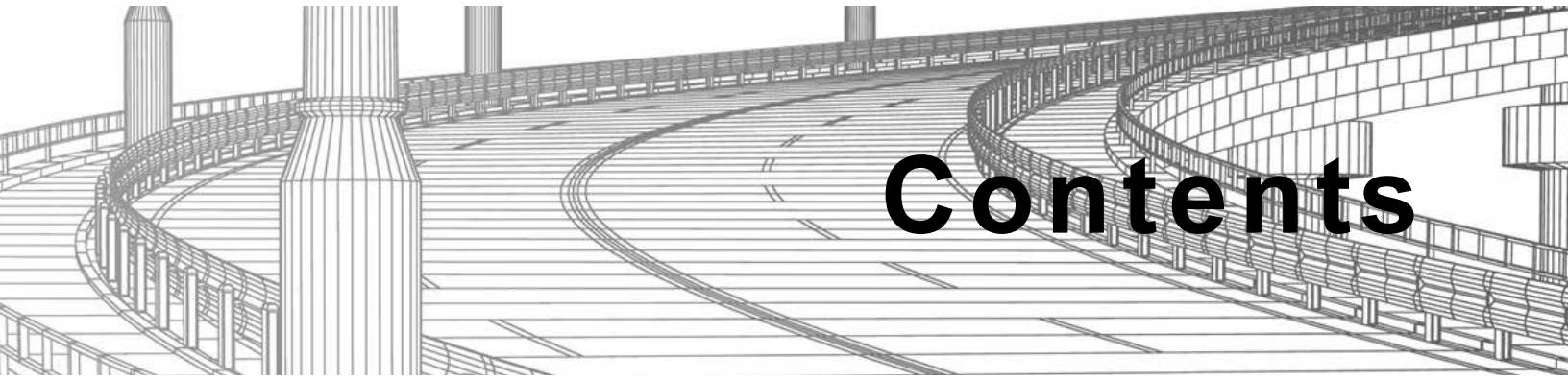


Autodesk® Civil 3D® 2020 Fundamentals

SDC PUBLICATIONS
Better Textbooks. Lower Prices.
www.SDCpublications.com

Visit the following websites to learn more about this book:



Contents

Preface ..... **xi**

In this Guide ..... **xv**

Practice Files ..... **xix**

Chapter 1: The Autodesk Civil 3D Interface **1-1**

1.1 Product Overview **1-2**

1.2 Autodesk Civil 3D Workspaces **1-3**
Start Tab 1-4

1.3 Autodesk Civil 3D User Interface **1-7**

Practice 1a Overview of Autodesk Civil 3D and the User Interface. **1-12**

1.4 Autodesk Civil 3D Toolspace **1-15**
Prospector Tab 1-16
Settings Tab 1-18
Survey Tab 1-19
Toolbox Tab 1-19

1.5 Autodesk Civil 3D Panorama **1-21**

Practice 1b Autodesk Civil 3D Toolspace **1-23**

1.6 Autodesk Civil 3D Templates, Settings, and Styles **1-30**
Drawing Settings in Detail 1-30
Styles 1-41
Templates 1-49

Practice 1c Autodesk Civil 3D Styles **1-53**

Chapter Review Questions **1-60**

Command Summary **1-62**

© 2019, ASCENT - Center for Technical Knowledge®

Chapter 2: Project Management 2-1

2.1 Autodesk Civil 3D Projects 2-2
Single-Design Drawing Projects 2-2
Multiple Drawings Sharing Data using Shortcuts 2-2
Multiple Drawings Sharing Data with Autodesk Vault 2-3

2.2 Sharing Data 2-4

2.3 Using Data Shortcuts for Project Management 2-5
Update Notification 2-6
Removing and Promoting Shortcuts 2-7
eTransmit Data References 2-7
Data Shortcut Workflow 2-8
Workflow Details 2-8
Advantages of Data Shortcuts 2-9
Limitations of Data Shortcuts 2-9

Practice 2a Starting a Project 2-10

Practice 2b Manage File Sizes with Data Shortcuts 2-15

Practice 2c Share Projects with Team Members Outside the Office Network 2-26

Chapter Review Questions 2-29

Command Summary 2-30

Chapter 3: Parcels 3-1

3.1 Lines and Curves 3-2

Practice 3a Beginning a Subdivision Project 3-5

3.2 Introduction to Parcels 3-8
ROW Parcel 3-9
Parcel Style Display Order 3-10
Parcel Properties 3-11
Parcel Labels and Styles 3-13
Create Parcels from Objects 3-13
Creating Right-of-Way Parcels 3-14

Practice 3b Create Parcels From Objects 3-15

3.3 Creating and Editing Parcels by Layout Overview 3-22

3.4 Creating and Editing Parcels 3-25
Freehand 3-26
Slide Line 3-27
Swing Line 3-27
Free Form Create 3-27

Practice 3c Creating and Editing Parcels 3-28

3.5 Renumbering Parcels 3-32

Practice 3d Rename/Renumber Parcels 3-33

© 2019, ASCENT - Center for Technical Knowledge®

3.6 Parcel Reports 3-38
3.7 Parcel Labels 3-40
3.8 Parcel Tables 3-43
Practice 3e Reporting On and Annotating the Parcel Layout 3-45
Chapter Review Questions 3-52
Command Summary 3-55

Chapter 4: Survey 4-1
4.1 Survey Workflow Overview 4-2
Workflow 4-2
4.2 Survey Figures 4-3
Figure Styles 4-3
Figure Prefix Database 4-4
Practice 4a Creating Figure Prefixes 4-5
4.3 Points Overview 4-6
Point Label Style 4-11
Practice 4b Point Marker Styles 4-18
4.4 Point Settings 4-27
4.5 Creating Points 4-29
Practice 4c Creating Autodesk Civil 3D Points 4-30
4.6 Description Key Sets 4-31
Practice 4d Creating a Description Key Set 4-34
4.7 Importing Survey Data 4-39
Import Points Only 4-39
Duplicate Point Numbers 4-41
Survey Toolspace 4-42
Import Points and Figures Using the Survey Database 4-42
Practice 4e Importing Survey Data 4-48
4.8 Point Groups 4-52
Defining Point Groups 4-52
Practice 4f Creating Point Groups 4-59
4.9 Reviewing and Editing Points 4-62
Practice 4g Manipulating Points 4-64
4.10 Point Reports 4-66
Practice 4h Point Reports 4-68
Chapter Review Questions 4-69
Command Summary 4-71

© 2019, ASCENT - Center for Technical Knowledge®

Chapter 5: Surfaces 5-1

5.1 Surface Process 5-2

5.2 Surface Properties 5-8

5.3 Contour Data 5-11
Weeding Factors 5-12
Supplementing Factors 5-12
Contour Issues 5-13
Minimizing Flat Triangle Strategies 5-14

5.4 Other Surface Data 5-15
DEM Files 5-15
Drawing Objects 5-15
Point Files 5-15
Point Groups 5-16
Point Survey Queries 5-16
Figure Survey Queries 5-16

Practice 5a Creating an Existing Ground Surface 5-17

5.5 Breaklines and Boundaries 5-24
Breaklines 5-25

Practice 5b Add Additional Data to an Existing Ground Surface 5-30

5.6 Surface Editing 5-38
Line Edits 5-40
Point Edits 5-40
Simplify Surface 5-41
Smooth Contours 5-42
Smooth Surface 5-43
Copy Surface 5-44
Surface Paste 5-44
Raise/Lower Surface 5-44
Adjusting Surfaces Through Surface Properties 5-45

5.7 Surface Analysis Tools 5-46
Viewing a Surface in 3D 5-46
Quick Profile 5-47

Practice 5c Surface Edits 5-48

5.8 Surface Labels 5-60
Contour Labels 5-61
Spot and Slope Labels 5-61

5.9 Surface Volume Calculations 5-62
Volumes Dashboard 5-62
Bounded Volumes 5-62
Volume Reports 5-63
Grid Volume or TIN Volume Surface 5-63
3D Solid Surface from TIN Surface 5-64

 © 2019, ASCENT - Center for Technical Knowledge®

5.10 Surface Analysis Display 5-66
Analysis Settings 5-68
Analysis Data Display 5-69

Practice 5d Surface Labeling and Analysis 5-70

5.11 Point Cloud Surface Extraction 5-78
Attach Point Cloud 5-79
Surfaces from Point Clouds 5-84

Practice 5e (Optional) Create a Point Cloud Surface 5-88

Chapter Review Questions 5-90

Command Summary 5-93

Chapter 6: Alignments 6-1

6.1 Design Development 6-2

6.2 Roadway Design Overview 6-3

6.3 Autodesk Civil 3D Sites 6-4

6.4 Introduction to Alignments 6-5
Criteria-Based Design 6-6
Alignment Types 6-7
Alignment Segment Types 6-8

Practice 6a Creating Alignments from Objects 6-11

6.5 Alignments Layout Tools 6-17
Alignment Editing 6-19

Practice 6b Creating and Modifying Alignments 6-20

6.6 Alignment Properties 6-26
Station Control Tab 6-26
Design Criteria Tab 6-26

6.7 Labels and Tables 6-28
Alignment Point Labels 6-28
Independent Alignment Labels 6-30
Alignment Table Styles 6-31

Practice 6c Alignment Properties and Labels 6-32

Chapter Review Questions 6-38

Command Summary 6-39

Chapter 7: Profiles 7-1

7.1 Profiles Overview 7-2
Repositioning and Deleting Profile Views 7-3

7.2 Create a Profile View Style 7-4

7.3 Create Profiles from Surface 7-12

© 2019, ASCENT - Center for Technical Knowledge®

7.4 Create Profile View Wizard 7-14
Practice 7a Working with Profiles Part I 7-19
7.5 Finished Ground Profiles 7-23
7.6 Create and Edit Profiles 7-24
Transparent Commands 7-25
Assigning Profile Band Elevations 7-26
Profile Segment Types 7-27
Profile Labels 7-27
Practice 7b Working with Profiles Part II 7-29
Practice 7c Working with Profiles Additional Practice 7-37
Chapter Review Questions 7-40
Command Summary 7-41

Chapter 8: Corridors 8-1
8.1 Assembly Overview 8-2
Assemblies 8-2
Subassemblies 8-3
8.2 Modifying Assemblies 8-6
Attaching Subassemblies 8-6
Detaching Subassemblies 8-8
Copying Assemblies 8-8
Mirroring Subassemblies 8-9
Select Similar Subassemblies 8-9
Sharing Assemblies 8-10
Getting More Information on Subassemblies 8-10
Practice 8a Creating Assemblies 8-11
Practice 8b Creating Assemblies Additional Practice 8-17
8.3 Creating a Corridor 8-21
Target Mapping 8-23
Corridor Frequency 8-24
8.4 Corridor Properties 8-25
Information Tab 8-25
Parameters Tab 8-25
Codes 8-26
Feature Lines 8-27
Slope Patterns 8-27
Corridor Contextual Ribbon 8-28
Practice 8c Working with Corridors - Part I 8-29
8.5 Designing Intersections 8-35
General Tab 8-36
Geometry Details Tab 8-37
Corridor Regions Tab 8-37

© 2019, ASCENT - Center for Technical Knowledge®

Practice 8d Working with Corridors - Part II 8-39

8.6 Corridor Surfaces 8-48
Overhang Correction 8-49
Surface Boundaries 8-49

8.7 Corridor Section Review and Edit 8-50

Practice 8e Working with Corridors - Part III 8-52

8.8 Corridor Visualization 8-55
Line of Sight Analysis 8-56

Practice 8f Working with Corridors - Part IV 8-59

Chapter Review Questions 8-63

Command Summary 8-65

Chapter 9: Grading 9-1

9.1 Grading Overview 9-2

9.2 Feature Lines 9-4
Feature Line Contextual Tab 9-4
Elevation Editor 9-5

Practice 9a Working with Feature Lines 9-7

9.3 Grading Tools 9-14
Grading Creation Tools Toolbar 9-14

Practice 9b Create Grading Groups 9-15

9.4 Modifying Autodesk Civil 3D Grading 9-22
Grading Styles 9-22
Feature Line Labels 9-22
Grading Criteria 9-23
Grading Criteria Set 9-23
Grading Volumes 9-25

Practice 9c Modify Grading and Calculate Volumes 9-26

Chapter Review Questions 9-30

Command Summary 9-31

Chapter 10: Pipe Networks 10-1

10.1 Pipes Overview 10-2

10.2 Pipes Configuration 10-4

Practice 10a Configuring Pipe Networks 10-16

10.3 Creating Networks from Objects 10-24

Practice 10b Creating Pipe Networks by Objects 10-25

10.4 The Network Layout Toolbar 10-28

© 2019, ASCENT - Center for Technical Knowledge®

Practice 10c Creating Pipe Networks by Layout 10-30

10.5 Network Editing 10-37
Pipe (and Structure) Properties 10-37
Swap Part 10-38
Connect/ Disconnect From Part 10-38

Practice 10d Editing Pipe Networks 10-39

10.6 Annotating Pipe Networks 10-44
Pipe Networks in Sections 10-45
Pipe Network Reports and Tables 10-46

Practice 10e Annotating Pipe Networks 10-47

10.7 Pressure Pipe Networks 10-52

Practice 10f Create a Pressure Pipe Network 10-55

Chapter Review Questions 10-62

Command Summary 10-63

Chapter 11: Quantity Take Off/Sections 11-1

11.1 Final Design 11-2

11.2 Sample Line Groups 11-4
Modifying Sample Line Groups 11-7

Practice 11a Creating Sections - Part I 11-8

11.3 Section Volume Calculations 11-13
Earthwork Volumes 11-13
Mass Haul 11-14
Material Volumes 11-15
Quantity Takeoff Criteria 11-15
Define Materials 11-16

Practice 11b Quantity Take Off - Part I 11-17

11.4 Pay Items 11-26

Practice 11c Quantity Take Off - Part II - Integrated Quantity Takeoff 11-27

11.5 Section Views 11-36
Section View Wizard 11-36

Practice 11d Creating Sections Part II 11-39

Chapter Review Questions 11-44

Command Summary 11-45

Chapter 12: Plan Production 12-1

12.1 Plan Production Tools 12-2
Overview 12-2
More Information 12-3

© 2019, ASCENT - Center for Technical Knowledge®

12.2 Plan Production Objects 12-4
View Frames 12-5
View Frame Groups 12-5
Match Lines 12-5

12.3 Plan Production Object Edits 12-6
Name 12-6
Description 12-6
Object style 12-6
View Frame Geometry Properties Edits 12-7
Match Line Geometry Properties Edits 12-8

Practice 12a Plan Production Tools I 12-9

12.4 Creating Sheets 12-18

Practice 12b Plan Production Tools II 12-19

12.5 Sheet Sets 12-24
Structuring Sheet Sets 12-25
Editing Sheet Sets 12-25
Sheet Set Manager Properties 12-27

Practice 12c Plan Production Tools III 12-29

Chapter Review Questions 12-39

Command Summary 12-41

Appendix A: Additional Information A-1

A.1 Opening a Survey Database A-2

A.2 Design Data A-3
Parcel Size A-3
Pipe Size Conversion A-3
Road Design Criteria A-4
Traffic Circle Design Criteria A-15
Intersection Design A-16

Appendix B: Autodesk Civil 3D Certification Exam Objectives B-1

Index Index-1