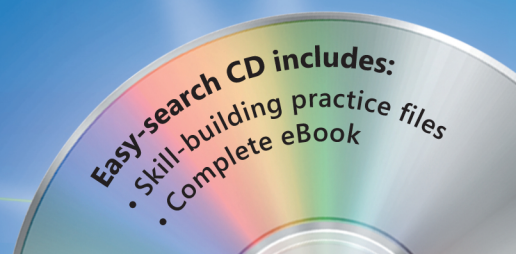
Microsoft

Step by Step

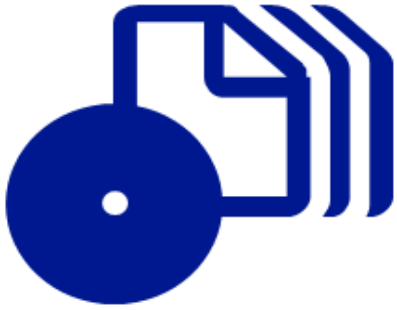
Microsoft® Office Project 2007

Build *exactly* the skills you need.
Learn at the pace *you* want.

Carl Chatfield, PMP
Timothy Johnson, MCP



How to access your CD files



The print edition of this book includes a CD. To access the CD files, go to http://aka.ms/623057/files, and look for the Downloads tab.

Note: Use a desktop web browser, as files may not be accessible from all ereader devices.

Questions? Please contact: mspinput@microsoft.com

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Part 1 **Managing a Simple Project**

Information for Readers Running Windows XP

The graphics and the operating system–related instructions in this book reflect the Windows Vista user interface. However, Windows Vista is not required; you can also use a computer running Microsoft Windows XP.

Most of the differences you will encounter when working through the exercises in this book on a computer running Windows XP center around appearance rather than functionality. For example, the Windows Vista Start button is round rather than rectangular and is not labeled with the word Start; window frames and window-management buttons look different; and if your system supports Windows Aero, the window frames might be transparent.

In this section, we provide steps for navigating to or through menus and dialog boxes in Windows XP that differ from those provided in the exercises in this book. For the most part, these differences are small enough that you will have no difficulty in completing the exercises.

Managing the Practice Files

The instructions given in the "Using the Book's CD" section are specific to Windows Vista. The only differences when installing, using, uninstalling, and removing the practice files supplied on the companion CD are the default installation location and the uninstall process.

On a computer running Windows Vista, the default installation location of the practice files is *Documents\Microsoft Press\Project 2007 SBS*. On a computer running Windows XP, the default installation location is *My Documents\Microsoft Press\Project 2007 SBS*. If your computer is running Windows XP, whenever an exercise tells you to navigate to your *Documents* folder, you should instead go to your *My Documents* folder.

To uninstall the practice files from a computer running Windows XP:

1. On the Windows taskbar, click the **Start** button, and then click **Control Panel**.
2. In **Control Panel**, click (or in Classic view, double-click) **Add or Remove Programs**.

3. In the **Add or Remove Programs** window, click **Microsoft Office Project 2007 Step by Step**, and then click **Remove**.
4. In the **Add or Remove Programs** message box asking you to confirm the deletion, click **Yes**.

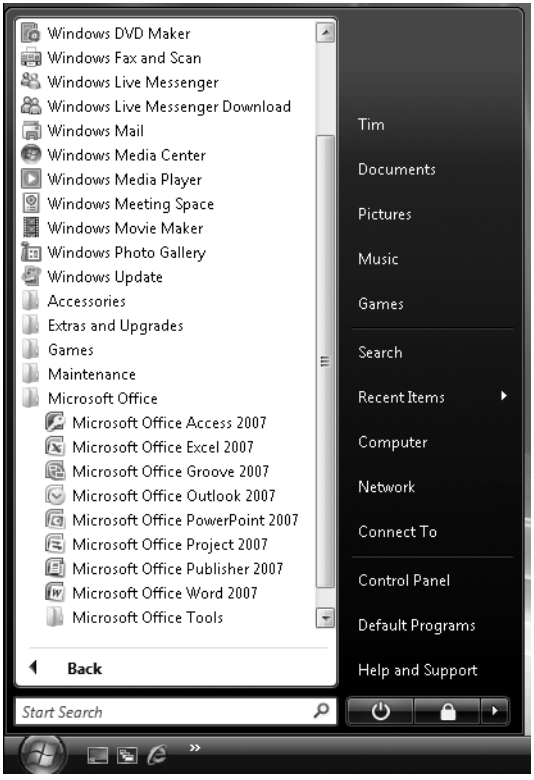
> **Important** If you need help installing or uninstalling the practice files, please see the "Getting Help" section later in this book. Microsoft Product Support Services does not provide support for this book or its companion CD.

Using the Start Menu

To start Microsoft Office Project 2007 on a computer running Windows XP:

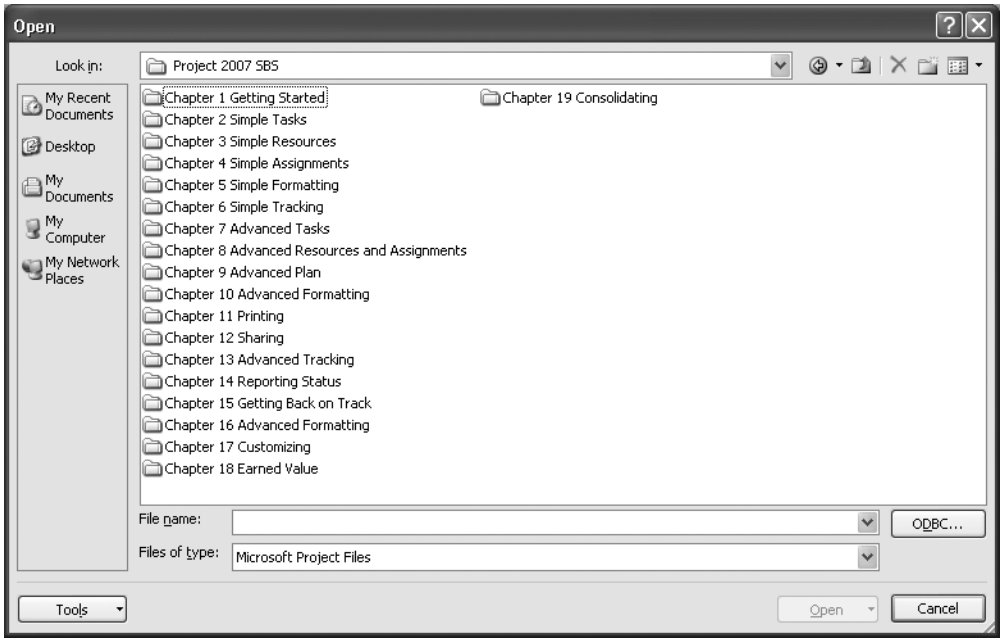
- Click the **Start** button, point to **All Programs**, click **Microsoft Office**, and then click **Microsoft Office Project 2007**.

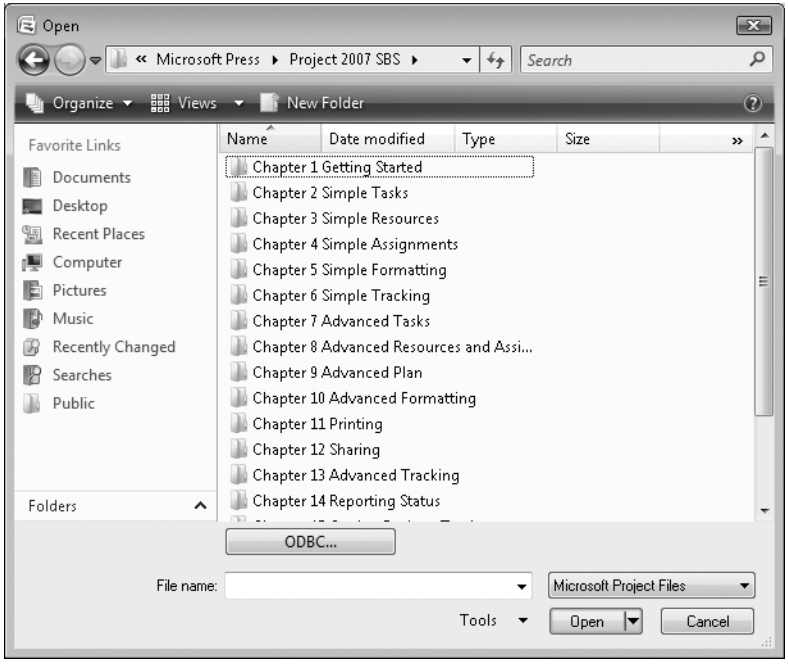
Folders on the Windows Vista Start menu expand vertically. Folders on the Windows XP Start menu expand horizontally. You will notice this variation between the images shown in this book and your Start menu.



Navigating Dialog Boxes

On a computer running Windows XP, some of the dialog boxes you will work with in the exercises not only look different from the graphics shown in this book but also work differently. These dialog boxes are primarily those that act as an interface between Project and the operating system, including any dialog box in which you navigate to a specific location. For example, here are the Open dialog boxes from Project 2007 running on Windows Vista and Windows XP and some examples of ways to navigate in them.


Open
Look in:
Project 2007 SBS
My Recent Documents
Desktop
My Documents
My Computer
My Network Places
Chapter 1 Getting Started
Chapter 2 Simple Tasks
Chapter 3 Simple Resources
Chapter 4 Simple Assignments
Chapter 5 Simple Formatting
Chapter 6 Simple Tracking
Chapter 7 Advanced Tasks
Chapter 8 Advanced Resources and Assignments
Chapter 9 Advanced Plan
Chapter 10 Advanced Formatting
Chapter 11 Printing
Chapter 12 Sharing
Chapter 13 Advanced Tracking
Chapter 14 Reporting Status
Chapter 15 Getting Back on Track
Chapter 16 Advanced Formatting
Chapter 17 Customizing
Chapter 18 Earned Value
Chapter 19 Consolidating
File name:
ODBC...
Files of type:
Microsoft Project Files
Tools
Open
Cancel


Open
Microsoft Press ▸ Project 2007 SBS ▸
Search
Organize
Views
New Folder
Favorite Links
Documents
Desktop
Recent Places
Computer
Pictures
Music
Recently Changed
Searches
Public
Folders
Name
Date modified
Type
Size
Chapter 1 Getting Started
Chapter 2 Simple Tasks
Chapter 3 Simple Resources
Chapter 4 Simple Assignments
Chapter 5 Simple Formatting
Chapter 6 Simple Tracking
Chapter 7 Advanced Tasks
Chapter 8 Advanced Resources and Assi...
Chapter 9 Advanced Plan
Chapter 10 Advanced Formatting
Chapter 11 Printing
Chapter 12 Sharing
Chapter 13 Advanced Tracking
Chapter 14 Reporting Status
ODBC...
File name:
Microsoft Project Files
Tools
Open
Cancel

To navigate to the **Chapter 2 Simple Tasks** folder in Windows Vista:

- In the **Favorite Links** pane, click **Documents**. Then in the folder content pane, double-click **Microsoft Press**, **Project 2007 SBS**, and double-click **Chapter 2 Simple Tasks**.

To move back to the **Project 2007 SBS** folder in Windows Vista:

- In the upper-left corner of the dialog box, click the **Back** button.

To navigate to the **Chapter 2 Simple Tasks** folder in Windows XP:

- On the **Places** bar, click **My Documents**. Then in the folder content pane, double-click **Microsoft Press**, **Project 2007 SBS**, and double-click **Chapter 2 Simple Tasks**.

To move back to the **Project 2007 SBS** folder in Windows XP:

- On the toolbar, click the **Up One Level** button.

Features and Conventions of This Book

This book has been designed to lead you step-by-step through all the tasks you are most likely to want to perform in Microsoft Office Project 2007. If you start at the beginning and work your way through all the exercises, you will gain enough proficiency to be able to create and work with Project files. However, each topic is self contained. If you have worked with a previous version of Project, or if you completed all the exercises and later need help remembering how to perform a procedure, the following features of this book will help you look up specific tasks in Project 2007:

- Detailed table of contents. Get an overview of which topics are discussed in which chapters.
- Chapter thumb tabs. Easily open the book at the beginning of the chapter you want.
- Topic-specific running heads. Within a chapter, quickly locate the topic you want by looking at the running head of odd-numbered pages.
- Quick Reference. Refresh your memory about a task while working with your own documents.
- Detailed index. Look up specific tasks and features in the index, which has been carefully crafted with the reader in mind.
- Companion CD. Use to install the practice files needed for the step-by-step exercises, but also as a source of other useful information, including an online, searchable version of this book.

In addition, we provide a glossary of terms for those times when you need to look up the meaning of a word or the definition of a concept.

You can save time when you use this book by understanding how the Step by Step series shows special instructions, keys to press, buttons to click, and so on.

Convention	Meaning
	This icon indicates a reference to the book's companion CD.

BE SURE TO	This paragraph preceding or following a step-by-step exercise indicates any prerequisite requirements that you should attend to before beginning the exercise, or actions you should take to restore your system after completing the exercise.
OPEN	This paragraph preceding a step-by-step exercise indicates files that you should open before beginning the exercise.
CLOSE	This paragraph following a step-by-step exercise provides instructions for closing open files or programs before moving on to another topic.
1 **2**	Blue numbered steps guide you through step-by-step exercises and procedures in the "Quick Reference."
1 **2**	Black numbered steps guide you through procedures in sidebars and topic introductions.
●	A single solid blue circle indicates an exercise that has only one step.
See Also	These paragraphs direct you to more information about a given topic in this book or elsewhere.
Troubleshooting	These paragraphs explain how to fix a common problem that might prevent you from continuing with an exercise.
Tip	These paragraphs provide a helpful hint or shortcut that makes working through a task easier, or information about other available options.
Important	These paragraphs point out information that you need to know to complete a procedure.
 Save	The first time you are told to click a button in an exercise, a picture of the button appears in the left margin. If the name of the button does not appear on the button itself, the name appears under the picture.
Enter	In step-by-step exercises, keys you must press appear in key-shaped boxes.
Ctrl + Home	A plus sign (+) between two key names means that you must hold down the first key while you press the second key. For example, "press Ctrl+Home" means "hold down the Ctrl key while you press the Home key."
Program interface elements	In steps, the names of program elements, such as buttons, commands, and dialog boxes, are shown in black bold characters.
User input	Anything you are supposed to type appears in blue bold characters.
Glossary terms	Terms that are explained in the glossary at the end of the book are shown in blue italic characters.

Getting Help

Every effort has been made to ensure the accuracy of this book and the contents of its companion CD. If you do run into problems, please contact the sources listed below for assistance.

Errata and Book Support

If you find an error, please report it on our Microsoft Press site:

1. Go to www.microsoftpressstore.com.

2. In the Search box, enter the book's ISBN or title.

3. Select your book from the search results.

4. On your book's catalog page, find the Errata & Updates tab.

5. Click View/Submit Errata.

You'll find additional information and services for your book on its catalog page. If you need additional support, please e-mail Microsoft Press Book Support at *mspinput@microsoft.com*.

If for any reason you are unable to install the practice files from the CD, the files can also be downloaded from the Web here:

http://www.microsoftpressstore.com/title/9780735623057 ▫

Please note that product support for Microsoft software is not offered through the addresses above. For software assistance, visit *support.microsoft.com*.

Getting Help with Project 2007

If your question is about Microsoft Office Project 2007, and not about the content of this Microsoft Press book, your first recourse is the Project Help system. This system is a combination of tools and files stored on your computer when you installed Project 2007 and, if your computer is connected to the Internet, information available from Microsoft Office Online. There are several ways to find general or specific Help information:

- To find out about an item on the screen, you can display a ***ScreenTip***. For example, to display a ScreenTip for a button, point to the button without clicking it. The

ScreenTip gives the button's name and the associated keyboard shortcut if there is one.

- In the Project program window, you can also type a question into the Search box in the upper right corner of the Project window. The Search box initially contains the text *Type a question for help*. You can also click the Microsoft Office Project Help command on the Help menu.
- After opening a dialog box, you can click the Help button to display the Project Help window with topics related to the functions of that dialog box already identified.

More Information

If your question is about Microsoft Office Project 2007 or another Microsoft software product and you cannot find the answer in the product's Help, please search the appropriate product solution center or the Microsoft Knowledge Base at:

support.microsoft.com

In the United States, Microsoft software product support issues not covered by the Microsoft Knowledge Base are addressed by Microsoft Product Support Services. Location-specific software support options are available from:

support.microsoft.com/gp/selfoverview/

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At Microsoft Press, your satisfaction is our top priority, and your feedback our most valuable asset. Please tell us what you think of this book at:

http://www.microsoft.com/learning/booksurvey

The survey is short, and we read every one of your comments and ideas. Thanks in advance for your input!

Stay in Touch

Let's keep the conversation going! We're on Twitter:

http://twitter.com/MicrosoftPress

Using the Book's CD

The companion CD included with this book contains the practice files you'll use as you work through the book's exercises, as well as other electronic resources that will help you learn how to use Microsoft Office Project 2007.

What's on the CD?

The following table lists the practice files supplied on the book's CD.

Chapter	Files
Chapter 1: Getting Started with Project	(no practice file)
Chapter 2: Creating a Task List	Wingtip Toys Commercial 2a
Chapter 3: Setting Up Resources	Wingtip Toys Commercial 3a
Chapter 4: Assigning Resources to Tasks	Wingtip Toys Commercial 4a
Chapter 5: Formatting and Printing Your Plan	Wingtip Toys Commercial 5a, Logo.gif
Chapter 6: Tracking Progress on Tasks	Wingtip Toys Commercial 6a
Chapter 7: Fine-Tuning Task Details	Short Film Project 7a
Chapter 8: Fine-Tuning Resource and Assignment Details	Short Film Project 8a
Chapter 9: Fine-Tuning the Project Plan	Short Film Project 9a
Chapter 10: Organizing and Formatting Project Details	Short Film Project 10a
Chapter 11: Printing Project Information	Short Film Project 11a
Chapter 12: Sharing Project Information with Other Programs	Short Film Project 12a, Letter to Client.rtf, Sample Task Lists.xls

Chapter 13: Tracking Progress on Tasks and Assignments	Short Film Project 13a, Short Film Project 13b, Short Film Project 13c, Short Film Project 13d
Chapter 14: Viewing and Reporting Project Status	Short Film Project 14a
Chapter 15: Getting Your Project Back on Track	Short Film Project 15a
Chapter 16: Applying Advanced Formatting	Parnell Film 16a
Chapter 17: Customizing Project	Parnell Aerospace Promo 17a, Wingtip Toys Commercial 17b
Chapter 18: Measuring Performance with Earned Value Analysis	Short Film Project 18a
Chapter 19: Consolidating Projects and Resources	Wingtip Toys Commercial 19a, Parnell Aerospace Promo 19b
Chapter 20: Planning Work with Project Server	(no practice files)
Chapter 21: Tracking Work with Project Server	(no practice files)
Chapter 22: Managing Risks, Issues, and Documents with Project Server	(no practice files)

In addition to the practice files, the CD contains some exciting resources that will really enhance your ability to get the most out of using this book and Project 2007, including the following:

- *Microsoft Office Project 2007 Step by Step* in eBook format
- *Microsoft Computer Dictionary*, Fifth Edition eBook
- *First Look 2007 Microsoft Office System* (Katherine Murray, 2006)
- Sample chapter and poster from *Look Both Ways: Help Protect Your Family on the Internet* (Linda Criddle, 2007)

Important The companion CD for this book does not contain the Project 2007 software. You should purchase and install that program before using this book.

Minimum System Requirements

2007 Microsoft Office System

The 2007 Microsoft Office system includes the following programs:

- Microsoft Office Access 2007
- Microsoft Office Communicator 2007
- Microsoft Office Excel 2007
- Microsoft Office Groove 2007
- Microsoft Office InfoPath 2007
- Microsoft Office OneNote 2007
- Microsoft Office Outlook 2007
- Microsoft Office Outlook 2007 with Business Contact Manager
- Microsoft Office PowerPoint 2007
- Microsoft Office Publisher 2007
- Microsoft Office Word 2007

No single edition of the 2007 Office system installs all of the above programs. Specialty programs available separately include Microsoft Office Project 2007, Microsoft Office SharePoint Designer 2007, and Microsoft Office Visio 2007.

To run Project Standard or Professional, your computer needs to meet the following minimum requirements:

- 700 megahertz (MHz) processor or higher
- 512 megabytes (MB) RAM or higher
- CD or DVD drive
- 1.5 gigabyte (GB) hard disk space necessary for install; a portion of this disk space will be freed if you select the option to delete the installation files

> **Tip** Hard disk requirements will vary depending on configuration; custom installation choices may require more or less hard disk space.

- Monitor with minimum 800x600 screen resolution; 1024x768 or higher recommended

- Keyboard and mouse or compatible pointing device
- Internet connection, 128 kilobits per second (Kbps) or greater, for download and activation of products, accessing Microsoft Office Online and online Help topics, and any other Internet-dependent processes
- Windows Vista or later, Microsoft Windows XP with Service Pack (SP) 2 or later, or Microsoft Windows Server 2003 or later
- Windows Internet Explorer 6.0 or later for Internet functionality

Installing the Practice Files

You need to install the practice files in the correct location on your hard disk before you can use them in the exercises. Follow the steps bellow.

> **Note** If for any reason you are unable to install the practice files from the CD, the files can also be downloaded from the Web at *http://wwww.microsoftpressstore.com/title/9780735623057*

1. Remove the companion CD from the envelope at the back of the book, and insert it into the CD drive of your computer.

   The Step By Step Companion CD License Terms appear. Follow the on-screen directions. To use the practice files, you must accept the terms of the license agreement. After you accept the license agreement, a menu screen appears.

   > **Important** If the menu screen does not appear, click the Start button and then click Computer. Display the Folders list in the Navigation Pane, click the icon for your CD drive, and then in the right pane, double-click the StartCD executable file.

2. Click **Install Practice Files**.
3. Click **Next** on the first screen, and then click **Next** to accept the terms of the license agreement on the next screen.
4. If you want to install the practice files to a location other than the default folder (*Documents\Microsoft Press\Project 2007 SBS*), click the **Change** button, select the new drive and path, and then click **OK**.

> **Important** If you install the practice files to a location other than the default, you will need to substitute that path within the exercises.

5. Click **Next** on the **Choose Destination Location** screen, and then click **Install** on the **Ready to Install the Program** screen to install the selected practice files.
6. After the practice files have been installed, click **Finish**.
7. Close the **Step by Step Companion CD** window, remove the companion CD from the CD drive, and return it to the envelope at the back of the book.

Using the Practice Files

When you install the practice files from the companion CD that accompanies this book, the files are stored on your hard disk in chapter-specific subfolders under *Documents**Microsoft Press**Project 2007 SBS*. Each chapter includes a paragraph that lists the files needed for that exercise and explains any preparations needed before you start working through the exercise. Here is an example:

OPEN Short Film Project 9a from the *Documents**Microsoft Press**Project 2007 SBS**Chapter 9 Advanced Plan* folder.

You can browse to the practice files in Windows Explorer by following these steps:

1. On the Windows taskbar, click the **Start** button, and then click **All Programs**.
2. Next, click **Microsoft Press**, click **Project 2007 Step By Step**, and then select a specific chapter folder.

Removing and Uninstalling the Practice Files

You can free up hard disk space by uninstalling the practice files that were installed from the companion CD. The uninstall process deletes any files that you created in the chapter-specific folders while working through the exercises. Follow these steps:

1. On the Windows taskbar, click the **Start** button, and then click **Control Panel**.
2. In **Control Panel**, under **Programs**, click the **Uninstall a program** task.

3. In the **Programs and Features** window, click **Microsoft Office Project 2007 Step by Step**, and then on the toolbar at the top of the window, click the **Uninstall** button.
4. If the **Programs and Features** message box asking you to confirm the deletion appears, click **Yes**.

Important Microsoft Product Support Services does not provide support for this book or its companion CD.

Quick Reference

1 Getting Started with Project

To Start Project Standard, page 6

1. On the Windows taskbar, click the Start button.
2. On the Start menu, point to All Programs, click Microsoft Office, and then click Microsoft Office Project 2007.

To start Project Professional and work offline, page 12

1. On the Windows taskbar, click the Start button.
2. On the Start menu, point to All Programs, click Microsoft Office, and then click Microsoft Office Project 2007.
3. If the Project Server Security Login dialog box appears, click Cancel.
4. In the Login dialog box, in the Profile box, select Computer, and then click Work Offline.

To create a project plan from a template, page 15

1. On the File menu, click New.
2. In the New Project task pane, under Template, click On computer.
3. In the Templates dialog box, click the Project Templates tab.
4. Click the template you want, and then click OK.

To switch to a different view, page 17

1. On the View menu, click the name of the view you want.
2. If the view is not listed, click More Views. In the More Views dialog box, click the name of the view you want, and click Apply.

To view a report in the Print Preview window, page 23

1. On the Report menu, click Reports.
2. Click a report category, or to see all reports, click Custom, and then click Select.
3. Select the report you want, and then click Select or Preview.

To create a visual report, page 25

1. On the Report menu, click Visual Reports.
2. Click a visual report tab, and then click the visual report you want.
3. Click View.

To create a new project plan and set its start date, page 28

1. On the File menu, click New.
2. In the New Project task pane, click Blank Project.
3. On the Project menu, click Project Information.
4. In the Start Date box, type or select the project start date you want.
5. Click OK.

To set nonworking time, page 30

1. On the Tools menu, click Change Working Time.
2. In the For Calendar box, select the base calendar you want to edit (normally Standard).
3. In the Name field on the Exceptions tab, enter a descriptive name for the nonworking time, such as Holiday.
4. In the Start and Finish fields, type or select the start and finish dates for the nonworking timespan.
5. Click OK.

To enter properties about a Project plan, page 32

1. On the File menu, click Properties.
2. In the Properties dialog box, click the Summary tab, and then enter the information you want.

2 Creating a Task List

To enter task names, page 38

1. In a task view, such as the Gantt Chart view, click a cell in the Task Name column.
2. Enter a task name and then press Enter.

To enter task durations, page 42

1. In a task view, such as the Gantt Chart view, click a cell in the Duration column.
2. Type the task duration, and then press Enter.

To enter a milestone, page 44

1. On the Entry table, enter a name for the milestone.
2. In the Duration field, type 0d, and then press Enter.

To organize tasks into phases, page 46

1. Select the names of tasks that you would like to become subtasks of a summary task.
2. On the Project menu, point to Outline, and then click Indent.

To link adjacent tasks, page 49

1. Select the adjacent tasks.
2. On the Edit menu, click Link tasks.

To link nonadjacent tasks, page 51

1. Select the first task, which will be the predecessor task.
2. While holding down the Ctrl key, select the second task. This will be the successor task.
3. On the Edit menu, click Link tasks.

To enter a task note, page 53

1. Select the name of a task.
2. On the Project menu, click Task Notes.
3. In the Notes box, type the note you want, and then click OK.

To enter a task hyperlink, page 54

1. Select the name of a task.
2. On the Insert menu, click Hyperlink.
3. In the Text to display box, type the text you want to appear when you hover over the hyperlink.
4. In the Address box, type the destination hyperlink you want, and then click OK.

To check a project plan's duration and other statistics, page 55

1. On the Project menu, click Project Information.
2. In the Project Information dialog box, click Statistics.

To display the project's entire duration in the Gantt Chart view, page 56

1. On the View menu, click Zoom.
2. Click Entire Project, and then click OK.

3 Setting Up Resources

To set up work (people and equipment) resources, page 61

1. On the View menu, click Resource Sheet (or another resource view).
2. In the Resource Name field, enter the resource's name.
3. In the Type field, click Work.
4. In the Max. Units field, type or click the maximum capacity of this resource to accomplish any task.
5. Enter whatever other resource information would be useful to your project.
6. Repeat steps 2 through 5 for each resource.

To set up material resources, page 66

1. On the View menu, click Resource Sheet.
2. In the Resource Name field, enter the material resource's name.
3. In the Type field, click Material.
4. In the Material Label field, enter the unit of measure you want to use for this resource. For example, you might measure cement in pounds or tons.
5. In the Std. Rate field, enter the cost per unit of measure for this material resource.
6. Enter whatever other resource information would be useful for our project.
7. Repeat steps 2 through 6 for each material resource.

To set up cost resources, page 67

1. On the View menu, click Resource Sheet.
2. In the Resource Name field, enter the cost resource's name.
3. In the Type field, click Cost.

To enter work (people and equipment) resource pay rates, page 68

1. On the View menu, click Resource Sheet.
2. In the Std. Rate field, enter the resource's pay rate per standard pay period (such as hourly, weekly, or monthly).
3. If the resource should accrue overtime pay, enter his or her overtime pay rate in the Ovt. Rate field.
4. If the resource accrues a per-use cost, enter that amount in the Cost/Use field.
5. In the Accrue At field, click the method by which the resource accrues cost.
6. Repeat steps 2 through 5 for each resource.

To make a one-time adjustment to an individual resource's working time, page 70

1. On the Tools menu, click Change Working Time.
2. In the For calendar box, click the name of the resource whose working time you want to change.
3. In the Name field on the Exceptions tab, enter a descriptive name for the nonworking time, such as Vacation.
4. In the Start and Finish fields, type or select the start and finish dates for the nonworking timespan.
5. Click OK.

To edit the regular work week for an individual resource, page 72

1. On the Tools menu, click Change Working Time.
2. In the For calendar box, click the name of the resource whose working time you want to change.
3. Click the Work Weeks tab in the Change Working Time dialog box.
4. Click [Default] or enter a new name and period, and then click Details.
5. Select the working time options you want for the work week, and then click OK.

To document resources with resource notes, page 74

1. Switch to a resource view, such as the Resource Sheet view.
2. Click the name of the resource for which you want to create a note.
3. On the Project menu, click Resource Notes.
4. In the Resource Information dialog box, type the note you want associated with this resource and then click OK.

4 Assigning Resources to Tasks

To assign resources to tasks, page 79

1. In a task view, such as the Gantt Chart view, on the Tools menu, click Assign Resources.
2. Click the name of the task to which you want to assign a resource.
3. In the Resource Name column of the Assign Resources dialog box, click a resource, and then click Assign.

To control how Project schedules the work on a task after assigning an additional resource, page 86

1. Assign an additional resource to a task.
2. Click the Smart Tag Actions button, and choose the action you want.

To assign material resources to tasks, page 90

1. On the Standard toolbar, click Assign Resources.
2. In the Gantt Chart view, click the name of the task to which you want to assign a material resource.
3. In the Resource Name column of the Assign Resources dialog box, click a resource, and in the Units column, enter the unit value you want.
4. Press Enter or click Assign.

To assign cost resources to tasks, page 92

1. On the Standard toolbar, click Assign Resources.
2. In the Gantt Chart view, click the name of the task to which you want to assign a cost resource.
3. In the Resource Name column of the Assign Resources dialog box, click a resource, and in the Cost column, enter the cost value you want.
4. Press Enter or click Assign.

5 Formatting and Printing Your Plan

To display the project summary task, page 99

1. On the Tools menu, click Options.
2. In the Options dialog box, click the View tab.
3. Under the Outline options for label, select the Show project summary task check box, and then click OK.

To create a new view based on an existing view, page 100

1. On the View menu, click More Views.
2. In the More Views dialog box, click the view's name, and then click Copy.
3. In the View Definition dialog box, enter a name for the new view.
4. Click OK.

To format Gantt bars with the Gantt Chart Wizard, page 101

1. On the Format menu, click Gantt Chart Wizard.
2. Follow the instructions that appear on your screen.

To draw a text box on a Gantt chart, page 106

1. On the View menu, point to Toolbars, and then click Drawing.

2. On the Drawing toolbar, click the Text Box button, and then drag a small box anywhere on the chart portion of a Gantt Chart view.
3. In the box you just drew, type the text you want.

To format a category of text in a view, page 109

1. On the Format menu, click Text Styles.
2. In the Item to Change list, click the type of text you want to format.
3. Select the font and other formatting options you want.

To format selected text in a view, page 111

1. Click the cell that contains the text you want to format.
2. On the Format menu, click Font.
3. Select the font and other formatting options you want.

To edit a report's header or footer, page 112

1. On the Report menu, click Reports.
2. Click a report category, or to see all reports, click Custom, and then click Select.
3. Select the report you want, and then click Select or Preview.
4. On the Print Preview toolbar, click Page Setup.
5. In the Page Setup dialog box, click the Header or Footer tab, and select the options you want.

6 Tracking Progress on Tasks

To set current values in a schedule as a baseline, page 124

1. On the Tools menu, point to Tracking, and then click Set Baseline.
2. Click OK.

To display the Variance table in the Task Sheet view, page 124

1. On the View menu, click More Views to display the More Views dialog box.
2. In the Views box, click Task Sheet, and click Apply.
3. On the View menu, point to Table: Entry, and click Variance.

To record project progress as scheduled, page 126

1. On the Tools menu, point to Tracking, and click Update Project.
2. In the Update Project dialog box, make sure the Update work as complete through option is selected. In the adjacent date list, type or click the date you want, and click OK.

To record a task's completion percentage, page 127

1. On the View menu, point to Toolbars, and then click Tracking.
2. Select the name of the task for which you want to record a percent complete.
3. Do one of the following:
   - To record a predefined percentage complete, click the 0%, 25%, 50%, 75%, or 100% Complete button.
   - To record some other percentage complete, click the Update Tasks button, and enter the value you want in the Percent Complete field.

To enter actual work values for tasks, page 129

1. In a task view, such as the Task Sheet view, on the View menu, point to Table: Entry, and click Work.
2. In the Actual field, enter the actual hours of work you want, and then press Enter.

To enter actual start and duration values for tasks, page 130

1. Click the task for which you want to enter actual values.
2. On the Tools menu, point to Tracking, and then click Update Tasks.
3. In the Start field in the Actual box on the left side of the Update Tasks dialog box, type or click the start date you want.
4. In the Actual dur field, type or click the duration value you want, and then click OK.

7 Fine-Tuning Task Details

To display what affects the scheduling of a task in the Task Drivers pane, page 140

1. On the Project menu, click Task Drivers.
2. Click the task for which you want to display Task Drivers details.

To enter lead and lag time between predecessor and successor tasks, page 141

1. Click the successor task whose lead or lag time with a predecessor you want to change.
2. On the Project menu, click Task Information.
3. In the Task Information dialog box, click the Predecessors tab.
4. In the Lag field for a predecessor task, enter the value you want (enter a positive value for lag time or a negative value for lead time).

To change task relationships, page 141

1. Click the successor task whose predecessor relationship you want to change.
2. On the Project menu, click Task Information.

3. In the Task Information dialog box, click the Predecessors tab.
4. Click in the Type column for a predecessor task, and click the type of task relationship you want.

To apply a constraint to a task, page 145

1. Click the task to which you want to apply a constraint.
2. On the Project menu, click Task Information.
3. In the Constraint Type box, select the constraint type you want.
4. If you selected date-driven constraint, in the Constraint Date box, type or select the constraint date you want, and then click OK.

To view a project's critical path, page 148

1. On the View menu, click More Views.
2. In the More Views dialog box, click Detail Gantt, and then click Apply.

To interrupt work on a task, page 150

1. On the Standard toolbar, click the Split Task button.
2. Move the mouse pointer over the task's Gantt bar where you want to start the split, click, and then drag to the right.

To create a new base calendar, page 153

1. On the Tools menu, click Change Working Time.
2. In the Change Working Time dialog box, click Create New Calendar.
3. In the Name box, type a name for the base calendar.
4. Click Create new base calendar, or click Make a copy of and then choose the base calendar on which you want to base the new calendar.
5. Click OK.
6. Select the Exceptions and Work Weeks details you want.

To apply a task calendar to a task, page 154

1. In the Gantt Chart view, click a task.
2. On the Project menu, click Task Information.
3. In the Task Information dialog box, click the Advanced tab.
4. In the Calendar box, choose the base calendar you want applied to this task.
5. If you want the task calendar to override resource calendar settings, click the Scheduling ignores resource calendars box.

To change a task type to fixed units, duration, or work, page 158

1. In a task view, such as the Gantt Chart view, click a task.
2. On the Project menu, click Task Information.
3. In the Task Information dialog box, click the Advanced tab.
4. In the Task Type box, click the task type you want.

To enter a deadline date on a task, page 161

1. In a task view, such as the Gantt Chart view, select the name of the task for which you want to enter a deadline.
2. On the Project menu, click Task Information.
3. Click the Advanced tab.
4. In the Deadline box, type or select the deadline date you want, and then click OK.

To enter a fixed cost, page 163

1. In a task view, such as the Gantt Chart view, on the View menu, point to Table: Entry, and then click Cost.
2. In the Fixed Cost field for the task you want, type or click an amount.
3. In the Fixed Cost Accrual field, choose a method, and then press Enter.

To create a recurring task, page 164

1. In a task view, such as the Gantt Chart view, click the task above which you want to insert a recurring task.
2. On the Insert menu, click Recurring Task.
3. In the Recurring Task Information dialog box, select the options you want.

8 Fine-Tuning Resource and Assignment Details

To create multiple pay rates for a resource, page 172

1. Switch to a resource view, such as the Resource Sheet view.
2. Click the name of the resource for whom you want to create an additional pay rate.
3. On the Project menu, click Resource Information.
4. In the Resource Information dialog box, click the Costs tab.
5. Under Cost rate tables, the resource's initial pay rate information appears on tab A. Click one of the other tabs, and then enter the rate information you want.
6. To apply a different cost rate table to a specific resource assignment, pick the one you want in the Cost Rate Tables field when you are in a usage view.

To create multiple pay rates that apply at different times, page 174

1. Switch to a resource view, such as the Resource Sheet view.
2. Click the name of the resource for whom you want to create an additional pay rate.
3. On the Project menu, click Resource Information.
4. In the Resource Information dialog box, click the Costs tab.
5. Click the tab of the rate you want to edit.
6. In the second or later row of the Effective Date column, enter the date on which the new pay rate is to take effect.
7. In the Standard Rate column (and, if applicable, the Overtime Rate or Per Use Cost columns), enter either a dollar amount or a positive or negative percentage of the existing pay rate. If you enter a percentage value, Project will calculate the new pay rate amount.

To customize a resource's availability over time, page 176

1. Switch to a resource view, such as the Resource Sheet view.
2. Click the name of the resource whose availability you want to change.
3. On the Project menu, click Resource Information.
4. In the Resource Information dialog box, click the General tab.
5. In the Resource Availability grid, enter the date ranges and unit values you want.

To delay the start of an assignment, page 178

1. On the View menu, click Task Usage or Resource Usage.
2. Click the assignment you want to delay.
3. On the Project menu, click Assignment Information.
4. In the Assignment Information dialog box, click the General tab.
5. In the Start box, type or click the date on which you want the selected resource to start work on the assignment, and then click OK.

To apply a work contour to an assignment, page 180

1. On the View menu, click Task Usage or Resource Usage.
2. Click the assignment for which you want to contour to an assignment.
3. On the Standard toolbar, click the Assignment Information button.
4. In the Assignment Information dialog box, click the General tab.
5. In the Work Contour box, click the contour you want, and then click OK.

To apply a different cost rate to an assignment, page 184

1. On the View menu, click Task Usage or Resource Usage.
2. Click the assignment for which you want to apply a different cost rate table.
3. On the Standard toolbar, click the Assignment Information button.
4. In the Assignment Information dialog box, click the General tab.
5. In the Cost Rate Table box, type or click the rate table you want to apply to this assignment, and then click OK.

9 Fine-Tuning the Project Plan

To view resource overallocations, page 193

- On the View menu, click More Views, click Resource Allocation, and then click Apply.

To manually resolve resource overallocations by changing assignment units, page 199

1. On the View menu, click More Views, click Resource Allocation, and then click Apply.
2. In the Resource Name column, click the name of an assignment for the resource you want to work with.
3. On the Standard toolbar, click the Assignment Information button.
4. In the Assignment Information dialog box, click the General tab.
5. In the Units box, enter the unit value you want, and then click OK.

To level overallocated resources, page 205

1. On the Tools menu, click Level Resources, and then choose the leveling options you want.
2. Click Level Now.

To examine project costs, page 210

1. On the View menu, click More Views, click Task Sheet, and then click Apply.
2. On the Tools menu, click Options.
3. In the Options dialog box, click the View tab.
4. Under the Outline options for label, select the Show project summary task check box, and then click OK.
5. On the View menu, point to Table: Entry, and click Cost.

To check a project's finish date, page 212

1. On the Project menu, click Project Information.
2. In the Project Information dialog box, click Statistics.

10 Organizing and Formatting Project Details

To sort data in a view, page 219

1. Switch to the view or table you want to sort.
2. On the Project menu, point to Sort, and then click the field by which you want to sort the view. To specify a custom sort, click Sort By, and in the Sort dialog box, choose the options you want.

To group data in a view, page 223

1. Switch to the view or table you want to group.
2. On the Project menu, point to Group By: No Group, and then choose the criteria by which you want to group the view. To specify different grouping options, click Customize Group By, and then choose the options you want in the Customize Group By dialog box.

To turn AutoFilter on or off, page 228

- On the Project menu, point to Filtered For: All Tasks, and then click AutoFilter.

To filter data in a view, page 228

1. Switch to the view you want to filter.
2. On the Project menu, point to Filtered For, and click More Filters.
3. In the More Filters dialog box, choose the filter you want, and then click Apply.

To create a custom filter, page 229

1. On the Project menu, point to Filtered For: All Tasks (for task views) or All Resources (for resource views), and then click More Filters.
2. In the More Filters dialog box, click New.
3. In the Filter Definition dialog box, select the options you want.

To remove a filter, page 231

- On the Project menu, point to Filtered For:<filter name>, and then click All Tasks (for task views) or All Resources (for resource views).

To create a custom table, page 231

1. On the View menu, point to Table: Entry, and then click More Tables.
2. Do one of the following:
   - To create a new table, click New.
   - To create a new table based on an exisiting table, select the task or resource table you want to use as a basis for a new custom table, and then click Copy.
3. In the Table Definition dialog box, select the options you want, and then click OK.

To create a custom view, page 235

1. On the View menu, click More Views.
2. In the More Views dialog box, do one of the following:
   - To create a view, click New. Click Single View or Combination View in the Define New View dialog box, and then click OK.
   - To redefine a view, click the view's name, and then click Edit.
   - To create a new view based on another view, click the view's name, and then click Copy.
3. In the View Definition dialog box, choose the options you want, and then click OK.

11 Printing Project Information

To see the page setup options for views, page 245

1. Switch to a view you want.
2. On the File menu, click Page Setup.

To see the page setup options for reports, page 247

1. On the View menu, click Reports.
2. In the Reports dialog box, click Custom, and then click Select.
3. In the Custom Reports dialog box, click a report, and then click Setup.

To preview a view before printing, page 249

- On the File menu, click Print Preview.

To work in the Print Preview window, page 249

1. On the File menu, click Print Preview.
2. Do one of the following:
   - To navigate between pages of a multi-page print job, click a page navigation button.

- To zoom out to see all pages of a print job, click Multiple Pages.
- To change page setup options, such as header or legend text, click Page Setup, and choose the options you want.
- To display the Print dialog box and set other options or to print what you see in the Print Preview window, click Print.
- To exit the Print Preview window, click Close.

To print a predefined report, page 254

1. On the View menu, click Reports.
2. In the Reports dialog box, click the category of report you want, and then click Select.
3. In the dialog box that appears next, click the specific report you want to print, and click Select.
4. In the Print Preview window, click Print.

To edit a predefined report, page 256

1. On the View menu, click Reports.
2. In the Reports dialog box, click the category of report you want, and then click Select (or for custom reports, click Preview).
3. In the dialog box that appears next, click the specific report you want to edit, and then click Edit.
4. In the dialog box that appears next, choose the options you want.

12 Sharing Project Information with Other Programs

To copy text from a Project table to the Windows Clipboard, page 262

1. Set up the table to display only the data you want to copy—for example, apply a filter or insert or hide columns.
2. Select the range of data you want to copy.
3. On the Edit menu, click Copy Cell, Copy Task, or Copy Resource.

To copy a snapshot of a view to the Windows Clipboard, page 264

1. Set up the view with the specific details you want such as tables, filters, or groups.
2. On the Report menu, click Copy Picture.
3. In the Copy Picture dialog box, click either For screen, to optimize the snapshot for online viewing, or For printer, to optimize it for printing.
4. Select whatever other options you want, and then click OK.

To open a file in a different format in Project, page 267

1. On the File menu, click Open.
2. In the Files of type box, click the file format you want.
3. Locate and click the specific file you want to open, and then click Open.
4. If the file you selected is not in Project format, the Import Wizard appears. Follow the instructions that appear on your screen.

To save a Project file in a different format, page 273

1. On the File menu, click Save As.
2. In the Save As dialog box, click the location, and enter the file name you want.
3. In the Save as type box, click the format you want, and then click Save.
4. Follow the instructions that appear on your screen in the Export Wizard.

To create a new Project summary report for Word, PowerPoint, or Visio, page 275

1. On the View menu, point to Toolbars, and click Analysis.
2. On the Analysis toolbar, click the Copy Picture to Office Wizard button, and then follow the instructions that appear on your screen.

To create a visual report with Excel or Visio, page 280

1. On the Report menu, click Visual Reports.
2. Under Show report templates created in, select the application for which you want to generate a visual report.
3. Select the tab that corresponds to the type of data you want in the visual report.
4. Select the visual report you want, and then click View.
5. In Excel or Visio, adjust the PivotTable (if Excel) or PivotDiagram (Visio) as needed.

13 Tracking Progress on Tasks and Assignments

To update a baseline, page 289

1. On the Tools menu, point to Tracking, and then click Set Baseline.
2. In the Set Baseline dialog box, select the baseline you want to update.
3. Under For, click either Entire project or Selected tasks.

To enter task-level or assignment-level actual work values, page 291

1. On the View menu, click Task Usage.
2. On the View menu, point to Table: Usage, and then click Work.
3. Enter the actual work values you want for a task or assignment in the Actual column.

To enter daily (or other time period's) actual work values per task or assignment, page 298

1. On the View menu, click Task Usage.
2. Scroll the timescale to the time period for which you want to record actual work.
3. On the Format menu, point to Details, and click Actual Work.
4. In the timescale grid, enter the task or assignment value you want in the Act. Work field.

To reschedule uncompleted work, page 304

1. On the Tools menu, point to Tracking, and then click Update Project.
2. Click Reschedule uncompleted work to start after, and in the Date box, type or click the date you want.

14 Viewing and Reporting Project Status

To identify tasks that have slipped in a view, page 312

- On the View menu, click Tracking Gantt.

To filter for tasks that have slipped, page 314

1. On the Project menu, point to Filtered For: All Tasks, and then click More Filters.
2. In the More Filters dialog box, click Slipping Tasks, and then click Apply.

To see schedule variance, page 315

1. On the View menu, click More Views.
2. In the More Views dialog box, click Task Sheet, and then click Apply.
3. On the View menu, point to Table: Entry, and then click Variance.

To see task costs in a view, page 319

1. On the View menu, click More Views.
2. In the More Views dialog box, click Task Sheet, and then click Apply.
3. On the View menu, point to Table: Entry, and click Cost.

To filter for tasks that are overbudget, page 320

1. On the Project menu, point to Filtered For: All Tasks, and then click More Filters.
2. In the More Filters dialog box, click Cost Overbudget, and then click Apply.

To see resource costs in a view, page 322

1. On the View menu, click Resource Sheet.
2. On the View menu, point to Table: Entry, and then click Cost.

To view and sort resources by cost, page 322

1. On the View menu, click Resource Sheet.
2. On the View menu, point to Table: Entry, and click Cost.
3. On the Project menu, point to Sort, and click Sort By.
4. In the Sort dialog box, in the Sort By box, click Cost.
5. Make sure the Permanently renumber resources check box is cleared, and then click Sort.

To view and sort resources by cost variance, page 323

1. On the View menu, click Resource Sheet.
2. On the View menu, point to Table: Entry, and click Cost.
3. On the Project menu, point to Sort, and click Sort By.
4. In the Sort dialog box, in the Sort By box, click Cost Variance.
5. Make sure the Permanently renumber resources check box is cleared, and then click Sort.

To customize fields for a custom view, page 325

1. On the Tools menu, point to Customize, and then click Fields.
2. In the Customize Fields dialog box, select the options you want.

15 Getting Your Project Back on Track

To edit resource assignments' work values, page 338

1. On the View menu, click Resource Usage.
2. In the Work column, edit the values you want.

To replace one resource with another, page 340

1. On the View menu, click Task Usage.
2. In the Task Name column, select the task for which you want to replace the resource.
3. On the Standard toolbar, click the Assign Resources button.

4. In the Assign Resources dialog box, in the Resource Name column, click the name of the resource you want to replace, and then click Replace.
5. In the Replace Resource dialog box, click the name of the replacement resource, and click OK.

To filter for critical tasks, page 343

- On the Project menu, point to Filtered For: All Tasks, and then click Critical.

To enter overtime work values in the Task Form, page 343

1. On the View menu, click Gantt Chart.
2. In the Task Name column, select the task you want.
3. On the Window menu, click Split.
4. Click anywhere in the Task Form. On the Format menu, point to Details, and then click Resource Work.
5. In the Ovt. Work column for the resource to which you want to assign overtime work, enter the number of hours of overtime work you want and then click OK.

16 Applying Advanced Formatting

To format bar styles in a Gantt Chart view, page 353

1. On the Format menu, click Bar Styles.
2. In the Bar Styles dialog box, select the options you want.

To display horizontal gridlines on the chart portion of a Gantt chart view, page 357

1. On the Format menu, click Gridlines.
2. In the Line to change box, make sure that Gantt Rows is selected, and then in the Type box, click the type of line you want.

To format box styles in the Network Diagram view, page 358

1. On the View menu, click Network Diagram.
2. On the Format menu, click Box Styles.
3. In the Box Styles dialog box, select the options you want.

To format bars in the Calendar view, page 362

1. On the View menu, click Calendar.
2. On the Format menu, click Bar Styles.
3. In the Bar Styles dialog box, select the options you want.

17 Customizing Project

To copy a custom element (such as a view or table) from one project plan to another through the Organizer, page 370

1. First open the project plan that contains the custom element (such as a custom table), and then open the project plan to which you want to copy the custom element.
2. On the Tools menu, click Organizer.
3. Click the tab name that corresponds to the type of custom element you want to copy.
4. In the <Custom Elements> available in drop-down list on the left side of the Organizer dialog box, click the name of the project plan that contains the custom element.
5. Click Copy.

To record a macro, page 374

1. On the Tools menu, point to Macro, and then click Record New Macro.
2. In the Macro name box, enter a name for the macro (no spaces allowed).
3. In the Store macro in box, click This Project to store the macro in the active project plan or Global File to store it in the global template.
4. Click OK.
5. Perform the actions you want recorded in the macro.
6. On the Tools menu, point to Macro, and then click Stop Recorder.

To run a macro, page 375

1. On the Tools menu, point to Macro, and then click Macros.
2. In the Macro name box, click the name of the macro you want to run, and then click Run.

To edit a macro in the Visual Basic Editor, page 377

1. On the Tools menu, point to Macro, and then click Macros.
2. In the Macro name box, click the name of the macro you want to edit, and then click Edit.
3. In the Visual Basic Editor, edit the macro.
4. On the File menu in the Visual Basic Editor, click Close and Return to Microsoft Project.

To create a custom toolbar, page 382

1. On the Tools menu, point to Customize, and then click Toolbars.
2. Click the Toolbars tab.
3. Click New.
4. In the Toolbar Name box, type the toolbar name you want, and then click OK.

To add a command to a custom toolbar, page 383

1. On the Tools menu, point to Customize, and then click Toolbars.
2. Click the Commands tab.
3. In the Categories list, click the category you want.
4. Drag the command you want from the Commands list to the custom toolbar.

To edit the graphic image and text that appears on a custom toolbar button, page 384

1. On the Tools menu, point to Customize, and then click Toolbars.
2. Click the Commands tab.
3. Click the custom button you want to modify on the custom toolbar.
4. Click Modify Selection, and then point to Change Button Image.
5. In the list of images that appears, click the image you want.
6. Click Modify Selection, and in the Name box, type the text you want for the custom button name.

18 Measuring Performance with Earned Value Analysis

To set the project status date, page 392

1. On the Project menu, click Project Information.
2. In the Project Information dialog box, in the Status Date box, type or click the status date you want, and click OK.

To view earned value schedule indicators, page 392

1. On the View menu, click More Views.
2. In the More Views dialog box, click Task Sheet, and then click Apply.
3. On the View menu, point to Table: Entry, and click More Tables.
4. In the More Tables dialog box, click Earned Value Schedule Indicators, and click Apply.

To view earned value cost indicators, page 394

1. On the View menu, click More Views.
2. In the More Views dialog box, click Task Sheet, and then click Apply.
3. On the View menu, point to Table: Entry, and click More Tables.
4. In the More Tables dialog box, click Earned Value Cost Indicators, and click Apply.

To create an Earned Value visual report, page 398

1. On the Report menu, click Visual Reports.
2. Click the Assignment Usage tab.
3. Click Earned Value Over Time.
4. In the Select level of usage data to include in the report box, select the time interval you want for reporting.
5. Click View.
6. In Excel, adjust the PivotTable and chart as needed.

19 Consolidating Projects and Resources

To create a resource pool, page 406

1. Create a new project plan.
2. Save the new project plan that will become a resource pool.
3. Open one of the project plans you want to make a sharer plan.
4. On the Tools menu, point to Resource Sharing, and click Share Resources.
5. Under Resources for <Sharer Plan Name>, click Use resources.
6. In the From list, click the name of your resource pool, and click OK to close the Share Resources dialog box.
7. If you have more than one sharer plan, open another sharer plan.
8. Repeat steps 3 through 7 for the other sharer plans.
9. Save changes to the sharer plans and the resource pool.

To view cross-project assignment details in the resource pool, page 410

1. On the View menu, click Resource Usage.
2. In the Resource Name column, click the name of a resource.
3. On the Window menu, click Split to display the Resource Form.

To update a resource's working time in the resource pool, page 413

1. Open the resource pool as read/write.
2. On the Tools menu, click Change Working Time.
3. In the For Calendar box, select the name of the resource whose working time you want to change.
4. In the Name field on the Exceptions tab, enter a descriptive name for the nonworking time, such as Vacation.
5. In the Start and Finish fields, type or select the start and finish dates for the nonworking timespan.
6. Click OK to close the Change Working Time dialog box.

To update working time for all sharer plans from the resource pool, page 417

1. Open the resource pool as read/write.
2. On the Tools menu, click Change Working Time.
3. In the Change Working Time dialog box, in the For calendar box, click the base calendar you want to change, such as Standard (Project Calendar).
4. In the Name field on the Exceptions tab, enter a descriptive name for the nonworking time, such as Holiday.
5. In the Start and Finish fields, type or select the start and finish dates for the nonworking timespan.
6. Click OK to close the Change Working Time dialog box.

To link new project files to the resource pool, page 420

1. Open the resource pool as read/write.
2. On the Standard toolbar, click the New button.
3. On the Tools menu, point to Resource Sharing, and click Share Resources.
4. In the Share Resources dialog box, under Resources for <File Name>, click Use resources.
5. In the From list, click the name of the resource pool, and click OK to close the Share Resources dialog box.
6. Save the sharer plan and resource pool.

To edit a sharer plan and update assignment details in the resource pool, page 422

1. Open a sharer plan.
2. When prompted, open the resource pool.
3. In the sharer plan, make changes to assignments.
4. On the Tools menu, point to Resource Sharing, and click Update Resource Pool.

To create a consolidated project plan, page 426

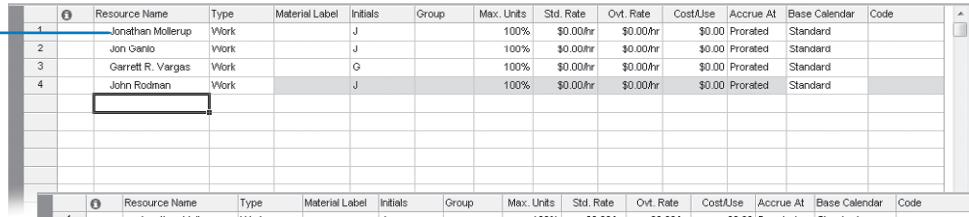
1. On the Standard toolbar, click the New button.
2. Save the new project plan.
3. On the Insert menu, click Project.
4. In the Insert Projects dialog box, locate and click the project plan you want to insert into the consolidated project plan. To select multiple plans, hold down the Ctrl key while you click the name of each plan.
5. Click Insert.

To create task dependencies between projects, page 429

1. Open the two project plans between which you want to create a task dependency.
2. Switch to the project plan that contains the task you want to make the successor task.
3. On the View menu, click Gantt Chart.
4. Click the name of the task you want to make the successor task.
5. On the Standard toolbar, click the Task Information button.
6. Click the Predecessors tab.
7. In the ID column, click the next empty cell below any other predecessor tasks, and enter the name of the predecessor task from the other project file in this format: File name\Task ID, such as Parnell Aerospace Promo 19\8.
8. Press Enter, and click OK to close the Task Information dialog box.

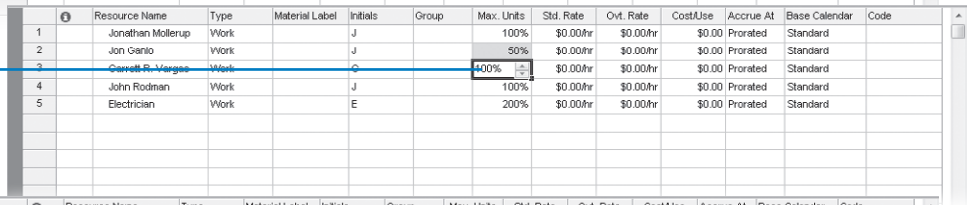
Chapter at a Glance

Create a list of resources, page 61



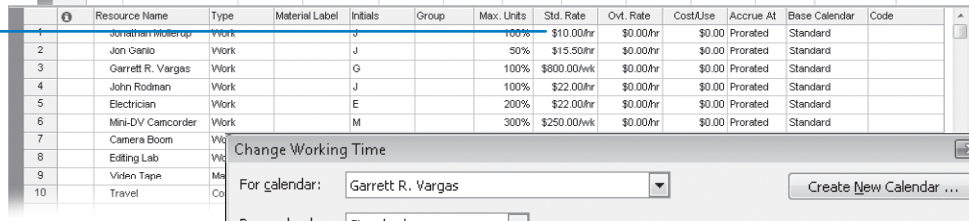
	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	

Change a resource's capacity to perform work, page 63



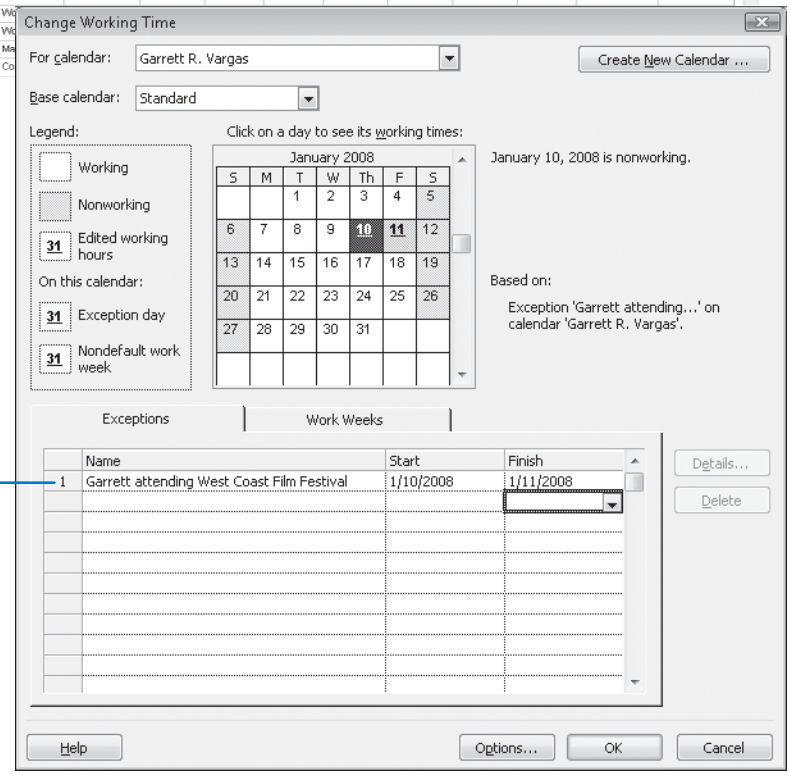
	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		50%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		400%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	

Enter resource cost rates, page 68



	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$10.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		50%	$15.50/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$800.00/wk	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$22.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$22.00/hr	$0.00/hr	$0.00	Prorated	Standard	
6	Mini-DV Camcorder	Work		M		300%	$250.00/wk	$0.00/hr	$0.00	Prorated	Standard	
7	Camera Boom	Wo										
8	Editing Lab	Wo										
9	Video Tape	Ma										
10	Travel	Co										

Change a resource's working time, page 70



3 Setting Up Resources

In this chapter, you will learn how to:

- ✔ Set up basic resource information for the people who work on projects.
- ✔ Enter basic resource information for the equipment that will be used in projects.
- ✔ Enter resource information for the materials that will be consumed as the project progresses.
- ✔ Enter cost resource information for financial tracking.
- ✔ Set up cost information for work resources.
- ✔ Change a resource's availability for work.
- ✔ Record additional information about a resource in a note.

Tip Do you need only a quick refresher on the topics in this chapter? See the Quick Reference entries on pages xxv-xlviii.

Resources include the people and equipment needed to complete the tasks in a project. Microsoft Office Project 2007 focuses on two aspects of resources: their availability and their costs. Availability determines when specific resources can work on tasks and how much work they can perform, and ***costs*** refer to how much money will be required to pay for those resources. In addition, Project supports two other types of special resources: material and cost.

In this chapter, you will set up the resources you need to complete the TV commercial project. Effective resource management is one of the most powerful advantages of using Project instead of task-focused planning tools, such as paper-based organizers. You do not need to set up resources and assign them to tasks in Project; however, without this information, you might be less effective in managing your schedule. Setting up resource information in Project takes a little effort, but the time is well spent if your project is primarily driven by time or cost ***constraints*** (and nearly all complex projects are driven by one, if not both, of these factors).

Important Before you can use the practice files provided for this chapter, you need to install them from the book's companion CD to their default locations. **See "Using the Book's CD" on page xix for more information.**

Setting Up People Resources

Project works with three types of resources: work, material, and cost resources. ***Work resources*** are the people and equipment that do the work of the project. We will focus on work resources first and then turn to material and cost resources later in this chapter.

Some examples of work resources are listed below.

Work Resource	Example
Individual people identified by name	Jon Ganio; Jim Hance
Individual people identified by job title or function	Director; camera operator
Groups of people who have common skills (When assigning such interchangeable resources to a task, do not be concerned who the individual resource is as long as the resource has the right skills.)	Electricians; carpenters; extras
Equipment	Video camera; 600-watt light

Equipment resources don't need to be portable; a fixed location or piece of machinery, such as a video editing studio, can also be considered equipment.

All projects require some people resources, and some projects require only people resources. Project can help you make smarter decisions about managing work resources and monitoring financial costs.

Tip This tip describes enterprise project management (EPM) functionality. The combination of Project Professional and Project Server provides substantial, enterprise-level resource management capabilities, such as skills-based resource assignments and a centralized enterprise resource pool. For more information, see Part 4, "Introducing Project Server."

In this exercise, you set up resource information for several people resources.

BE SURE TO start Microsoft Office Project 2007 if it's not already running.

Important If you are running Project Professional, you may need to make a one-time adjustment to use the Computer account and to work offline. This ensures that the practice files you work with in this chapter do not affect your Project Server data. For more information, see "Starting Project Professional" on page 11.

OPEN Wingtip Toys Commercial 3a from the *\Documents\Microsoft Press\Project 2007 SBS\Chapter 3 Simple Resources* folder. You can also access the practice files for this book by clicking Start, All Programs, Microsoft Press, Project 2007 Step by Step, and then selecting the chapter folder of the file you want to open.

1. On the **File** menu, click **Save As**.

   The Save As dialog box appears.

2. In the **File name** box, type Wingtip Toys Commercial 3, and then click **Save**.

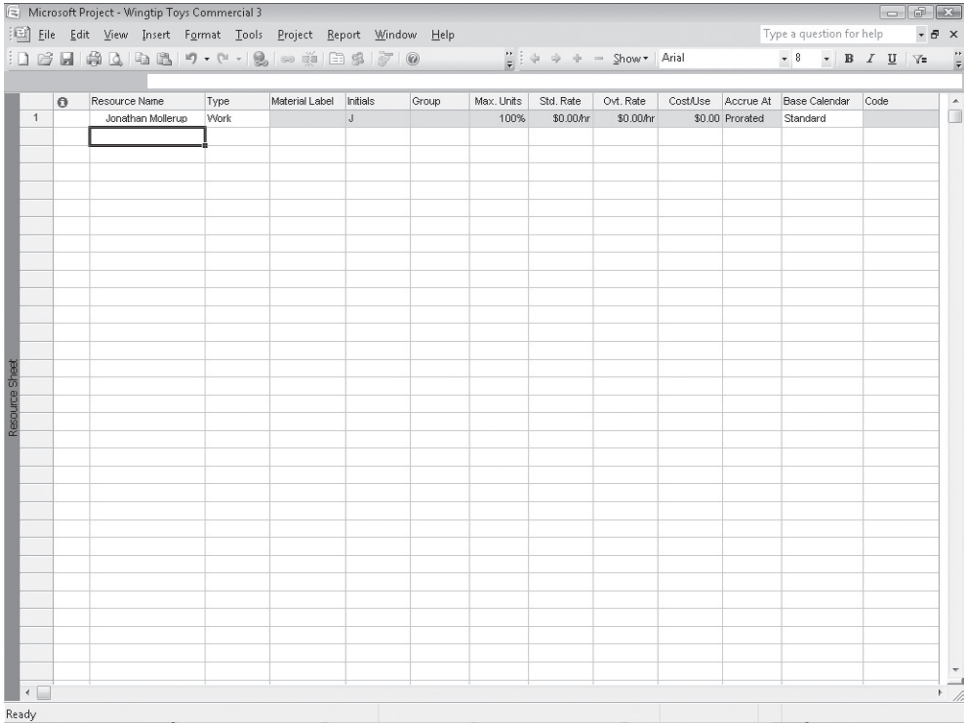
3. On the **View** menu, click **Resource Sheet**.

   You will use the Resource Sheet view to help set up the initial list of resources for the Wingtip Toys TV commercial project.

4. In the Resource Sheet view, click the cell directly below the **Resource Name** column heading.

5. Type Jonathan Mollerup, and press Enter.

   Project creates a new resource.



	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	

6. On the next empty rows in the **Resource Name** column, enter the following names:

   Jon Ganio

   Garrett R. Vargas

   John Rodman

	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	

You can also have a resource that represents multiple people.

7. In the ***Resource Name*** field below the last resource, type **Electrician**, and then press Tab.

8. In the **Type** field, make sure that **Work** is selected, and then press Tab several times to move to the *Max. Units* field.

The ***Max. Units*** field represents the maximum capacity of a resource to accomplish any task. Specifying that a resource, such as Jon Ganio, has 100% maximum units means that 100% of Jon's time is available to work on the tasks to which you assign him. Project will alert you if you assign Jon to more tasks than he can accomplish at 100% maximum units (in other words, if Jon becomes ***overallocated***). As you can see, 100% is the default Max. Units value for new resources.

9. In the **Max. Units** field for the electrician, type or select **200%**, and then press Enter.

Tip When you click a numeric field, up and down arrows appear. You can click these to display the number you want, or simply type the number in the field.

The resource named *Electrician* does not represent a single person; instead, it represents a category of interchangeable people called electricians. Because the Electrician resource has a Max. Units setting of 200%, you can plan on two electricians being available to work full time every workday. At this point in the planning phase, it is alright that you do not know exactly who these electricians will be. You can still proceed with more general planning.

Now you'll update the Max. Units value for Jon Ganio to indicate that he works half time.

10. Click the ***Max. Units*** field for Jon Ganio, type or select **50%**, and then press Enter.

When you create a new work resource, Project assigns it 100% Max. Units by default.

	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		50%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	

Tip If you prefer, you can enter maximum units as partial or whole numbers (.5, 1, 2) rather than as percentages (50%, 100%, 200%). To use this format, on the Tools menu, click Options, and then click the Schedule tab. In the Show assignment units as a box, click Decimal.

What Is the Best Way to Enter Resource Names?

In Project, work resource names can refer to specific people (Jon Ganio) or to specific job titles, such as Camera Operator or Actor. Use whatever method makes the most sense to you and to those who will see your project plan information. The important questions are *who* will see these resource names and *how* will they identify the resources. The resource names you choose will appear both in Project and in any information published from Project. For example, in the default Gantt Chart view, the name of the resource appears next to the bars of the tasks to which that resource is assigned.

A resource might refer to somebody who is already on staff or to a position to be filled later. If you have not yet filled all of the resource positions required, you might not have real people's names to enter. In that case, use placeholder names or job titles when setting up resources in Project.

Setting Up Equipment Resources

In Project, you set up people and equipment resources in exactly the same way because people and equipment are both examples of work resources. However, you should be aware of important differences in how you can schedule these two work resources. Most people resources have a working day of no more than 12 hours, but equipment resources might work around the clock. Moreover, people resources might be flexible in the tasks they can perform, but equipment resources tend to be more specialized. For example, a director of photography for a film or video project might also act as a camera operator in a pinch, but a video camera cannot replace an editing studio.

You do not need to track every piece of equipment that will be used in your project, but you might want to set up equipment resources when

- Multiple teams or people might need a piece of equipment to accomplish different tasks simultaneously, and the equipment might be overbooked.
- You want to plan and track costs associated with the equipment.

In this exercise, you enter information about equipment resources in the Resource Information dialog box.


Resource Information

1. In the Resource Sheet, click the next empty cell in the **Resource Name** column.
2. On the **Standard** toolbar, click the **Resource Information** button.

   The Resource Information dialog box appears.

Tip You can also double-click a resource name or an empty cell in the Resource Name column to display the Resource Information dialog box.

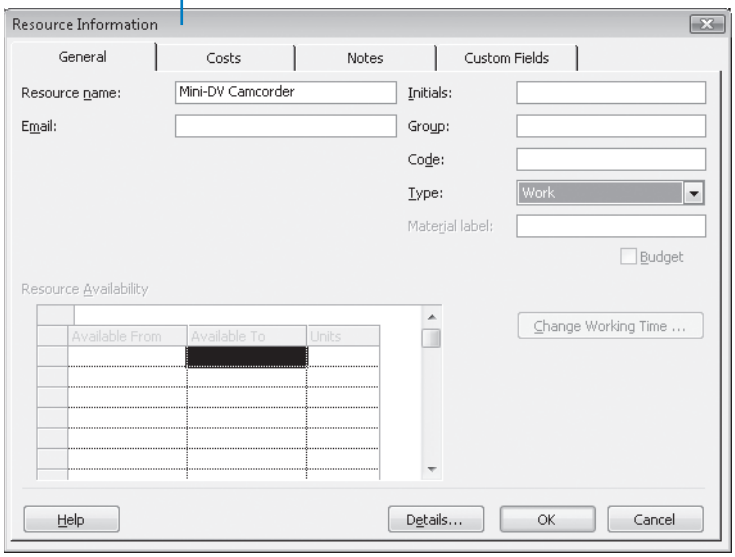
3. Click the **General** tab if it is not already displayed.

   In the upper portion of the General tab, you might recognize the fields you saw in the Resource Sheet view. As with many types of information in Project, you can usually work in at least two ways: a table or a dialog box.

4. In the **Resource name** field, type **Mini-DV Camcorder**

5. In the **Type** field, click **Work**.

The Resource Information dialog box contains many of the same fields you in the Resource Sheet view.



Tip The Resource Information dialog box contains a button labeled Details. If you have an e-mail program that complies with the Messaging Application Programming Interface (MAPI) and the program is installed on the same computer as Project, you can click Details to see contact information about the selected resource. MAPI-compliant programs include Microsoft Office Outlook and Outlook Express.

6. Click **OK** to close the Resource Information dialog box and return to the Resource Sheet.

   The *Max. Units* field shows 100% for this resource; next, you will change this percentage.

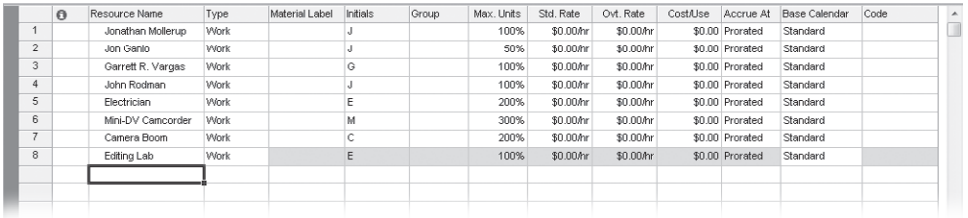
Tip You can also double-click on an empty cell in the Resource Name column to create a new resource using the Resource Information dialog box. Note that when creating a resource in this way, you cannot enter a Max. Units value. However, you can edit this value in the dialog box, as well as in the Resource Sheet, after you create the resource.

7. In the **Max. Units** field for the Mini-DV Camcorder, type or click the arrows until the value shown is **300%** and press Enter.

   This means that you plan to have three camcorders available every workday.

8. Enter the following information about equipment resources directly in the Resource Sheet or in the **Resource Information** dialog box, whichever you prefer. In either case, make sure **Work** is selected in the **Type** field.

Resource name	Max. Units
Camera Boom	200%
Editing Lab	100%



	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		50%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
6	Mini-DV Camcorder	Work		M		300%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
7	Camera Boom	Work		C		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
8	Editing Lab	Work		E		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	

Setting Up Material Resources

Material resources are consumables that you use up as the project proceeds. On a construction project, material resources might include nails, lumber, and concrete. For the toy commercial project, video tape is the consumable resource that interests you most. You work with material resources in Project mainly to track the rate of consumption and the associated cost. Although Project is not a complete system for tracking inventory, it can help you stay better informed about how quickly you are consuming your material resources.

In this exercise, you enter information about a material resource.

1. In the Resource Sheet, click the next empty cell in the **Resource Name** column.
2. Type **Video Tape** and press Tab.
3. In the **Type** field, click the down arrow, select **Material**, and press Tab.
4. In the **Material Label** field, type **30-min. cassette** and press Enter.

You will use 30-minute cassettes as the unit of measure to track video tape consumption during the project.

	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		50%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
6	Mini-DV Camcorder	Work		M		300%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
7	Camera Boom	Work		C		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
8	Editing Lab	Work		E		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
9	Video Tape	Material	30-min. cassett	V			$0.00		$0.00	Prorated		

This Material Label field only applies to material resources.

Note that you cannot enter a Max. Units value for a material resource. Since a material resource is a consumable item and not a person or piece of equipment that performs work, the Max. Units value doesn't apply.

Setting Up Cost Resources

The third and final type of resource that you can use in Project is the cost resource. You can use a ***cost resource*** to represent a financial cost associated with a task in a project. While work resources, such as people and equipment, can have associated costs (hourly rates and fixed costs per assignment), the sole purpose of a cost resource is to associate a particular type of cost with one or more tasks. Common types of cost resources might include categories of expenses you'd want to track on a project for accounting purposes such as travel, entertainment, or training. Like material resources, cost resources do no work and have no effect on the scheduling of a task. However, after you assign a cost resource to a task and specify the cost amount per task, you can then see the cumulative costs for that type of cost resource, such as total travel costs in a project.

1. In the Resource Sheet, click the next empty cell in the **Resource Name** column.
2. Type **Travel** and press Tab.
3. In the **Type** field, click the down arrow, select **Cost**, and press Enter.

	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		50%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
6	Mini-DV Camcorder	Work		M		300%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
7	Camera Boom	Work		C		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
8	Editing Lab	Work		E		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
9	Video Tape	Material	30-min. cassett	V			$0.00		$0.00	Prorated		
10	Travel	Cost		T						Prorated		

Entering Resource Pay Rates

Almost all projects have some financial aspect, and cost limits drive the ***scope*** of many projects. Tracking and managing cost information allows the project manager to answer such important questions as

- What is the expected total cost of the project based on our task duration and resource estimates?
- Are we using expensive resources to do work that less expensive resources could do?
- How much money will a specific type of resource or task cost over the life of the project?
- How have we allocated a particular type of expense, such as travel, in a project?
- Are we spending money at a rate that we can sustain for the planned duration of the project?

For the TV commercial project, you have been entrusted with pay rate information for all people resources used in the project. In the information below, note that the fees for the camcorders and editing lab are rental fees. Because the Southridge Video Company already owns the camera booms, you will not bill yourself for them.

> **Important** You deal with the per-task cost of a cost resource only when you assign the cost resource to the task. You will do this in Chapter 4, "Assigning Resources to Tasks."

In this exercise, you enter cost information for each work resource.

1. In the Resource Sheet, click the **Std. Rate** field for Jonathan Mollerup.
2. Type 10 and press Enter.

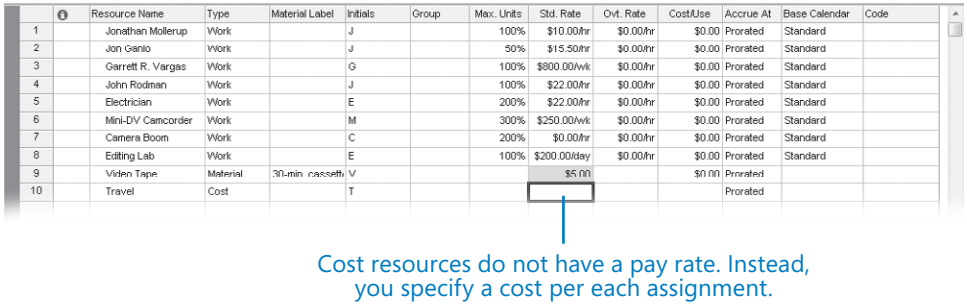
   Jonathan's standard hourly rate of $10 appears in the Std. Rate column. Note that the default standard rate is hourly, so you did not need to specify cost per hour.
3. In the **Std. Rate** field for Jon Ganio, type 15.50 and press Enter.

   Jon's standard hourly rate appears in the Std. Rate column.

	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
1	Jonathan Mollerup	Work		J		100%	$10.00/hr	$0.00/hr	$0.00	Prorated	Standard	
2	Jon Ganio	Work		J		50%	$15.50/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
6	Mini-DV Camcorder	Work		M		300%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
7	Camera Boom	Work		C		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
8	Editing Lab	Work		E		100%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
9	Video Tape	Material	30-min. cassett	V			$0.00		$0.00	Prorated		
10	Travel	Cost		T						Prorated		

4. Enter the following standard pay rates for the given resources.

Resource Name	Standard Rate
Garrett R. Vargas	800/w
John Rodman	22
Electrician	22
Mini-DV camcorder	250/w
Camera boom	0
Editing lab	200/d
Video tape	5



	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar	Code
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2	Jon Ganio	Work		J		50%	$15.50/hr	$0.00/hr	$0.00	Prorated	Standard	
3	Garrett R. Vargas	Work		G		100%	$800.00/wk	$0.00/hr	$0.00	Prorated	Standard	
4	John Rodman	Work		J		100%	$22.00/hr	$0.00/hr	$0.00	Prorated	Standard	
5	Electrician	Work		E		200%	$22.00/hr	$0.00/hr	$0.00	Prorated	Standard	
6	Mini-DV Camcorder	Work		M		300%	$250.00/wk	$0.00/hr	$0.00	Prorated	Standard	
7	Camera Boom	Work		C		200%	$0.00/hr	$0.00/hr	$0.00	Prorated	Standard	
8	Editing Lab	Work		E		100%	$200.00/day	$0.00/hr	$0.00	Prorated	Standard	
9	Video Tape	Material	30-min. cassette	V			$5.00		$0.00	Prorated		
10	Travel	Cost		T						Prorated		

Cost resources do not have a pay rate. Instead, you specify a cost per each assignment.

Note that you enter a fixed amount rather than a rate (hourly, daily, or weekly) for the video tape's cost. For material resources, the standard rate value is per unit of consumption—in our case, 30-minute cassettes.

Note also that you cannot enter a standard pay rate for the Travel cost resource. You specify the cost when you assign the cost resource to a task.

Project Management Focus: Getting Resource Cost Information

Work resources can account for the majority of costs in many projects. To take full advantage of the extensive cost management features in Project, the project manager should know the costs associated with each work resource. For people resources, it might be difficult to obtain such information. In many organizations, only senior management and human resource specialists know the pay rates of all resources working on a project, and they might consider this information confidential. Depending on your organizational policies and project priorities, you might not be able to track resource pay rates. If you cannot track this information, your effectiveness as a project manager might be reduced, and the ***sponsors*** of your projects should understand this limitation.

Adjusting Working Time for Individual Resources

Project uses different types of calendars for different purposes. In this exercise, we will focus on the resource calendar. A ***resource calendar*** controls the working and nonworking times of a resource. Project uses resource calendars to determine when work for a specific resource can be scheduled. Resource calendars apply only to work resources (people and equipment) and not to material or cost resources.

When you initially create resources in a project plan, Project creates a resource calendar for each work resource. The initial working time settings for resource calendars exactly match those of the ***Standard base calendar***, which is a calendar built into Project that accommodates a default work schedule from 8 A.M. to 5 P.M., Monday through Friday. If all of the working times of your resources match the working time of the Standard base calendar, you do not need to edit any resource calendars. However, chances are that some of your resources will need exceptions to the working time in the Standard base calendar—such as

- A flex-time work schedule
- Vacation time
- Other times when a resource is not available to work on the project, such as time spent training or attending a conference

Any changes that you make to the Standard base calendar are automatically reflected in all resource calendars based on the Standard base calendar. However, any specific changes you have made to the working time of a resource are not changed.

> **Tip** If you have a resource who is only available to work on your project part-time, you might be tempted to set the working time of the resource in your project to reflect a part-time schedule, such as 8 A.M. to 12 P.M. daily. However, a better approach would be to adjust the availability of the resource as recorded in the *Max. Units* field to 50%. Changing the unit availability of the resource keeps the focus on the capacity of the resource to work on the project rather than on the specific times of the day when that work might occur. You set the maximum units for a resource in the Resource Sheet view, which you display by clicking Resource Sheet on the View menu. For more information about resource units, see "Setting Up People Resources," on page 60.

In this exercise, you specify the working and nonworking times for individual work resources.

1. On the **Tools** menu, click **Change Working Time**.

   The Change Working Time dialog box appears.

2. In the **For calendar** box, click **Garrett R. Vargas**.

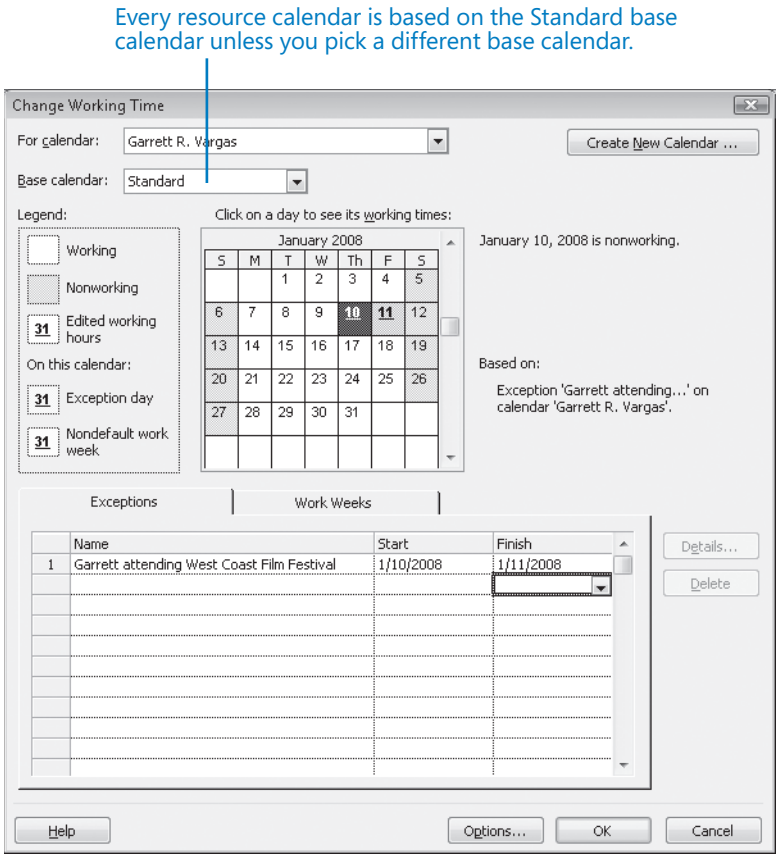
Garrett R. Vargas's resource calendar appears in the Change Working Time dialog box. Garrett has told you he will not be available to work on Thursday and Friday, January 10 and 11, because he plans to attend a film festival.

3. On the **Exceptions** tab in the **Change Working Time** dialog box, click in the first row directly below the **Name** column heading and type **Garrett attending West Coast Film Festival**

   The description for the calendar exception is a handy reminder for you and others who may view the project plan later.

4. Click in the **Start** field and type or select **1/10/2008**.

5. Click in the **Finish** field, type or select **1/11/ 2008**, and then press Enter.



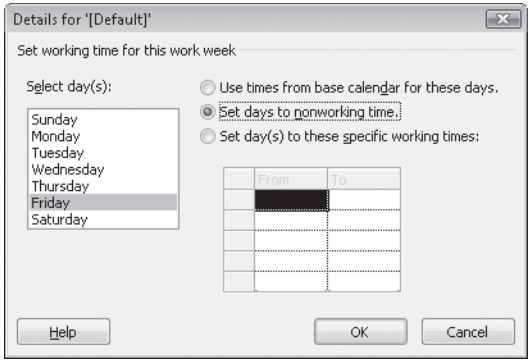
Project will not schedule work for Garrett on these dates.

Tip To set up a partial working time exception for a resource, such as a portion of a day when a resource cannot work, click Details. In the Details dialog box, you can also create recurring exceptions to the resource's availability.

To conclude this exercise, you will set up a "4 by 10" work schedule (that is, 4 days per week, 10 hours per day) for a resource.

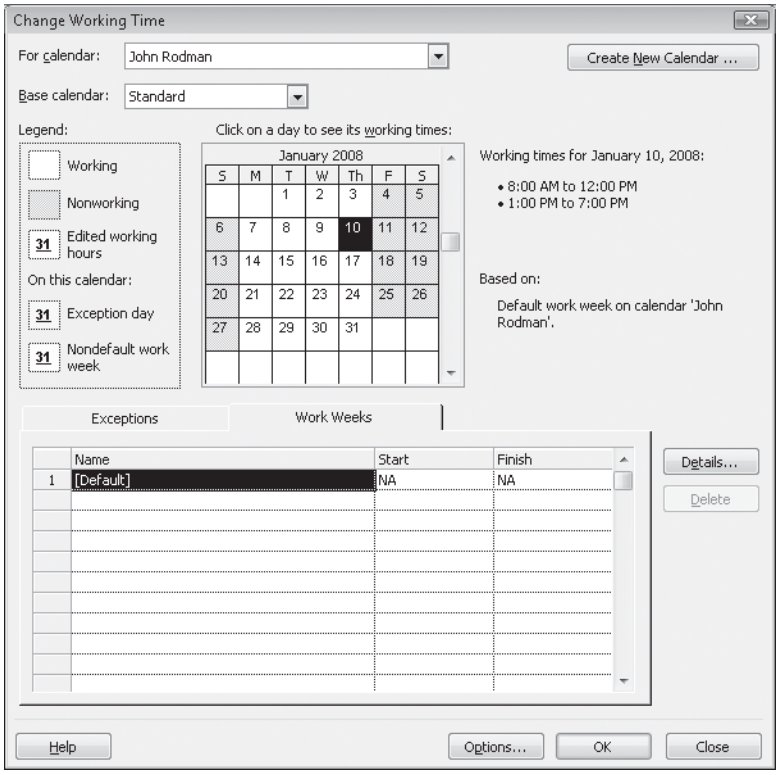
6. In the **For** box, click **John Rodman**.
7. When prompted to save the resource calendar changes that you made for Garrett, click **Yes**.
8. Click the **Work Weeks** tab in the **Change Working Time** dialog box.
9. Click **[Default]**, and then click **Details**.
10. Under **Selected Day(s)**, select **Monday** through **Thursday**.
11. Click **Set day(s) to these specific working times**.
12. In the lower **To** box, click **5:00 PM** and replace it with **7:00 PM,** and then press Enter.
13. Click **Friday**.
14. Click **Set days to nonworking time**.

    Now Project can schedule work for John as late as 7 P.M. every Monday through Thursday, but it will not schedule work for him on Fridays.



15. Click **OK** to close the Details dialog box.

    Now you can see that Fridays are marked as nonworking days for John Rodman.



16. Click **OK** to close the Change Working Time dialog box.

Because you have not yet assigned these resources to tasks, you don't see the scheduling effect of their nonworking time settings. You will observe this later in Chapter 4.

Tip If you find that you must edit several resource calendars in a similar way (to handle a night shift, for example), it may be easier to assign a different base calendar to a resource or collection of resources. This is more efficient than editing individual calendars, and it allows you to make project-wide adjustments to a single base calendar if needed. For example, if your project includes a day shift and a night shift, you can apply the Night Shift base calendar to those resources who work the night shift. You change a base calendar in the Change Working Time dialog box on the Tools menu. For collections of resources, you can select a specific base calendar directly in the Base Calendar column on the Entry table in the Resource Sheet view.

Documenting Resources

You might recall from Chapter 2, "Creating a Task List," that you can record any additional information about a task, resource, or assignment in a ***note***. For example, if a resource has flexible skills that can help the project, it is a good idea to record this in a note. In that way, the note resides in the project plan and can be easily viewed or printed.

In this exercise, you enter resource notes to document that a resource can assume multiple roles in the TV commercial project.

1. In the **Resource Name** column, click **Garrett R. Vargas**.
2. On the **Project** menu, click **Resource Notes**.


Resource Notes

Tip You can also click the Resource Notes button on the **Standard** toolbar.

Project displays the Resource Information dialog box with the Notes tab visible.

3. In the **Notes** box, type **Garrett is trained on camera and lights** and then click **OK**.

A note icon appears in the Indicators column.

4. Point to the note icon.

The note appears in a ScreenTip. For notes that are too long to appear in a ScreenTip, you can double-click the note icon to display the full text of the note.

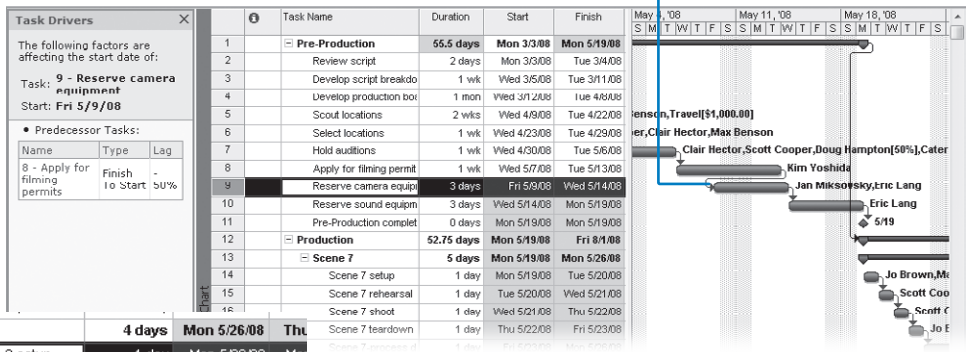
CLOSE the Wingtip Toys Commercial 3 file.

Key Points

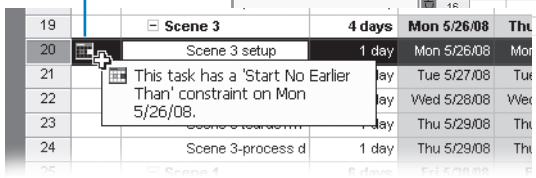
- Recording resource information in your project plans helps you better control who does what work when and at what cost.
- People and equipment resources perform the work in a project.
- Cost resources account for types of expenses across a project.
- Material resources are consumed during a project.

Chapter at a Glance

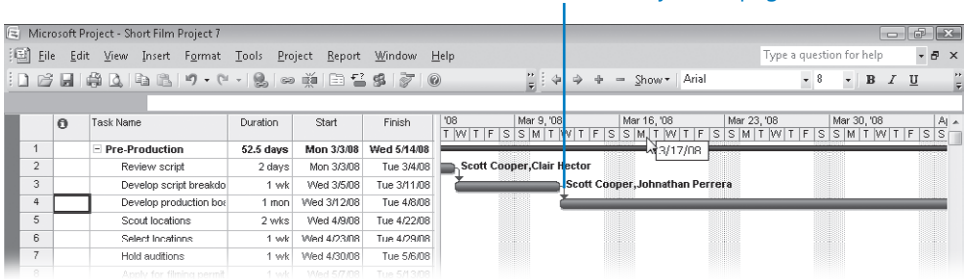
Change how tasks are related to each other, page 140



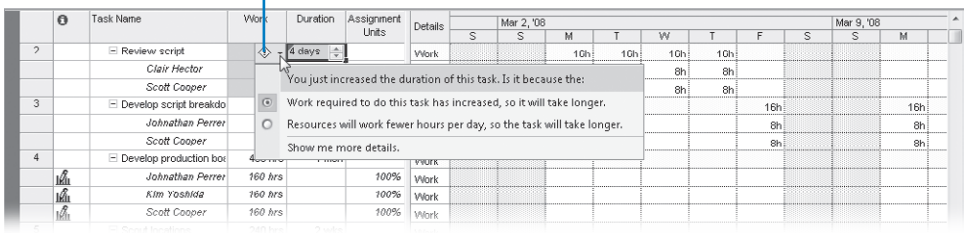
Apply constraints to control when tasks can be scheduled, page 142



View the project's critical path and identify slack, page 148



Change a task's duration, work, or assignments units and control how Project handles the change, page 157



7 Fine-Tuning Task Details

In this chapter, you will learn how to:

- ✔ Adjust task links to have more control over how tasks are related.
- ✔ Apply a constraint to a task.
- ✔ Identify the tasks on the critical path.
- ✔ Split a task to record an interruption in work.
- ✔ Create a task calendar and apply it to tasks.
- ✔ Change a task type to control how Project schedules tasks.
- ✔ Record deadlines for tasks.
- ✔ Enter a fixed cost and specify how it should accrue.
- ✔ Set up a recurring task in the project schedule.

Tip Do you need only a quick refresher on the topics in this chapter? See the Quick Reference entries on pages xxv-xlviii.

In this chapter, you examine and use a variety of advanced features in Microsoft Office Project 2007. These features focus on fine-tuning task details prior to saving a baseline as well as commencing work on the project with the goal of developing the most accurate schedule representation of the tasks you anticipate for the plan.

Important Before you can use the practice files provided for this chapter, you need to install them from the book's companion CD to their default locations. **See "Using the Book's CD" on page xix for more information.**

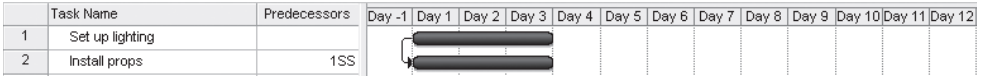
Adjusting Task Relationships

You might recall from Chapter 2, "Creating a Task List," that there are four types of task dependencies, or relationships:

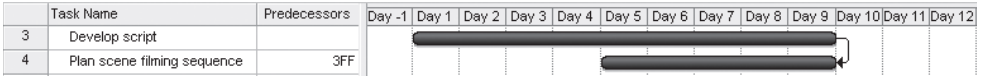
- Finish-to-start (FS): The finish date of the predecessor task determines the start date of the successor task.
- Start-to-start (SS): The start date of the predecessor task determines the start date of the successor task.
- Finish-to-finish (FF): The finish date of the predecessor task determines the finish date of the successor task.
- Start-to-finish (SF): The start date of the predecessor task determines the finish date of the successor task.

When you enter tasks in Project and link them by clicking the Link Tasks button on the **Standard** toolbar, the tasks are given a finish-to-start (FS) relationship. This should be fine for most tasks, but you will most likely change some task relationships as you fine-tune a project plan. The following are some examples of tasks that require relationships other than finish-to-start:

- You can start setting up the lighting for a film scene as soon as you start setting up the props (start-to-start relationship). This reduces the overall time required to complete the two tasks, as they are completed in parallel.



- Planning the filming sequence can begin before the script is complete, but it cannot be finished until the script is complete. You want the two tasks to finish at approximately the same time (finish-to-finish relationship).



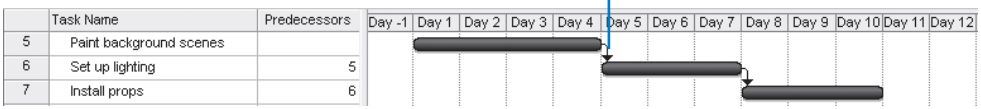
Task relationships should reflect the sequence in which work should be performed. After you have established the correct task relationships, you can fine-tune your schedule by entering overlap (called ***lead time***) or delay (called ***lag time***) between the finish or start dates of predecessor and successor tasks.

Assuming that two tasks have a finish-to-start relationship:

- Lead time causes the successor task to begin before its predecessor task concludes.
- Lag time causes the successor task to begin some time after its predecessor task concludes.

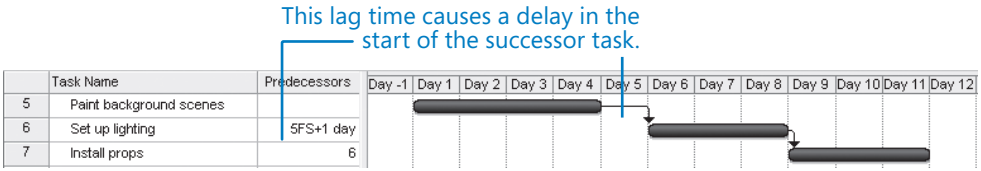
The following is an illustration of how lead and lag time affect task relationships. Assume that you initially planned the following three tasks using finish-to-start relationships.

Initially the tasks are linked with finish-to-start relationships, so the successor tasks begin as soon as the predecessor tasks finish.



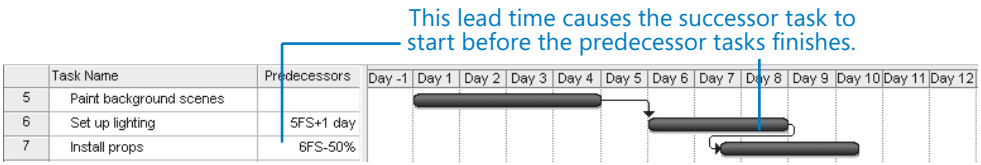
Before task 6 can begin, you need to allow an extra day for the paint applied in task 5 to dry. You do not want to add a day to the duration of task 5 because no real work will occur on that day. Instead, you enter a one-day lag between tasks 5 and 6.

This lag time causes a delay in the start of the successor task.



However, task 7 can start as soon as task 6 is halfway completed. To make this happen, enter a 50% lead time between tasks 6 and 7.

This lead time causes the successor task to start before the predecessor tasks finishes.



You can enter lead and lag time as units of time, such as two days, or as a percentage of the duration of the predecessor task, such as 50%. Lag time is entered in positive units and lead time in negative units (for example, *-2d* or *-50%*). You can apply lead or lag time to any type of task relationship: finish-to-start, start-to-start, and so on.

Tip Places in which you can enter lead or lag time include the Task Information dialog box (Project menu), the Predecessors column in the Entry table, and the Task Dependency dialog box (viewable by double-clicking a link line between Gantt bars).

In this exercise, you enter lead time and change task relationships between predecessor and successor tasks.

BE SURE TO start Microsoft Office Project 2007 if it's not already running.

Important If you are running Project Professional, you may need to make a one-time adjustment to use the Computer account and to work offline. This ensures that the practice files you work with in this chapter do not affect your Project Server data. For more information, see "Starting Project Professional" on page 11.

OPEN Short Film Project 7a from the *\Documents\Microsoft Press\Project 2007 SBS\Chapter 7 Advanced Tasks* folder. You can also access the practice files for this book by clicking Start, All Programs, Microsoft Press, Project 2007 Step by Step, and then selecting the chapter folder of the file you want to open.

1. On the **File** menu, click **Save As**.

   The Save As dialog box appears.

2. In the **File name** box, type Short Film Project 7, and then click **Save**.

3. On the **Project** menu, click **Task Drivers.**

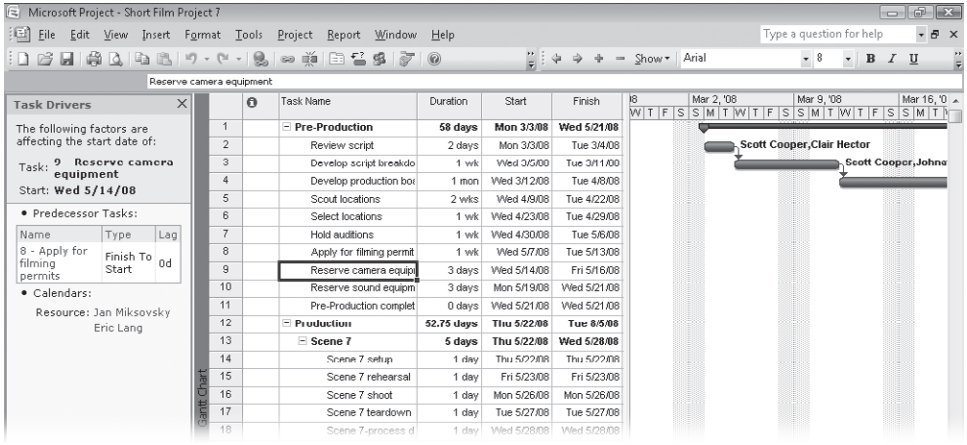

Task Drivers

Tip You can also click the **Task Drivers** button on the **Standard** toolbar.

The Task Drivers pane appears. This pane succinctly reveals all of the scheduling factors that affect the selected task, such as predecessor task relationships, resource calendars, and/or task calendars.

4. Select the name of task 9, **Reserve camera equipment**.

   In the Task Drivers pane, you can view the scheduling factors affecting this task.



For task 9, you can see that its predecessor is task 8, *Apply for filming permits*. You can see in the pane that the two tasks have a finish-to-start relationship with zero

lag time. Next, you'll adjust the lag value on the task relationship. Because you cannot edit this value directly in the pane, you'll display the Task Information dialog box.

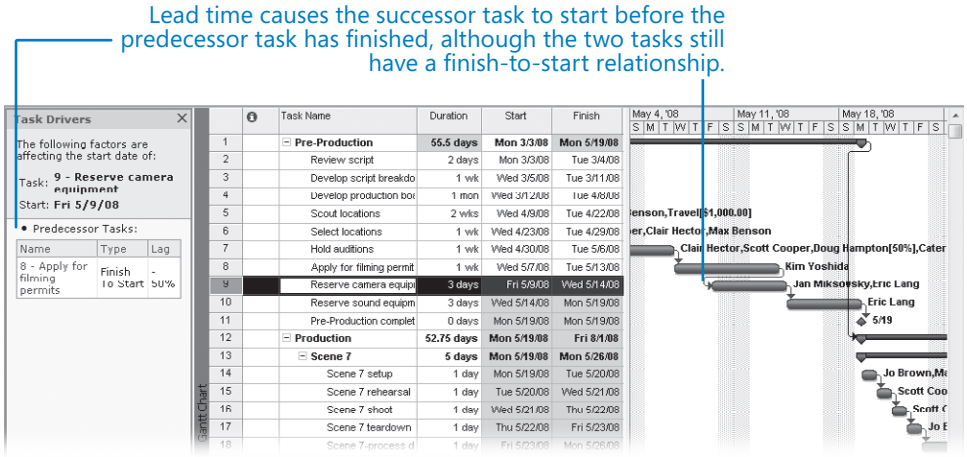

Task Information

5. On the **Standard** toolbar, click the **Task Information** button.
6. Click the **Predecessors** tab.
7. In the **Lag** field for predecessor task 8, type **–50%.**

   Entering lag time as a negative value produces lead time.
8. Click **OK** to close the Task Information dialog box.


Scroll To Task

9. To observe the effect of adjusting lag on the Gantt bars, on the **Standard** toolbar, click the **Scroll To Task** button.



Task 9 is now scheduled to start at 50% of the duration of task 8. Should the duration of task 8 change, Project will reschedule the start of task 9 so that it maintains a 50% lead time.

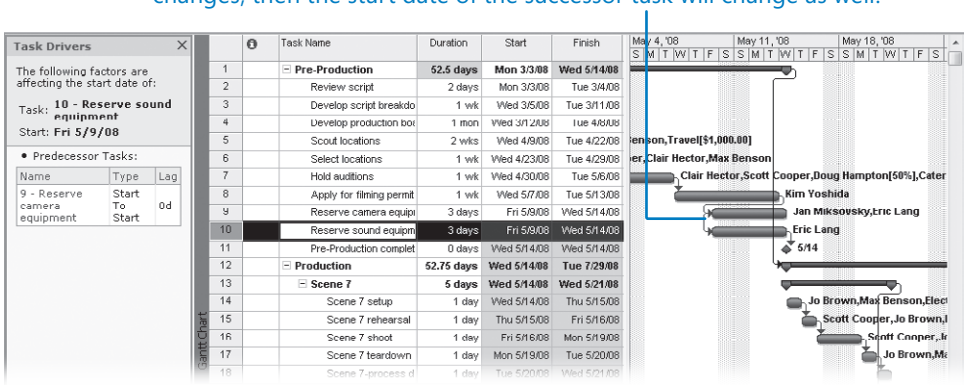
Next, you will change the task relationship between two tasks.

10. Double-click the name of task 10, **Reserve sound equipment**.

    The Task Information dialog box appears. The Predecessors tab should be visible. Note also that the Task Drivers pane in the background updates to display the scheduling details for task 10, the currently selected task.
11. On the **Predecessors** tab, click in the **Type** column for predecessor task 9. Select **Start-to-Start (SS)**, and click **OK**.

    Project changes the task relationship between tasks 9 and 10 to start-to-start.

The start-to-start task relationship causes the successor task to start at the same time as the predecessor task. If the start date of the predecessor task changes, then the start date of the successor task will change as well.



Important Assigning tasks' start-to-start relationships and entering lead times where appropriate are both excellent techniques to shorten overall project duration. However, Project cannot automatically make such schedule adjustments for you. As project manager, you must analyze the sequences and relationships of your tasks and make those adjustments where necessary.

Setting Task Constraints

Every task you enter into Project has some type of constraint applied to it. A ***constraint*** controls the start or finish date of a task and the degree to which that task can be rescheduled. There are three categories of constraints:

- ***Flexible constraints*** Project can change the start and finish dates of a task. For example, the task *Select locations to film* can start as soon as possible. This type of flexible constraint is called As Soon As Possible, or ASAP for short, and is the default constraint type in Project. No constraint date is associated with flexible constraints.
- ***Inflexible constraints*** A task must begin or end on a certain date. For example, a task, such as *Set up lighting*, must end on June 14, 2008. Inflexible constraints are sometimes called hard constraints.
- ***Semi-flexible constraints*** A task has a start or finish date boundary. However, within that boundary, Project has the scheduling flexibility to change the start and finish dates of a task. For example, a task such as *Install props* must finish no later than June 13, 2008. However, the task could finish before this date. Semi-flexible constraints are sometimes called soft or moderate constraints.

In total, there are eight types of task constraints.

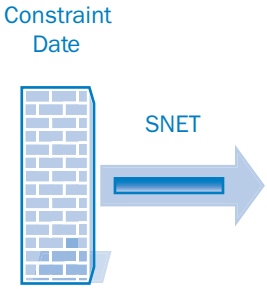
This constraint category	Includes these: constraint types	And means
Flexible	As Soon As Possible (ASAP)	Project will schedule a task to occur as soon as it can occur. This is the default constraint type applied to all new tasks when scheduling from the project start date. There is no constraint date for an ASAP constraint.
	As Late As Possible (ALAP)	Project will schedule a task to occur as late as it can occur. This is the default constraint type applied to all new tasks when scheduling from the project finish date. There is no constraint date for an ALAP constraint.
Semi-flexible	Start No Earlier Than (SNET)	Project will schedule a task to start on or after the constraint date you specify. Use this constraint type to ensure that a task will not start before a specific date.
	Start No Later Than (SNLT)	Project will schedule a task to start on or before the constraint date you specify. Use this constraint type to ensure that a task will not start after a specific date.
	Finish No Earlier Than (FNET)	Project will schedule a task to finish on or after the constraint date you specify. Use this constraint type to ensure that a task will not finish before a specific date.
	Finish No Later Than (FNLT)	Project will schedule a task to finish on or before the constraint date you specify. Use this constraint type to ensure that a task will not finish after a specific date.
Inflexible	Must Start On (MSO)	Project will schedule a task to start on the constraint date you specify. Use this constraint type to ensure that a task will start on an exact date.
	Must Finish On (MFO)	Project will schedule a task to finish on the constraint date you specify. Use this constraint type to ensure that a task will finish on an exact date.

Important Beginning Project users are often tempted to enter start or finish dates for tasks. However, doing so applies semi-flexible constraints, such as Start No Earlier Than or Finish No Earlier Than. This essentially prevents users from taking full advantage of the Project scheduling engine. Although this is one of the most common scheduling problems that people create when using Project, it is usually avoidable.

These three constraint categories have very different effects on the scheduling of tasks:

- Flexible constraints, such as As Soon As Possible, allow tasks to be scheduled without any limitations other than their predecessor and successor relationships. No fixed start or end dates are imposed by these constraint types. Use these constraint types whenever possible.

- Semi-flexible constraints, such as Start No Earlier Than or Start No Later Than, limit the rescheduling of a task within the date boundary that you specify.



- Inflexible constraints, such as Must Start On, completely prevent the rescheduling of a task. Use these constraint types only when absolutely necessary.

The type of constraint that you apply to the tasks in your projects depends on what you need from Project. You should use inflexible constraints only if the start or finish date of a task is fixed by factors beyond the control of the project team. Examples of such tasks include handoffs to clients and the end of a funding period. For tasks without such limitations, you should use flexible constraints. Flexible constraints provide the most discretion in adjusting start and finish dates, and they allow Project to adjust dates if your project plan changes. For example, if you have used ASAP constraints and the duration of a predecessor task changes from four days to two days, Project adjusts or "pulls in" the start and finish dates of all successor tasks. However, if a successor task had an inflexible constraint applied, Project could not adjust its start or finish dates.

In this exercise, you apply a Start No Earlier Than constraint to a task.

1. Select the name of task 20, **Scene 3 setup**.

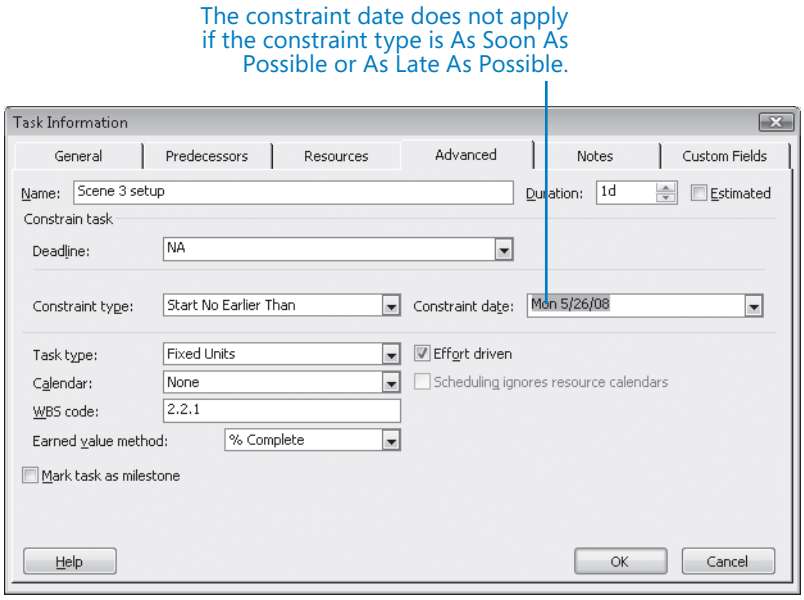
   This scene must be shot at a location that is not available to the film crew until May 26, 2008.

2. On the **Standard** toolbar, click **Task Information**.

3. In the **Task Information** dialog box, click the **Advanced** tab.

4. In the **Constraint Type** box, select **Start No Earlier Than**.

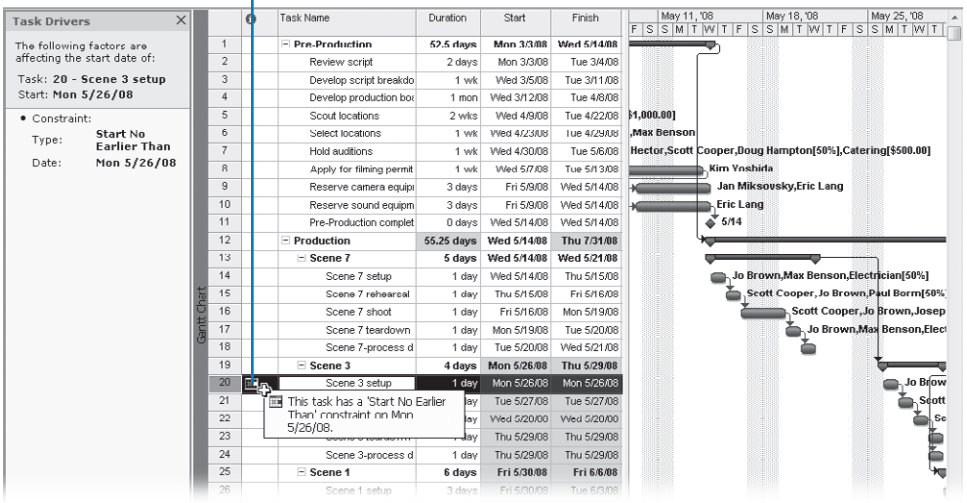
5. In the **Constraint Date** box, type or select **5/26/08**.



6. Click **OK**.

   Project applies a Start No Earlier Than (SNET) constraint to the task, and a constraint icon appears in the Indicators column. You can point to the icon to see the constraint details in a ScreenTip. You can also see the constraint details in the Task Drivers pane.

Position your mouse pointer over a constraint indicator (or any icon in the Indicators column) to see a ScreenTip.



Task 20 is rescheduled to start on May 26 instead of May 21. All tasks that depend on task 20 are also rescheduled. One way to view this rescheduling is by the light blue change highlighting that Project applies to the Start and Finish dates of the successor tasks of task 20. Because the duration of the Production phase was also changed by applying the constraint to task 20, the *Duration* and *Finish* fields for the *Production summary* task (task 12) are also highlighted. Change highlighting remains visible until you perform another editing action or save the file, and it is an effective visual way to see the broader consequences of your specific actions in your schedule.

7. Click the **Close** button (the "X" button in the upper right corner) on the Task Drivers pane.

Here are a few other things to keep in mind when applying constraints to tasks:

- Entering a Finish date for a task (for example, in the Finish column) applies a Finish No Earlier Than (FNET) constraint to the task.
- Entering a Start date for a task (for example, in the Start column) or dragging a Gantt bar directly on the Gantt chart applies a Start No Earlier Than (SNET) constraint to the task.
- In many cases, entering a deadline date is a preferable alternative to entering a semi-flexible or inflexible constraint. You will work with deadline dates later in this chapter.

- Unless you specify a time, Project schedules a constraint date's start or finish time using the Default Start Time or Default End Time values on the Calendar tab (Tools menu, Options command). In this project, the default start time is 8 A.M. If you want a constrained task to be scheduled to start at a different time, enter that time along with the start date. For example, if you want to schedule a task to start at 10 A.M. on May 26, enter 5/26/08 10AM in the Start field.
- To remove a constraint, first select the task or tasks and, on the Project menu, click Task Information. In the Task Information dialog box, click the Advanced tab. In the Constraint Type box, select As Soon As Possible or (if scheduling from the project finish date) As Late As Possible.
- If you must apply semi-flexible or inflexible constraints to tasks in addition to task relationships, you might create what is called negative slack. For example, assume that you have a successor task that has a finish-to-start relationship with its predecessor task. If you entered a Must Start On constraint on the successor task earlier than the finish date of the predecessor task, this would result in negative slack and a scheduling conflict. By default, the constraint date applied to the successor task will override the relationship. However, if you prefer, you can set Project to honor relationships over constraints. On the Tools menu, click Options, and in the Options dialog box, click the Schedule tab. Clear the Tasks Will Always Honor Their Constraint Dates check box. This setting applies only to the current project file.
- If you must schedule a project from a finish date rather than a start date, some constraint behaviors change. For example, the As Late As Possible (ALAP) rather than the As Soon As Possible (ASAP) constraint type becomes the default for new tasks. You should pay close attention to constraints when scheduling from a finish date to make sure they create the effect you intend.

Viewing the Project's Critical Path

A ***critical path*** is the series of tasks that will push out the project's end date if the tasks are delayed. The word *critical* has nothing to do with how important these tasks are to the overall project. It refers only to how their scheduling will affect the project's finish date; however, the project finish date is of great importance in most projects. If you want to shorten the duration of a project to bring in the finish date, you must begin by shortening (also referred to as "crashing") the critical path.

Over the life of a project, the project's critical path is likely to change from time to time as tasks are completed ahead of or behind schedule. Schedule changes, such as assigning resources to tasks, can also alter the critical path. After a task on the critical path is completed, it is no longer critical because it cannot affect the project finish date. In

Chapter 15, "Getting Your Project Back on Track," you will work with a variety of techniques to shorten a project's overall duration.

A key to understanding the critical path is to understand slack, also known as float. There are two types of slack: free and total. ***Free slack*** is the amount of time a task can be delayed before it delays another task. ***Total slack*** is the amount of time a task can be delayed before it delays the completion of the project.

A task is on the critical path if its total slack is less than a certain amount—by default, if it is zero. In contrast, ***noncritical tasks*** have slack, meaning they can start or finish earlier or later within their slack time without affecting the completion date of a project.

In this exercise, you view the project's critical path. One way to see the critical path is to switch to the Detail Gantt view.

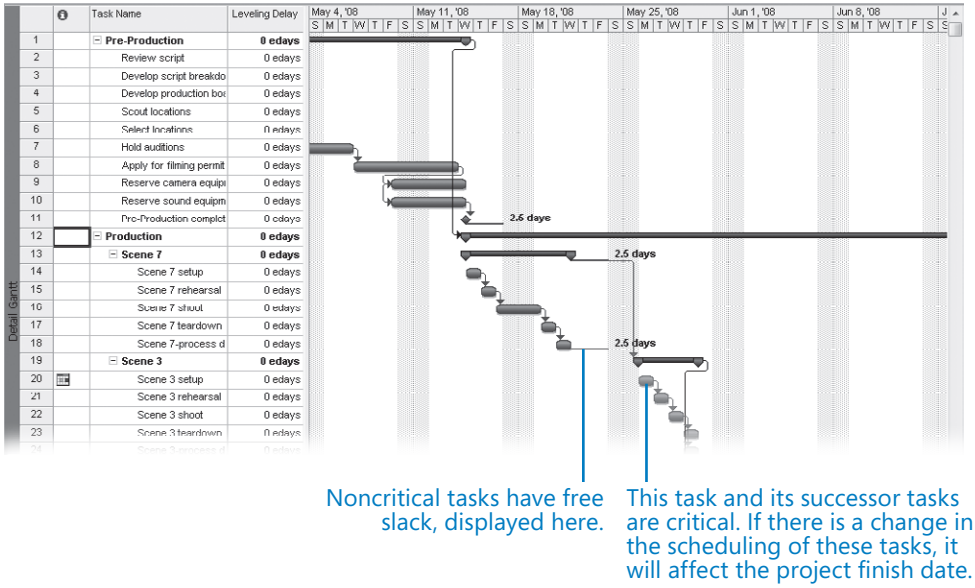
1. On the **View** menu, click **More Views**.
2. In the **More Views** dialog box, select **Detail Gantt**, and then click the **Apply** button.

   The project appears in the Detail Gantt view.
3. On the **Edit** menu, click **Go To**.

> **Tip** Ctrl+G is the keyboard shortcut for Go To.

4. In the **ID** box, type 12, and then click **OK**.

   Project displays task 12, the *Production* summary task.



The Scene 3 tasks and later tasks are critical tasks. In the Detail Gantt view, Project distinguishes between critical and noncritical tasks. Critical task bars are red, but noncritical task bars are blue. In this view, you can also see tasks with free slack.

Notice the Gantt bar of task 18, *Scene 7–process dailies*. The blue bar represents the duration of the task. The thin teal line and the number next to it represent free slack for this task. As you can see, this particular task has some slack and is therefore a noncritical task. (Remember that the term critical in this sense has nothing to do with the task's importance, but only with how much or little total slack is associated with the task—and, ultimately, what effect the task has on the project's finish date.) The slack on task 18 was caused by the Start No Earlier Than constraint applied to task 20. Without that constraint being applied, all tasks in the project would have been critical.

5. On the **View** menu, click **Gantt Chart**.

   Working with the critical path is the most important way to manage a project's overall duration. In later exercises, you will make adjustments that might extend the project's duration. Checking the project's critical path and, when necessary, shortening the overall project duration are important project management skills.

> **Tip** "Critical path" is a frequently misused phrase on many projects. Just listen for references to critical path work on your current projects to determine how frequently the phrase is used correctly. Remember that critical has nothing to do with the relative importance of a task, but only with its effect on the project finish date.

Here are a few other things to keep in mind when working with the critical path:

- By default, Project defines a task as critical if it has zero slack. However, you can change the amount of slack required for a task to be considered critical. You might do this, for example, if you wanted to more easily identify tasks that were within one or two days of affecting the project's finish date. On the Tools menu, click Options, and in the Options dialog box, click the Calculation tab. In the Tasks Are Critical If Slack Is Less Than Or Equal To box, enter the number of days you want.
- Project constantly recalculates the critical path even if you never display it.
- You see free slack represented in the chart portion of the Detail Gantt view, and you can also see the values of free and total slack in the Schedule table. You can apply the Schedule table to any Gantt Chart or Task Sheet view.

> **Tip** To learn more about managing a critical path, type **critical path** into the Search box in the upper right corner of the Project window. The Search box initially contains the text *Type a question for help*.

Interrupting Work on a Task

When initially planning project tasks, you might know that work on a certain task will be interrupted. You can split the task to indicate times when the work will be interrupted and when it can resume. The following are some reasons why you might want to split a task:

- You anticipate an interruption in a task. For example, a resource might be assigned to a week-long task, but needs to attend an event on Wednesday that is unrelated to the task.
- A task is unexpectedly interrupted. After a task is under way, a resource might have to stop work on the task because another task has taken priority. After the second task is completed, the resource can resume work on the first task.

In this exercise, you split a task to account for a planned interruption of work on that task.

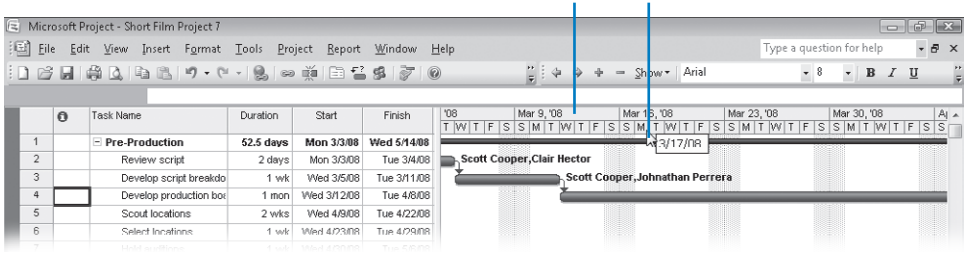
1. On the **Edit** menu, click **Go To**.
2. In the **ID** box, type 4, and then click **OK**.

   Project displays task 4, *Develop production boards*.

   You know that work on this task will be interrupted for two days starting March 17.

The timescale is divided onto tiers. The time setting of the lowest tier determines how you can split tasks. In this example, you can split tasks into one-day increments.

Point at the timescale to see the date.



3. On the **Standard** toolbar, click the **Split Task** button.

Split Task

> **Tip** You can also click the Split Task command on the Edit menu.

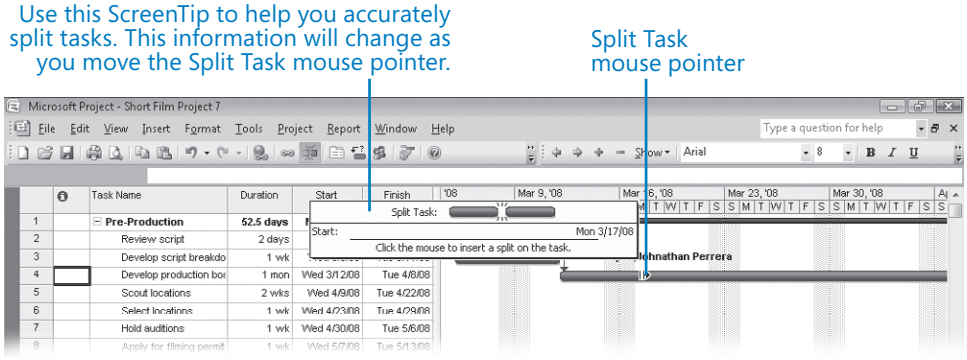
Split Task Mouse Pointer

A ScreenTip appears, and the mouse pointer changes.

4. Move the mouse pointer over the Gantt bar of task 4.

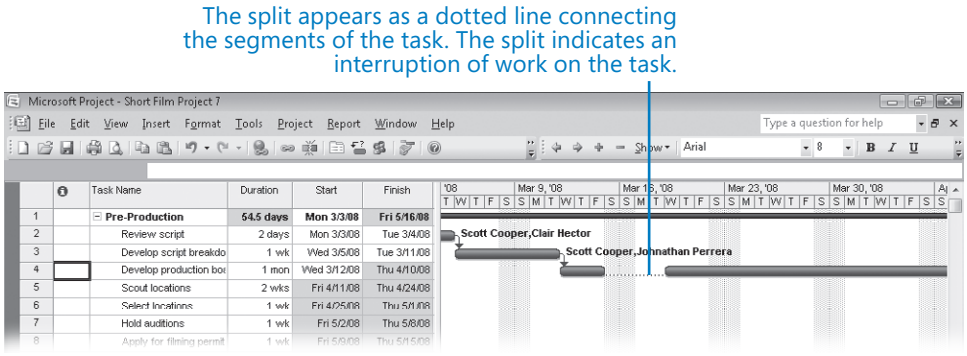
   This ScreenTip is essential for accurately splitting a task, because it contains the date at which you would start the second segment of the task if you dragged the mouse pointer from its current location on the Gantt bar. As you move the mouse pointer along the Gantt bar, you will see the start date in the ScreenTip change.

5. Move (but don't click) the mouse pointer over the Gantt bar of task 4 until the start date of Monday, 3/17/08, appears in the ScreenTip.



6. Click and drag the mouse pointer to the right until the start date of Wednesday, 3/19/08, appears in the ScreenTip, and then release the mouse button.

Project inserts a task split, represented in the Gantt chart as a dotted line, between the two segments of the task.



Four-headed Arrow Mouse Pointer

Tip Splitting tasks with the mouse might take a little practice. In step 6, if you didn't split task 4 so that the second segment starts on 3/19/08, just point to it again. When the mouse pointer changes to a four-headed arrow, drag the segment to the correct start date.

Here are a few other things to keep in mind when splitting tasks:

- Adjusting the bottom tier of the timescale is important for splitting tasks: the calibration of the bottom tier determines the smallest time increment into which you can split a task. With the bottom tier set at the Days level, you must split a task by at least one day. If you want to split a task at the Hourly level, you must adjust the bottom tier further (through the Timescale command on the Format menu).

- You can split a task into as many segments as you want.
- You can drag a segment of a split task either left or right to reschedule the split.
- The time of the task split, represented by the dotted line, is not counted in the duration of the task. No work occurs during the split.
- If the duration of a split task changes, the last segment of the task is increased or decreased.
- If a split task is rescheduled (for example, if its start date changes), the entire task is rescheduled, splits and all. The task keeps the same pattern of segments and splits.
- Resource leveling or manually contouring assignments over time can cause tasks to split. You will level resources in Chapter 8, "Fine-Tuning Resource and Assignment Details," and contour assignments in Chapter 9, "Fine-Tuning the Project Plan."
- To rejoin two segments of a split task, drag one segment of the task until it touches the other segment.
- If you do not want to display splits as a dotted line, you can remove them. On the Format menu, click Layout, and in the Layout dialog box, clear the Show Bar Splits check box.

Adjusting Working Time for Individual Tasks

You might want specific tasks to occur at times that are outside of the working time of the project calendar (or for assigned resources, the resource calendar). To accomplish this, you apply a ***task calendar*** to these tasks. As with the project calendar, you specify which base calendar to use as a task calendar. The following are some examples of when you might need a task calendar:

- You are using the Standard base calendar as your project calendar, and you have a task that must run overnight.
- You have a task that must occur on a specific weekday.
- You have a task that must occur over the weekend.

Unlike resources and resource calendars, Project does not create task calendars as you create tasks. When you need a custom task calendar, you assign one of the base calendars provided with Project (or, more likely, a new base calendar you have created) to the task. For example, if you assign the 24 Hours base calendar to a task, Project will schedule that task according to a 24-hour workday rather than the working time specified in the project calendar.

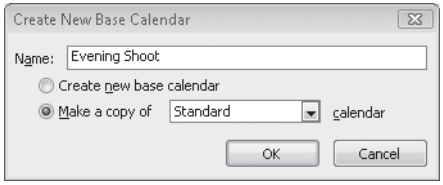
For tasks that have both a task calendar and resource assignments, Project schedules work during the working times that are common between the task calendar and resource calendar(s). If there is no common working time, Project alerts you when you apply the task calendar or assign a resource to the task.

Tip When you assign a base calendar to a task, you can choose to ignore resource calendars for all resources assigned to the task. Doing so causes Project to schedule the resources to work on the task according to the task calendar and not their own resource calendars (for example, to work 24 hours per day). If this would result in resources working in what would otherwise be their nonworking time, you might want to first discuss this with the affected resources.

In the film project, one of the scenes must be filmed at night. However, the project calendar does not include working time late enough to cover the filming of this scene. Because this task is really an exception to the normal working time of the project, you do not want to change the project calendar. In this exercise, you create a new base calendar and apply it to the appropriate task.

1. On the **Tools** menu, click **Change Working Time**.
2. In the **Change Working Time** dialog box, click the **Create New Calendar** button.

   The Create New Base Calendar dialog box appears.
3. In the **Name** box, type Evening Shoot.
4. Make sure that the **Make a copy of** option is selected and that **Standard** is selected in the drop-down menu.



5. Click **OK**.

Tip The benefit of basing the new calendar on the Standard calendar is that all of the working day exceptions from the Standard calendar, such as Independence Day, will also appear in the new calendar.

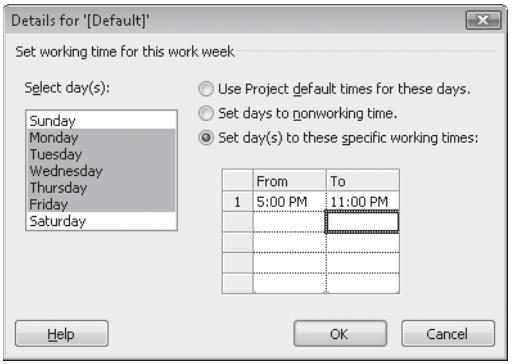
Note that *Evening Shoot* now appears in the For calendar box.

6. In the **Change Working Time** dialog box, click the **Work Weeks** tab.

   Next you'll enter the working time details for this new calendar.

7. Make sure that the Name value **[Default]** in Row 1 is selected, and then click the **Details** button.
8. In the **Select Day(s)** box, select **Monday** through **Friday**.

   You want to set this calendar's working time to 5:00 PM and 11:00 PM, Monday through Friday.
9. Click **Set day(s) to these specific working times:**.
10. Select the number 2 row heading in the **Working Times** box, and press Del.
11. In the **From** field for the first row, type 5:00 PM, and then press the → key.
12. Type 11:00 PM, and then press Enter.



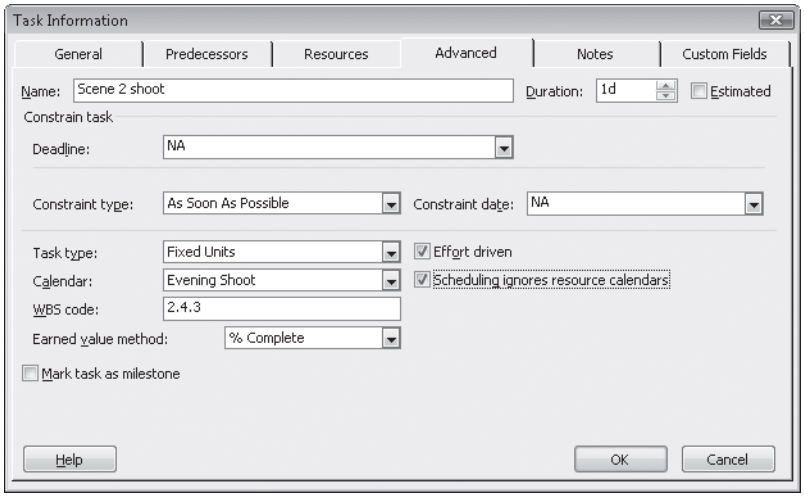
13. Click **OK** to close the Details dialog box, and then click **OK** again to close the Change Working Time dialog box.

    Now that you've created the Evening Shoot calendar, you're ready to apply it to a task that must be filmed in the evening.


Task Information

14. Select the name of task 34, **Scene 2 shoot**.
15. On the **Standard** toolbar, click **Task Information**.

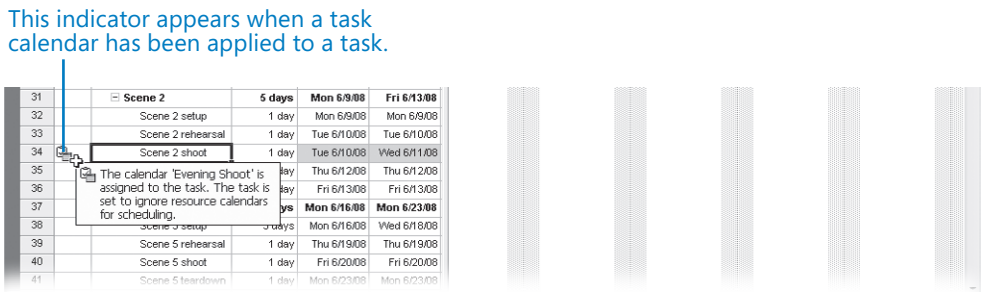
    The Task Information dialog box appears.
16. Click the **Advanced** tab if it is not already selected.
17. In the **Calendar** box, select **Evening Shoot** from the list.
18. Click the **Scheduling ignores resource calendars** check box.



19. Click **OK** to close the dialog box.

Project applies the Evening Shoot calendar to task 34. A calendar icon appears in the Indicators column, reminding you that this task has a task calendar applied to it.

20. Point to the calendar icon.



A screentip appears, showing the calendar details.

Because you chose to ignore resource calendars in the previous step, the resources assigned to these tasks will be scheduled at times that would otherwise be non-working times for them (specifically, 5:00 P.M. through 11:00 P.M.).

Tip To remove a task calendar from a task, on the Advanced tab of the Task Information dialog box, click None in the Calendar box.

Changing Task Types

You might recall from Chapter 4, "Assigning Resources to Tasks," that Project uses the following formula, called the scheduling formula, to calculate a task's work value:

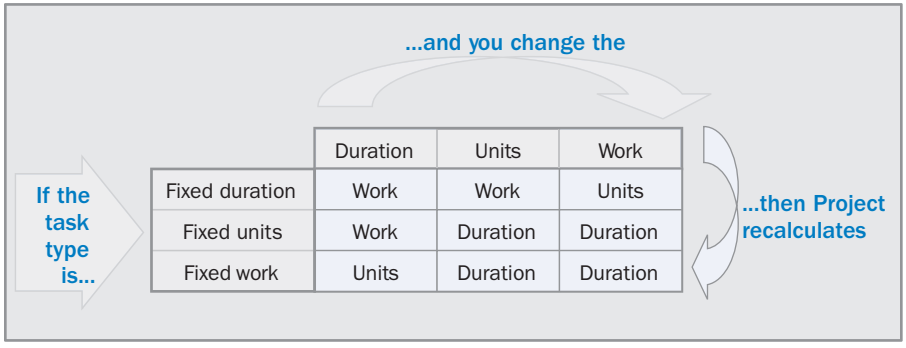
Work = Duration × Units

where Units refers to the resource assignment units, normally expressed as a percentage. Remember also that a task has work when it has at least one work (people or equipment) resource assigned to it. Each value in the scheduling formula corresponds to a task type. A ***task type*** determines which of the three scheduling formula values remains fixed if the other two values change.

The default task type is ***fixed units***: when you change a task's duration, Project recalculates work. Likewise, if you change a task's work, Project recalculates the duration. In either case, the units value is unchanged. The two other task types are fixed duration and fixed work.

For a ***fixed-duration*** task, you can change the task's units or work value, and Project will recalculate the other value. For a ***fixed-work*** task, you can change the task's units or duration value, and Project will recalculate the other value. Note that you cannot turn off ***effort-driven scheduling*** for a fixed-work task.

Which is the right task type to apply to each of your tasks? It depends on how you want Project to schedule that task. The following table summarizes the effects of changing any value for any task type. You read it like a multiplication table.



If the task type is...	Duration	Units	Work
Fixed duration	Work	Work	Units
Fixed units	Work	Duration	Duration
Fixed work	Units	Duration	Duration

To view the task type of the selected task, on the Standard toolbar, click the Task Information button. Then in the Task Information dialog box, click the Advanced tab. You can also view the task type in the Task Form. (When in the Gantt Chart view, you can display the Task Form by clicking the Split command on the Window menu.) You can change a task type at any time. Note that characterizing a task type as fixed does

not mean that its duration, units, or work values are unchangeable. You can change any value for any task type.

In this exercise, you change scheduling formula values (work, duration, and units) and task types.

1. On the **View** menu, click **Task Usage**.

   The Task Usage view appears.

2. On the **Edit** menu, click **Go To**.

3. In the **ID** box, type 2, and then click **OK**.

   Project displays task 2, *Review script*, and its assignments.

   The Task Usage view groups the assigned resources below each task and shows you, among other things, each task's and assignment's duration and work—two of the three variables of the scheduling formula.

4. Drag the vertical divider bar to the right so that the Start column is visible.

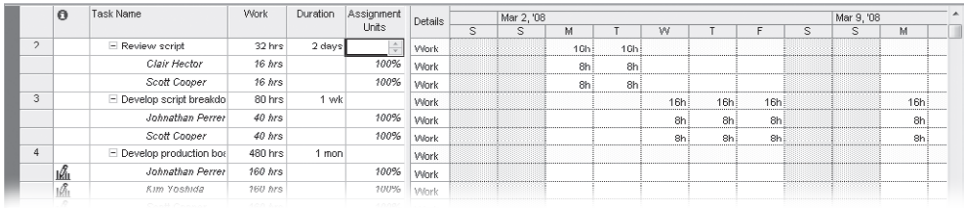
   Next, you'll add a column to the Task Usage view so you can see the assignment units—the third variable of the scheduling formula. You don't need to modify this view every time you want to use it, but for our purposes here, this is a good way to illustrate the effect of changing task types on the three variables of the scheduling formula.

5. Click the **Start** column heading, and then on the **Insert** menu, click **Column**.

   The Column Definition dialog box appears.

6. In the **Field Name** box, select **Assignment Units**, and then click **OK**.

   Project inserts the Assignment Units column to the left of the Start column.



		Task Name	Work	Duration	Assignment Units	Details	Mar 2, '08 S	S	M	T	W	T	F	S	Mar 9, '08 S	M
2		Review script	32 hrs	2 days		Work			16h	16h						
		Clair Hector	*16 hrs*		*100%*	Work			8h	8h						
		Scott Cooper	*16 hrs*		*100%*	Work			8h	8h						
3		Develop script breakdo	80 hrs	1 wk		Work					16h	16h	16h			16h
		Johnathan Perrer	*40 hrs*		*100%*	Work					8h	8h	8h			8h
		Scott Cooper	*40 hrs*		*100%*	Work					8h	8h	8h			8h
4		Develop production boo	480 hrs	1 mon		Work										
		Johnathan Perrer	*160 hrs*		*100%*	Work										
		Kim Yoshida	*160 hrs*		*100%*	Work										

You can see that task 2 has a total work value of 32 hours (that is, 16 hours each for two resources), resource units of 100% each, and a duration of two days. Next, you will change the task's duration to observe the effects on the other values.

After a discussion among all of the resources who will review the script, all agree that the task's duration should double but that the work required to complete the task should remain the same.

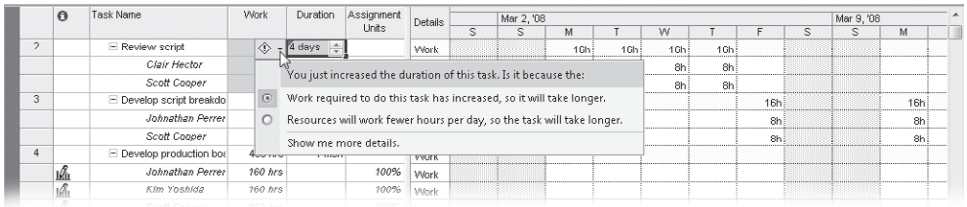
7. In the **Duration** field for task 2, type **4d**, and press F.

   Project changes the duration of task 2 to four days and increases the work per resource to 32 hours each. Note the change highlighting applied to the Work and Duration values. You wanted the duration to double (it did) but the work to remain the same (it didn't), so you will use the Smart Tag to adjust the results of the new task duration.


Smart Tag Actions

8. Point at the **Duration** field and then click the **Smart Tag Actions** button.

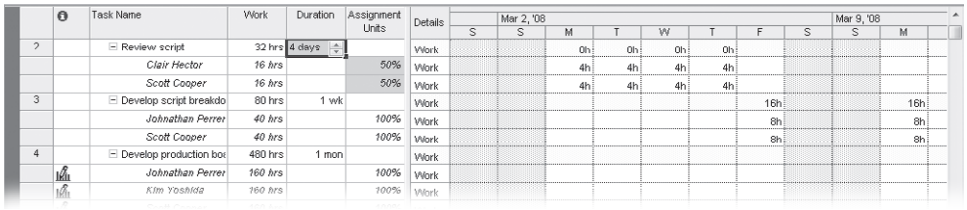
   Review the options on the list that appears.



   Because task 2's task type is fixed units (the default task type), the Smart Tag's default selection is to increase work as the duration increases. However, you'd like to keep the work value the same and decrease assignment units for the task's new duration.

9. On the **Smart Tag Actions** list, click **Resources will work fewer hours per day so that the task will take longer**.

   The assignment units value of each resource decreases to 50%, and the total work on the task remains unchanged at 32 hours (that is, 16 hours per each assigned resource).



   Next, you will change a task type using the Task Information dialog box.

10. On the **Edit** menu, click **Go To**.

11. In the **ID** box, type **67**, and then click **OK**.

    Project displays task 67, *Hold formal approval showing*.


Task Information

12. On the **Standard** toolbar, click **Task Information**.

The Task Information dialog box appears.

13. Click the **Advanced** tab if it is not already selected.

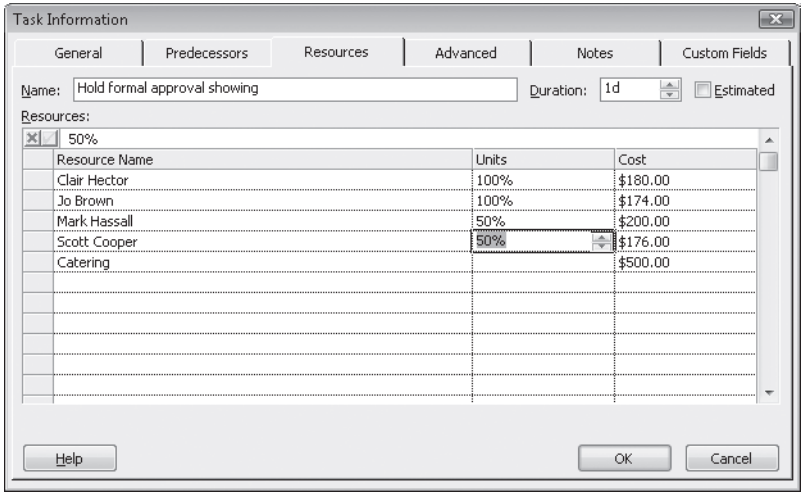
    The selected task describes the formal screening of the film for the financial backers of the project. As you can see in the Task Type box, this task currently has a fixed-units task type.

    The task is scheduled for a full day, although a few of the assigned resources will work for the equivalent of half a day. To reflect this (and properly manage resource costs for the task), you will make this a fixed-duration task and adjust the assignment unit values for some of the assigned resources.

14. In the **Task Type** box, select **Fixed Duration**.

15. Click the **Resources** tab.

16. In the **Units** column, set the units values for Mark Hassall and Scott Cooper to 50% each.



17. Click **OK** to close the Task Information dialog box.

    The change highlighting shows you the updated work values of the two resources on the task in the Task Usage view. Note that the duration value remains unchanged.

18. On the **View** menu, click **Gantt Chart**.

Important A summary task always has a fixed-duration task type, and you cannot change it. Because a summary task is based on the earliest start date and the latest finish date of its subtasks, its duration is calculated based on its subtasks and is not directly editable. If you want to confirm this, double-click Summary Task 1, Pre-Production (or a different summary task) and view the Advanced tab in the Task Information dialog box.

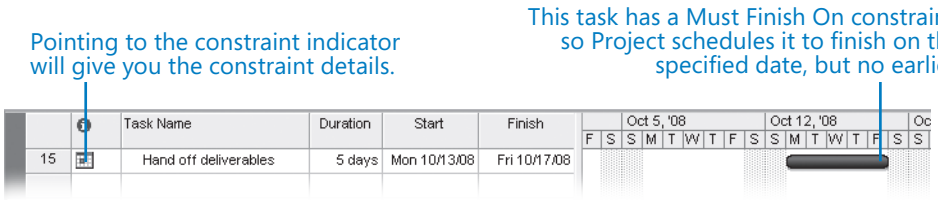
Task Types and Effort-Driven Scheduling

Many people misunderstand task types and effort-driven scheduling and conclude that these two issues are more closely related than they really are. Both settings can affect your schedule. Whereas the effect of a task type applies whenever you edit a task's work, duration, or unit values, effort-driven scheduling affects your schedule only when you're assigning or removing resources from tasks. For more information about effort-driven scheduling, see Chapter 4.

Entering Deadline Dates

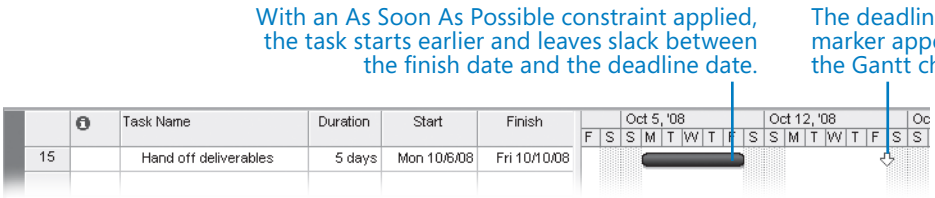
One common mistake made by new Project users is to place semi-flexible or inflexible constraints on too many tasks in their projects. Such constraints severely limit your scheduling flexibility.

Yet, if you know that a specific task must be completed by a certain date, why not enter a Must Finish On constraint? This is the reason why not: Assume that you have a five-day task that you want to see completed by October 17, and today is October 6. If you enter a Must Finish On constraint on the task and set it to October 17, Project will move it out so that it will, indeed, end on October 17.



Even if the task could be completed earlier, Project will not reschedule it to start earlier. In fact, by applying that constraint, you have increased the risk for this task. If the task is delayed for even one day for any reason (a required resource is sick, for example), the task will miss its planned finish date.

A better approach to scheduling this task is to use the default As Soon As Possible (ASAP) constraint and enter a deadline of October 17. A ***deadline*** is a date value you enter for a task that indicates the latest date by which you want the task to be completed, but the deadline date itself does not constrain the task.



Now the task has the greatest scheduling flexibility. It might be completed well before its deadline depending on resource availability, predecessor tasks, and whatever other scheduling issues apply.

Entering a deadline date causes Project to display a deadline indicator on the chart portion of the Gantt Chart view. If the task's finish date moves past its deadline, Project displays a missed deadline indicator in the *Indicator* field for that task.

In this exercise, you enter deadline dates for some tasks.

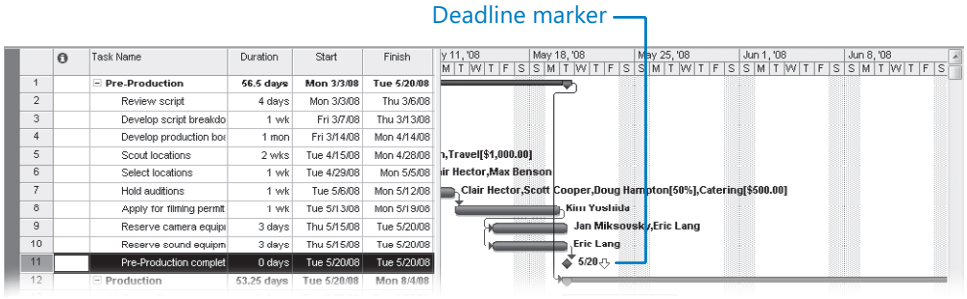
1. On the **Edit** menu, click **Go To**.
2. In the **ID** box, type **11** and click **OK**.

   Project displays task 11. This task is a milestone marking the scheduled finish date of the pre-production phase of the project. You want to make sure that the pre-production tasks conclude by May 22, 2008, so you will enter a deadline date for this milestone.


Task Information

3. On the **Standard** toolbar, click **Task Information**.
4. Click the **Advanced** tab.
5. In the **Deadline** box, type or select **5/22/08**, and then click **OK**.

   Project inserts a deadline indicator in the chart portion of the Gantt Chart view.



You can now see at a glance how close the pre-production phase has come to meeting or missing its deadline. If the scheduled completion of the pre-production phase moves past May 22, Project will display a missed deadline indicator in the Indicators column.

With one exception, entering a deadline date has no effect on the scheduling of a summary or subtask. However, a deadline date will cause Project to alert you if the scheduled completion of a task exceeds its deadline date.

The one situation in which the deadline date can affect the scheduling of a task involves slack. When a task is given a deadline date, its slack does not extend beyond the deadline date.

> **Tip** To remove a deadline from a task, clear the Deadline field on the Advanced tab of the Task Information dialog box (available by clicking Task Information on the Project menu).

Entering Fixed Costs

Projects that budget or track financial costs can deal with several different sources of costs. These include costs associated with resources, as well as costs associated directly with a specific task.

For many projects, financial costs are derived mainly from costs associated with work resources, such as people and equipment, or with material resources. To handle costs of similar types for which you want to track aggregate sums (travel and catering are two examples used in the short film project), Project 2007 has introduced cost resources (introduced in Chapter 3, "Setting Up Resources.").

However, you may occasionally want to associate a cost with a task that is not tied to resources or work and is not something you want to aggregate across the project. Project calls this a fixed cost, and it is applied per task. A ***fixed cost*** is a specific monetary amount budgeted for a task. It remains the same regardless of any resources assigned to the task. The following are common examples of fixed costs in projects:

- A setup fee, charged in addition to a per-day rental fee, for a piece of equipment.
- A permit to film in a public location.

If you assign resources with cost rates, assign cost resources, or add fixed costs to a task, Project adds it all together to determine the task's total cost. If you do not enter resource cost information into a project plan (perhaps because you do not know how much your work resources will be paid), you can still gain some control over the project's total cost by entering fixed costs per task.

As with resources, you can specify when fixed costs should accrue:

- Start. The entire fixed cost is scheduled for the start of the task. When you track progress, the entire fixed cost of the task is incurred as soon as the task starts.
- End. The entire fixed cost is scheduled for the end of the task. When you track progress, the entire fixed cost of the task is incurred only after the task is completed.
- Prorated. The fixed cost is distributed evenly over the duration of the task. When you track progress, the project incurs the cost of the task at the rate at which the task is completed. For example, if a task has a $100 fixed cost and is 75% complete, the project has incurred $75 against that task.

When you plan a project, the ***accrual*** method you choose for fixed costs determines how these costs are scheduled over time. This can be important in anticipating budget and cash-flow needs. By default, Project assigns the prorated accrual method for fixed costs, but you can change that to match your organization's cost accounting practices.

For the film project, you know from past experience that the filming permits will cost $500, payable when you apply for the permits. In this exercise, you assign a fixed cost to a task and specify its accrual method.

1. On the **View** menu, click **More Views**.
2. In the **More Views** dialog box, click **Task Sheet**, and then click **Apply**.

   The Task Sheet view appears.
3. On the **View** menu, point to **Table: Entry**, and click **Cost**.

   The Cost table appears, replacing the Entry table.
4. In the **Fixed Cost** field for task 8, **Apply for filming permits**, type **500**, and press Tab.
5. In the **Fixed Cost Accrual** field, select **Start**, and press Tab.

A fixed cost value is either accrued at the start or finish of a task or prorated over the duration of the task, depending on the option you choose.

	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaining
1	**Pre-Production**	**$0.00**	**Prorated**	**$27,402.00**	**$0.00**	**$27,402.00**	**$0.00**	**$27,402.00**
2	Review script	$0.00	Prorated	$712.00	$0.00	$712.00	$0.00	$712.00
3	Develop script breakdo	$0.00	Prorated	$1,880.00	$0.00	$1,880.00	$0.00	$1,880.00
4	Develop production boo	$0.00	Prorated	$10,144.00	$0.00	$10,144.00	$0.00	$10,144.00
5	Scout locations	$0.00	Prorated	$6,640.00	$0.00	$6,640.00	$0.00	$6,640.00
6	Select locations	$0.00	Prorated	$2,860.00	$0.00	$2,860.00	$0.00	$2,860.00
7	Hold auditions	$0.00	Prorated	$2,600.00	$0.00	$2,600.00	$0.00	$2,600.00
8	Apply for filming permit	$500.00	Start	$1,156.00	$0.00	$1,156.00	$0.00	$1,156.00
9	Reserve camera equips	$0.00	Prorated	$066.00	$0.00	$066.00	$0.00	$066.00
10	Reserve sound equipm	$0.00	Prorated	$444.00	$0.00	$444.00	$0.00	$444.00
11	Pre-Production complet	$0.00	Prorated	$0.00	$0.00	$0.00	$0.00	$0.00

Project will now schedule a $500 cost against the task *Apply for filming permits* at the task's start date, and the project will incur this cost when the task starts. This cost is independent of the task's duration and of the costs of resources assigned to it. In fact, the task's total cost of $1,156 (visible in the Total Cost column) includes both the $500 fixed cost and the cost of the resources assigned to the task.

Setting Up a Recurring Task

Many projects require repetitive tasks, such as attending project status meetings, creating and publishing status reports, or running quality-control inspections. Although it is easy to overlook the scheduling of such events, you should account for them in your project plan. After all, status meetings and similar events that indirectly support the project require time from resources, and such events take time away from your resources' other assignments.

To help account for such events in your project plan, create a ***recurring task***. As the name suggests, a recurring task is repeated at a specified frequency such as daily, weekly, monthly, or yearly. When you create a recurring task, Project creates a series of tasks with Start No Earlier Than constraints, no task relationships, and effort-driven scheduling turned off.

In this exercise, you create a recurring task that will represent a weekly meeting associated with this project.

1. On the **View** menu, click **Gantt Chart**.

   The Gantt Chart view appears.

2. Select the name of task 12, **Production**.

   You want the recurring tasks to be inserted into the project as the last items in the pre-production phase, directly above task 12, the *Production* task.

3. On the **Insert** menu, click **Recurring Task**.

   The Recurring Task Information dialog box appears.

4. In the **Task Name** box, type **Staff planning meeting**

5. In the **Duration** box, type **2h**

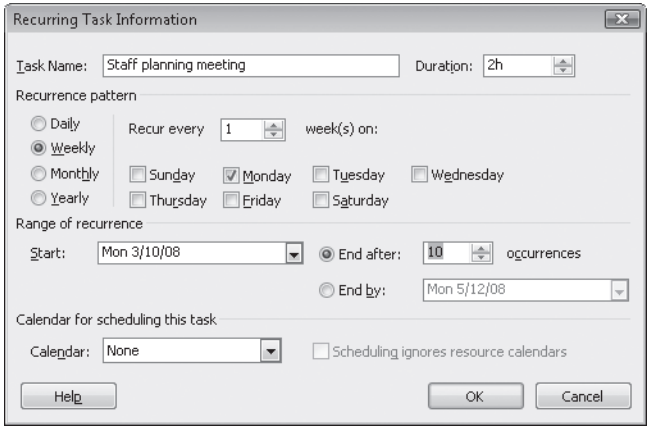
6. Under **Recurrence pattern**, make sure **Weekly** is selected, and then select the **Monday** check box.

   Next, you will specify the date of its first occurrence. By default, it is the project start date. However, you want the weekly status meetings to begin one week later.

7. In the **Start** box, type or select **3/10/08**.

Next, you will specify the number of recurrences. You do this by entering either an exact number of recurrences or a date by which the task should end.

8. Select **End after**, and type or select **10** occurrences.



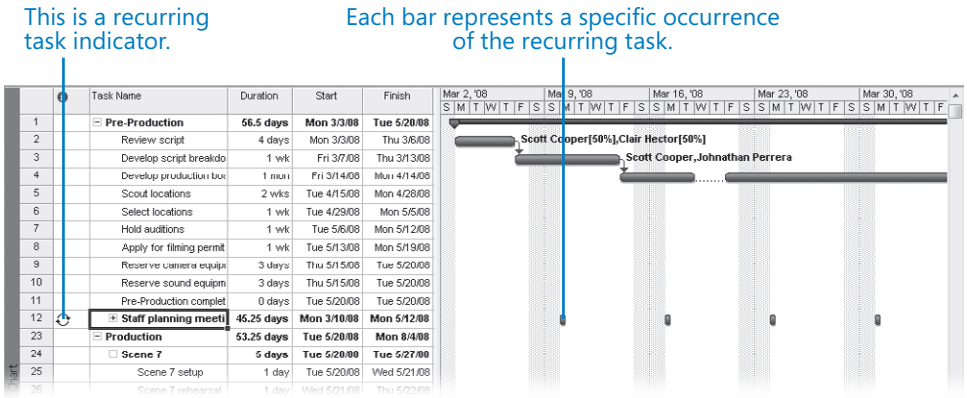

Recurring Task

9. Click **OK** to create the recurring task.

Project inserts the recurring tasks, nested within the pre-production phase. Initially, the recurring task is collapsed. A recurring task icon appears in the Indicators column.


Scroll To Task

10. To view the first occurrences of the recurring meeting's Gantt bars, on the **Standard** toolbar, click **Scroll To Task**.



Note that the Gantt bar for the recurring task does not look like the other Gantt bars in the Gantt chart. A Gantt bar for a recurring task shows only the occurrences or roll-ups of the individual occurrences of the task. For example, contrast the summary Gantt bar for the recurring task with that of task 1, Pre-Production.

Next, you will assign resources to the recurring task.


Assign Resources

11. Verify that task 12, *Staff planning meeting*, is selected, and then, on the **Standard** toolbar, click **Assign Resources**.

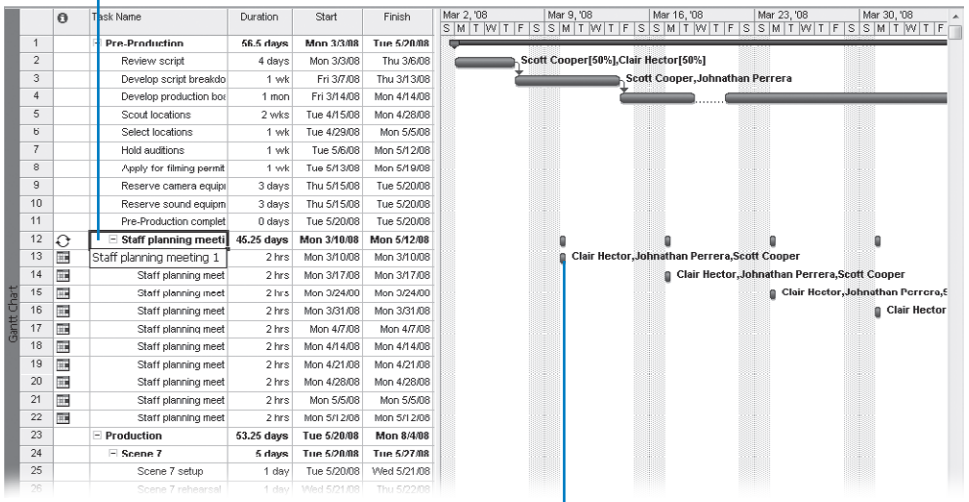
12. In the **Assign Resources** dialog box, click **Clair Hector**. Then hold down the Ctrl key while clicking **Johnathan Perrera** and **Scott Cooper**.

13. Click the **Assign** button, and then click **Close**.

The Assign Resources dialog box closes, and Project assigns the selected resources to the recurring task. Next, you will view the individual occurrences of the recurring task.

14. Click the plus sign next to the recurring task's title, *Staff planning meeting*.

The names of recurring tasks are automatically numbered sequentially. Pointing to a value that isn't fully visible in a cell will display the value in a ScreenTip.



The individual occurrences of the recurring task bars are rolled up to the recurring task.

Each occurrence of the recurring task is sequentially numbered (if you wish to verify this, widen the Task Name column, or point to the task's name and note the content of the ScreenTip), and the resource assignments appear for the individual occurrences.

15. Click the minus sign next to the recurring task's title, *Staff planning meeting*, to hide the individual occurrences.

Here are a few other things to keep in mind when creating recurring tasks:

- By default, Project schedules a recurring task to start at the Default Start Time value entered on the Calendar tab (on the Tools menu, click Options); in this project, that value is 8 A.M. If you want to schedule a recurring task to start at a different time, enter that time along with the start date in the Start box of the Recurring Task Information dialog box. For example, if you want the recurring staff meeting to be scheduled for 10 A.M. starting on October 6, you would enter 10/6/08 10AM in the Start box.
- As with a summary task, the duration of a recurring task spans the earliest start to latest finish date of the individual occurrences of the recurring task.
- When you schedule a recurring task to end on a specific date, Project suggests the current project end date. If you use this date, be sure to manually change it if the project end date changes later.
- Project alerts you if you create a recurring task that would occur during nonworking time, such as a holiday. You can then choose not to create that occurrence or to schedule it for the next working day.
- You should always assign resources to recurring tasks with the Assign Resources dialog box. Entering resource names in the *Resource Name field* of the recurring task assigns the resources to the recurring task and not to the individual occurrences.

CLOSE the Short Film Project 7 file.

Key Points

- By using a combination of task relationships plus lead and lag time, you can more accurately model how work should be done.
- When entering lead time between a predecessor and successor task, entering a percentage lead time value offers more flexibility because Project recalculates the lead time value whenever the duration of the predecessor task changes.
- The constraint options in Project enable you to fully take advantage of the scheduling engine in Project or to effectively turn it off. Think through the effects of semi-flexible and inflexible constraints on your schedules, and use them sparingly.
- You can often set a deadline date for a task instead of applying a hard constraint, such as Must Finish On.

- You can record any fixed cost value you wish per task, and it is not associated with resource costs.
- The critical path indicates the series of tasks that determine the project's finish date. Project constantly recalculates the critical path, which may change as the details of your project plan change.
- You can interrupt work on a task by splitting it.
- For tasks that must be completed outside of the project's normal working time (as specified by the project calendar), you can create a new base calendar and apply it to the task.
- Project supports three different task types; fixed units is the default. A task's type determines how Project reschedules a task when you change work, duration, or assignment unit values.
- Set up a recurring task for activities, such as status meetings, that occur on a regular frequency.

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