



# **AutoCAD® Civil 3D 2011 Fundamentals**

**Student Guide**

*Revision 1.0*

*June 2010*

**ASCENT - Center for Technical Knowledge®**  
**AutoCAD® Civil 3D 2011**  
**Fundamentals**  
**Revision 1.0**

Prepared and produced by:

ASCENT Center for Technical Knowledge  
1001 E. Market Street, Suite 102  
Charlottesville, VA 22902

866-527-2368  
www.ascented.com



ASCENT - Center for Technical Knowledge is a division of RAND Worldwide Inc., providing custom developed knowledge products and services for leading engineering software applications. ASCENT is focused on specializing in the creation of education programs that incorporate the best of classroom learning and technology-based training offerings.

We welcome any comments you may have regarding this training manual, or any of our products. To contact us please email: [education@ASCENTed.com](mailto:education@ASCENTed.com).

© ASCENT - Center for Technical Knowledge 2010

Printed in the United States of America, all rights reserved. No part of this manual may be reproduced in any form by any photographic, electronic, mechanical or other means or used in any information storage and retrieval system without the written permission of ASCENT, a division of RAND Worldwide, Inc.

AutoCAD® Civil 3D® is a registered trademark of Autodesk, Inc.

**General Disclaimer:**

NOTWITHSTANDING ANY LANGUAGE TO THE CONTRARY, NOTHING CONTAINED HEREIN CONSTITUTES NOR IS INTENDED TO CONSTITUTE AN OFFER, INDUCEMENT, PROMISE, OR CONTRACT OF ANY KIND. THE DATA CONTAINED HEREIN IS FOR INFORMATIONAL PURPOSES ONLY AND IS NOT REPRESENTED TO BE ERROR FREE. ASCENT, ITS AGENTS AND EMPLOYEES, EXPRESSLY DISCLAIM ANY LIABILITY FOR ANY DAMAGES, LOSSES OR OTHER EXPENSES ARISING IN CONNECTION WITH THE USE OF ITS MATERIALS OR IN CONNECTION WITH ANY FAILURE OF PERFORMANCE, ERROR, OMISSION EVEN IF ASCENT, OR ITS REPRESENTATIVES, ARE ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, LOSSES OR OTHER EXPENSES. NO CONSEQUENTIAL DAMAGES CAN BE SOUGHT AGAINST ASCENT OR RAND WORLDWIDE FOR THE USE OF THESE MATERIALS BY ANY THIRD PARTIES OR FOR ANY DIRECT OR INDIRECT RESULT OF THAT USE.

THE INFORMATION CONTAINED HEREIN IS INTENDED TO BE OF GENERAL INTEREST TO YOU AND IS PROVIDED "AS IS", AND IT DOES NOT ADDRESS THE CIRCUMSTANCES OF ANY PARTICULAR INDIVIDUAL OR ENTITY. NOTHING HEREIN CONSTITUTES PROFESSIONAL ADVICE, NOR DOES IT CONSTITUTE A COMPREHENSIVE OR COMPLETE STATEMENT OF THE ISSUES DISCUSSED THERETO. ASCENT DOES NOT WARRANT THAT THE DOCUMENT OR INFORMATION WILL BE ERROR FREE OR WILL MEET ANY PARTICULAR CRITERIA OF PERFORMANCE OR QUALITY. IN PARTICULAR (BUT WITHOUT LIMITATION) INFORMATION MAY BE RENDERED INACCURATE BY CHANGES MADE TO THE SUBJECT OF THE MATERIALS (I.E. APPLICABLE SOFTWARE). RAND SPECIFICALLY DISCLAIMS ANY WARRANTY, EITHER EXPRESSED OR IMPLIED, INCLUDING THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

# Table of Contents

Preface .....	ix
<b>Module 1 The AutoCAD Civil 3D Interface .....</b>	<b>1-1</b>
<b>Section 1: AutoCAD Civil 3D Interface .....</b>	<b>1-3</b>
1.1 Product Overview .....	1-4
1.2 AutoCAD Civil 3D Workspaces .....	1-5
1.3 AutoCAD Civil 3D User Interface .....	1-7
1.4 AutoCAD Civil 3D Toolspace.....	1-12
1.5 AutoCAD Civil 3D Panoramas.....	1-18
<b>Practice 1a Overview of AutoCAD Civil 3D and its User Interface .....</b>	<b>1-19</b>
<b>Module 2 Parcels Level 1.....</b>	<b>2-1</b>
<b>Section 1: Parcels Overview .....</b>	<b>2-3</b>
2.1 Introduction to Parcels .....	2-4
ROW Parcel .....	2-5
Parcel Style Display Order.....	2-6
Parcel Properties .....	2-7
Parcel Labels and Styles .....	2-9
Create Parcels from Objects.....	2-9
Creating Right-of-Way Parcels .....	2-9
<b>Practice 2a Beginning a Subdivision Project.....</b>	<b>2-11</b>
<b>Section 2: Subdividing Parcels.....</b>	<b>2-22</b>
2.2 Creating and Editing Parcels by Layout Overview....	2-23
2.3 Creating and Editing Parcels.....	2-26
Freehand.....	2-27
Slide Line .....	2-27
Swing Line .....	2-27
Free Form Create .....	2-27
Frontage.....	2-27
2.4 Renumbering Parcels.....	2-28
<b>Practice 2b Creating and Editing Parcels.....</b>	<b>2-29</b>
<b>Section 3: Parcel Reports, Annotation, and Tables.....</b>	<b>2-38</b>
2.5 Parcel Reports .....	2-39
2.6 Parcel Labels .....	2-40
2.7 Parcel Tables .....	2-42

<b>Practice 2c Reporting on and Annotating the Parcel Layout</b> .....	<b>2-44</b>
<b>Module 3 Survey Level 1</b> .....	<b>3-1</b>
<b>Section 1: Civil 3D Survey Toolspace</b> .....	<b>3-3</b>
<b>3.1 Survey Workflow Overview</b> .....	<b>3-4</b>
<b>3.2 Introduction to the Survey Toolspace</b> .....	<b>3-8</b>
<b>3.3 The Survey Toolspace</b> .....	<b>3-10</b>
<b>Practice 3a Creating a Survey Database</b> .....	<b>3-12</b>
<b>3.4 Survey Networks</b> .....	<b>3-17</b>
<b>Practice 3b Creating a Survey Network</b> .....	<b>3-19</b>
<b>Section 2: Civil 3D Points</b> .....	<b>3-21</b>
<b>3.5 Points Overview</b> .....	<b>3-23</b>
<b>Practice 3c Point Marker Styles</b> .....	<b>3-30</b>
<b>3.6 Point Label Styles</b> .....	<b>3-35</b>
Information Tab.....	3-36
General Tab.....	3-36
Layout Tab.....	3-38
Dragged State Tab .....	3-40
<b>Practice 3d Point Label Styles</b> .....	<b>3-43</b>
<b>3.7 Styles and Templates</b> .....	<b>3-48</b>
<b>3.8 Point Settings</b> .....	<b>3-50</b>
<b>3.9 Creating Points</b> .....	<b>3-52</b>
<b>3.10 Transparent Command</b> .....	<b>3-53</b>
<b>Practice 3e Creating AutoCAD Civil 3D Points</b> .....	<b>3-54</b>
<b>3.11 Description Key Sets</b> .....	<b>3-56</b>
<b>Practice 3f Creating a Description Key Set</b> .....	<b>3-59</b>
<b>3.12 Importing and Exporting Points</b> .....	<b>3-64</b>
To Import Points .....	3-64
Duplicate Point Numbers .....	3-67
Transforming Points on Import or Export.....	3-68
<b>Practice 3g Importing and Exporting Points Part I</b> .....	<b>3-70</b>
<b>Practice 3h Importing and Exporting Points Part II</b> .....	<b>3-74</b>
<b>3.13 Point Groups</b> .....	<b>3-77</b>
<b>Practice 3i Creating Point Groups</b> .....	<b>3-83</b>
<b>3.14 Reviewing and Editing Points</b> .....	<b>3-86</b>
<b>Practice 3j Manipulating Points</b> .....	<b>3-89</b>
<b>3.15 Locking/Unlocking Points</b> .....	<b>3-91</b>

<b>Practice 3k Point Locking and Editing</b> .....	<b>3-93</b>
<b>3.16 Point Reports</b> .....	<b>3-95</b>
<b>Practice 3l Point Reports</b> .....	<b>3-97</b>
<b>Section 3: Civil 3D Survey Figures</b> .....	<b>3-99</b>
<b>3.17 Survey Figures</b> .....	<b>3-100</b>
Drawing Settings.....	3-101
Figure Styles .....	3-101
Figure Prefix Database .....	3-103
<b>Practice 3m Creating Figure Prefixes</b> .....	<b>3-104</b>
<b>3.18 Importing a Field Book</b> .....	<b>3-105</b>
<b>Practice 3n Importing a Field Book</b> .....	<b>3-108</b>
<b>3.19 Working with Figures</b> .....	<b>3-111</b>
<b>Practice 3o Field Book Edits, Styles, and Figure Prefixes</b> .....	<b>3-114</b>
<b>Module 4 Surfaces Level 1</b> .....	<b>4-1</b>
<b>Section 1: Civil 3D Surface Overview</b> .....	<b>4-3</b>
<b>4.1 Surface Process</b> .....	<b>4-4</b>
<b>4.2 Surface Properties</b> .....	<b>4-11</b>
<b>Practice 4a Creating an Existing Ground Surface Part I</b>	<b>4-13</b>
<b>4.3 Contour Data</b> .....	<b>4-16</b>
Weeding Factors.....	4-17
Supplementing Factors .....	4-17
Contour Issues.....	4-17
Minimizing Flat Triangle Strategies.....	4-19
<b>4.4 Other Surface Data</b> .....	<b>4-20</b>
DEM Files .....	4-20
Drawing Objects.....	4-20
Point Files .....	4-20
<b>Practice 4b Creating an Existing Ground Surface Part II</b>	<b>4-21</b>
<b>4.5 Breaklines and Boundaries</b> .....	<b>4-26</b>
Breaklines .....	4-27
<b>4.6 Surface Analysis Tools</b> .....	<b>4-31</b>
Viewing a Surface in 3D.....	4-31
Quick Profile.....	4-31
<b>Practice 4c Creating an Existing Ground Surface Part III</b>	<b>4-32</b>
<b>Section 2: Civil 3D Surface Editing</b> .....	<b>4-40</b>
<b>4.7 Surface Editing</b> .....	<b>4-41</b>
Line Edits .....	4-43
Point Edits.....	4-43

Simplify Surface.....	4-44
Smooth Contours.....	4-45
Smooth Surface.....	4-46
Copy Surface.....	4-47
Surface Paste.....	4-47
Raise/Lower Surface.....	4-47
<b>4.8 Adjusting Surfaces through Surface Properties.....</b>	<b>4-48</b>
<b>4.9 Viewing Surfaces in 3D.....</b>	<b>4-49</b>
<b>Practice 4d Surface Edits.....</b>	<b>4-50</b>
<b>Section 3: Civil 3D Surface Labels and Analysis.....</b>	<b>4-62</b>
<b>4.10 Surface Labels.....</b>	<b>4-63</b>
Contour Labels.....	4-64
Spot and Slope Labels.....	4-64
<b>4.11 Surface Volume Calculations.....</b>	<b>4-65</b>
Composite Volumes vista.....	4-65
Bounded Volumes.....	4-66
Grid Volume or TIN Volume Surface.....	4-66
<b>4.12 Surface Analysis Display.....</b>	<b>4-67</b>
Analysis Settings.....	4-68
Analysis Data Display.....	4-69
<b>Practice 4e Surface Labeling and Analysis.....</b>	<b>4-70</b>
<b>Module 5 Alignments Level 1.....</b>	<b>5-1</b>
<b>Section 1: Civil 3D Alignments.....</b>	<b>5-3</b>
<b>5.1 Roadway Design Overview.....</b>	<b>5-4</b>
<b>5.2 AutoCAD Civil 3D Sites.....</b>	<b>5-5</b>
<b>5.3 Alignments.....</b>	<b>5-6</b>
Criteria-Based Design.....	5-7
Alignment Segment Types.....	5-8
Alignment Layout Tools.....	5-10
Alignment Editing.....	5-12
<b>Practice 5a Creating and Modifying Alignments.....</b>	<b>5-13</b>
<b>5.4 Alignment Properties.....</b>	<b>5-23</b>
Station Control Tab.....	5-23
Design Criteria Tab.....	5-23
<b>5.5 Labels and Tables.....</b>	<b>5-25</b>
Alignment Point Labels.....	5-25
Independent Alignment Labels.....	5-27
Alignment Table Styles.....	5-28
<b>Practice 5b Alignment Properties and Labels.....</b>	<b>5-29</b>

<b>Module 6 Data Sharing Level 1 .....</b>	<b>6-1</b>
<b>Section 1: Data Sharing Overview.....</b>	<b>6-3</b>
<b>6.1 AutoCAD Civil 3D Projects .....</b>	<b>6-4</b>
Single-Design Drawing Projects .....	6-4
Multiple Drawings Sharing Data through Shortcuts .....	6-4
Multiple Drawings Sharing Data with Autodesk Vault .....	6-4
<b>6.2 Sharing Data .....</b>	<b>6-5</b>
<b>Section 2: Data Shortcuts .....</b>	<b>6-7</b>
<b>6.3 Data Shortcuts .....</b>	<b>6-8</b>
Update Notification.....	6-9
Removing and Promoting Shortcuts .....	6-10
eTransmit Data References .....	6-10
Data Shortcut Workflow .....	6-11
Workflow Details .....	6-12
Advantages of Data Shortcuts .....	6-12
Limitations of Data Shortcuts .....	6-12
<b>Practice 6a Data Shortcuts Part I .....</b>	<b>6-13</b>
<b>Practice 6b Data Shortcuts Part II .....</b>	<b>6-18</b>
<b>Practice 6c Data Shortcuts Part III.....</b>	<b>6-29</b>
<b>Section 3: Vault .....</b>	<b>6-33</b>
<b>6.4 Vault Overview.....</b>	<b>6-34</b>
Key Terms.....	6-34
Vault Architecture.....	6-35
<b>6.5 Using the Vault Client .....</b>	<b>6-41</b>
Status Symbols in Civil 3D Toolspace .....	6-41
Vault Workflow .....	6-43
<b>Practice 6d Vault Client .....</b>	<b>6-45</b>
<b>Practice 6e Setting up the Vault - Part I .....</b>	<b>6-47</b>
<b>Practice 6f Working with Vault - Part II .....</b>	<b>6-51</b>
<b>Module 7 Profiles Level 1 .....</b>	<b>7-1</b>
<b>Section 1: Civil 3D Profiles.....</b>	<b>7-3</b>
<b>7.1 Profiles Overview .....</b>	<b>7-4</b>
Repositioning and Deleting Profile Views .....	7-5
<b>7.2 Create Profiles from Surface .....</b>	<b>7-6</b>
<b>7.3 Create Profile View Wizard .....</b>	<b>7-8</b>
<b>Practice 7a Working with Profiles Part I .....</b>	<b>7-13</b>
<b>7.4 Finished Ground Profiles.....</b>	<b>7-21</b>
<b>7.5 Create and Edit Profiles .....</b>	<b>7-22</b>
Transparent Commands .....	7-23

Assigning Profile Band Elevations .....	7-24
Profile Segment Types .....	7-24
Profile Labels .....	7-24
<b>Practice 7b Working with Profiles Part II.....</b>	<b>7-26</b>
<b>Module 8 Corridors Level 1 .....</b>	<b>8-1</b>
<b>Section 1: Civil 3D Assemblies .....</b>	<b>8-3</b>
<b>8.1 Assembly Overview .....</b>	<b>8-4</b>
Assemblies .....	8-4
Subassemblies .....	8-4
<b>8.2 Modifying Assemblies .....</b>	<b>8-7</b>
Attaching Subassemblies .....	8-7
Detaching Subassemblies .....	8-9
Copying Assemblies .....	8-9
Mirroring Assemblies .....	8-9
Sharing Assemblies .....	8-9
Getting More Information on Subassemblies.....	8-9
<b>Practice 8a Creating Assemblies .....</b>	<b>8-10</b>
<b>Section 2: Civil 3D Corridors .....</b>	<b>8-25</b>
<b>8.3 Creating a Corridor .....</b>	<b>8-26</b>
Target Mapping .....	8-27
<b>8.4 Corridor Properties .....</b>	<b>8-28</b>
Information Tab.....	8-28
Parameters Tab .....	8-28
Codes .....	8-29
Feature Lines.....	8-30
Slope Patterns .....	8-30
<b>Practice 8b Working with Corridors Part I.....</b>	<b>8-31</b>
<b>Practice 8c Working with Corridors Part II.....</b>	<b>8-38</b>
<b>8.5 Corridor Surfaces.....</b>	<b>8-55</b>
Overhang Correction .....	8-55
Surface Boundaries .....	8-56
<b>8.6 Corridor Section Review and Edit .....</b>	<b>8-57</b>
<b>Practice 8d Working with Corridors Part II.....</b>	<b>8-59</b>
<b>Module 9 Grading Level 1.....</b>	<b>9-1</b>
<b>Section 1: Grading Overview .....</b>	<b>9-3</b>
<b>9.1 Grading Overview .....</b>	<b>9-4</b>
Feature Line Contextual Tab .....	9-5
Elevation Editor.....	9-6
Grading Creation Tools Toolbar .....	9-7
<b>9.2 Configuring AutoCAD Civil 3D Grading.....</b>	<b>9-8</b>

Grading Styles .....	9-8
Feature Line Labels .....	9-8
Grading Criteria.....	9-8
Grading Criteria Set .....	9-9
Grading Volumes .....	9-9
<b>Practice 9a Pond Grading Part I - Create Existing Site Conditions .....</b>	<b>9-10</b>
<b>Practice 9b Pond Grading Part II .....</b>	<b>9-20</b>
<b>Practice 9c Grading the Proposed Pond .....</b>	<b>9-29</b>
<b>Module 10 Pipe Networks Level 1 .....</b>	<b>10-1</b>
<b>Section 1: Pipe Networks Overview .....</b>	<b>10-3</b>
<b>10.1 Pipes Overview .....</b>	<b>10-4</b>
<b>10.2 Pipes Configuration .....</b>	<b>10-5</b>
<b>10.3 The Network Layout Toolbar .....</b>	<b>10-13</b>
<b>10.4 Creating Networks from Objects.....</b>	<b>10-15</b>
<b>Practice 10a Creating Pipe Networks.....</b>	<b>10-16</b>
<b>Section 2: Pipe Networks Editing and Annotation.....</b>	<b>10-26</b>
<b>10.5 Network Editing .....</b>	<b>10-27</b>
Pipe (and Structure) Properties .....	10-27
Swap Part .....	10-28
Connect / Disconnect From Part.....	10-28
<b>10.6 Annotating Pipe Networks .....</b>	<b>10-29</b>
Pipe Networks in Sections .....	10-30
Pipe Network Reports and Tables .....	10-30
<b>Practice 10b Pipe Networks Editing and Annotating....</b>	<b>10-31</b>
<b>Module 11 Quantity Take Off/Sections Level 1.....</b>	<b>11-1</b>
<b>Section 1: Sections .....</b>	<b>11-3</b>
<b>11.1 Sample Line Groups.....</b>	<b>11-4</b>
Modifying Sample Line Groups.....	11-7
<b>Practice 11a Creating Sections Part I.....</b>	<b>11-8</b>
<b>11.2 Section Views .....</b>	<b>11-15</b>
Section View Wizard .....	11-15
<b>Practice 11b Creating Sections Part II .....</b>	<b>11-18</b>
<b>Section 2: Quantity Take Off.....</b>	<b>11-23</b>
<b>11.3 Section Volume Calculations .....</b>	<b>11-24</b>
Earthwork Volumes.....	11-24
Mass Haul.....	11-25
Material Volumes .....	11-25
Quantity Takeoff Criteria .....	11-25

Define Materials.....	11-26
<b>Practice 11c Quantity Take Off Part I.....</b>	<b>11-27</b>
<b>Practice 11d Quantity Take Off Part II - Integrated Quantity Takeoff.....</b>	<b>11-36</b>
<b>Module 12 Plan Production Level 1.....</b>	<b>12-1</b>
<b>Section 1: Productivity Tools .....</b>	<b>12-3</b>
<b>12.1 Plan Production Tools .....</b>	<b>12-4</b>
Overview.....	12-4
More Information.....	12-5
<b>12.2 Plan Production Objects .....</b>	<b>12-6</b>
View Frames.....	12-6
View Frame Groups.....	12-7
Match Lines .....	12-7
<b>12.3 Plan Production Object Edits.....</b>	<b>12-8</b>
Name .....	12-8
Description.....	12-8
Object style.....	12-8
View Frame Geometry Properties Edits .....	12-8
Match Line Geometry Properties Edits.....	12-9
<b>Practice 12a Plan Production Tools I.....</b>	<b>12-10</b>
<b>12.4 Creating Sheets.....</b>	<b>12-18</b>
<b>Practice 12b Plan Production Tools II .....</b>	<b>12-19</b>
<b>12.5 Sheet Sets.....</b>	<b>12-28</b>
Structuring Sheet Sets.....	12-29
Editing Sheet Sets .....	12-29
Sheet Set Manager Properties .....	12-30
<b>Practice 12c Plan Production Tools III.....</b>	<b>12-33</b>
<b>Appendix A Design Data .....</b>	<b>A-1</b>
<b>A.1 Set Up Data Shortcuts Working Folder.....</b>	<b>A-3</b>
<b>A.2 Design Data .....</b>	<b>A-5</b>
Parcel Size.....	A-5
Pipe Size Conversion .....	A-5
Road Design Criteria .....	A-6
Traffic Circle Design Criteria.....	A-14
Intersection Design.....	A-15
<b>A.3 Drawing Settings.....</b>	<b>A-16</b>