Geocentrix

Renown 1

Quick-Start Guide

Offshore pile design

Notices

Set in Optimum using Corel® WordPerfect® 12. Printed in the UK.

Acknowledgments

Renown 1 was designed and written by Dr Andrew Bond of Geocentrix.

The *Renown Quick-Start Guide* was written by Andrew Bond.

The following people and organizations assisted with the production of the program and its documentation: Giles Thompson.

Revision history

Version 1 of Guide written on 26th April 2006

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CHAPTER 1
TUTORIAL 1 – PIPE PILE IN CLAY

This tutorial demonstrates the basic features of Renown, through a worked example involving the analysis of a pipe pile installed in clay:

- Ground conditions comprise 30m of clay beneath 20m of sea water. The clay has unit weight of 20 kN/m^3 and undrained shear strength of 50 kPa.
- The foundation consists of a 42" pipe pile with 1" wall thickness, made of Grade S270SP steel. The length of pile embedded in the clay will be 20m.
- You want to determine load capacity vs depth curves for the pile under compression and tension loads, according to API Recommended Practice 2A-WSD (2002).
- You also want to generate t-z and Q-z curves for the pile according to the rules given RP2A-WSD.

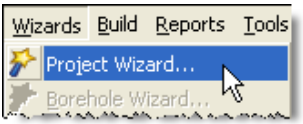
Overview

- In Step 1, you will use the Project Wizard to enter project information, select a design standard, and create scenarios to represent compression and tension loading conditions.
- In Step 2, you will create a soil layer, water table, and borehole to represent ground conditions at the site.
- In Step 3, you will create a pipe pile and specify its cross-section and steel grade.
- In Step 4, you will create compression and tension forces to be applied to the foundation.
- In Step 5, you will use the Calculation Wizard to create the calculations you want Renown to perform.
- In Step 6, you will perform the calculations and review the results.
- In Step 7, you will produce a report summarising the results of the calculations.
- In Step 8, you will close (and optionally save) the project.

If Renown is not already running, double-click on the Renown icon on Windows' Desktop to start the program. Once the splash screen has disappeared, Renown displays its main user interface.

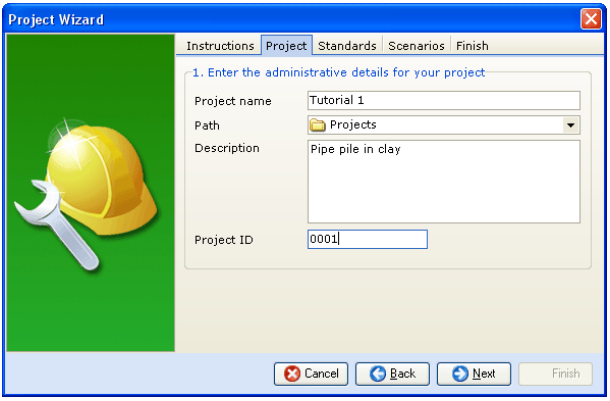
Step 1 – create the project

In Step 1, you will use the Project Wizard to enter project information, select a design standard, and create scenarios to represent compression and tension loading conditions.



1. Open the Project Wizard by clicking on the appropriate command on Renown's **Wizards** menu.
2. When the Project Wizard appears, read the instructions on the first page.
3. Click **Next** to display the Project page.
4. In the **Project name** box, type "Tutorial 1". Choose the folder where you want to save this project by using the **Path** control. (If you do not change the setting here, the project will be saved in Renown's Projects folder.)
5. Enter "Pipe pile in clay" in the **Description** box.

6. Enter “0001” in the **Project ID** box.



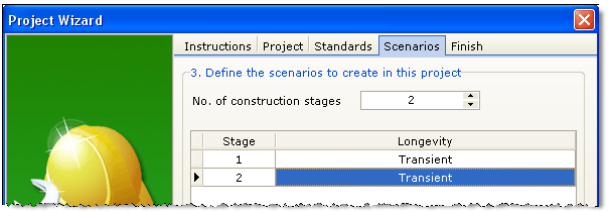
7. Click **Next** to display the Standards page. The design standards that appear on this page depend on which edition of Renown you are running (the Professional Edition supports more design standards than other editions).

8. Select API RP 2A: 2002 by clicking on the relevant checkbox (a tick mark appears next to a standard when it is selected).

9. Click **Next** to display the Scenarios page.

10. Increase the number of construction stages to 2.

11. In the table, change the longevity of both Stages 1 and 2 to “Transient” (this will ensure that the pile’s capacity is determined under undrained conditions).

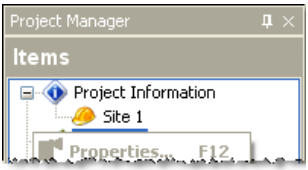


12. Click **Next** to display the Finish page.

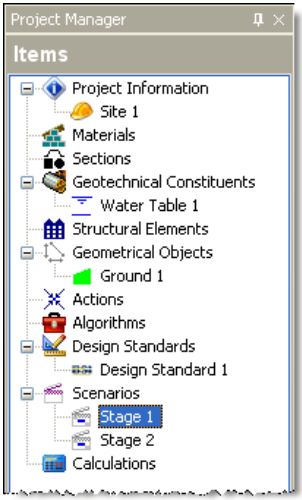
13. If you wish to review any of the settings you have made, click **Back** to return to the relevant page. Otherwise, click **Finish** to generate the project.

The Project Wizard creates a new project named `Tutorial 1.rnx` containing the following items:

- Project Information: Site 1
- Geotechnical Constituents: Water Table 1
- Geometrical Objects: Ground 1
- Design Standards: Design Standard 1
- Scenarios: Stages 1 and 2

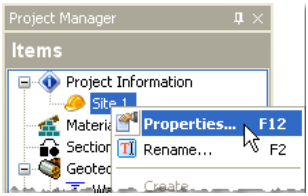


You can view these items by right-clicking anywhere inside the Project Manager to display its context menu and selecting the **Expand All** command. The Project Manager will then look like this:

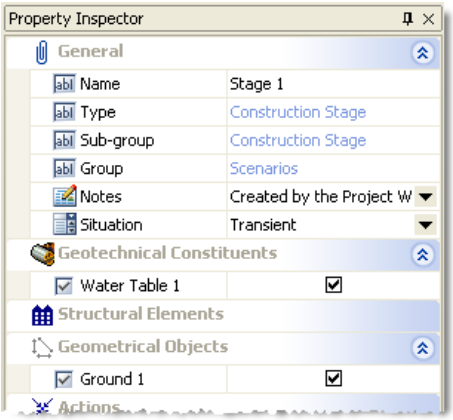


To view the properties of any particular item:

1. Select the item you want to inspect in Renown's Project Manager (e.g. Site 1)
2. Display the Property Inspector for that item by:
   - Right-clicking on the item to display its context menu and clicking the **Properties...** command; or
   - Double-clicking on the item.



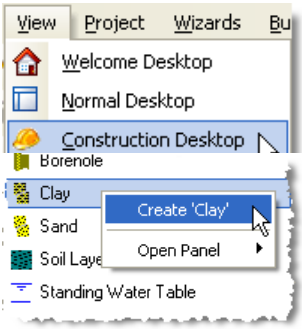
3. Renown's Property Inspector will open and display the properties of the selected item.



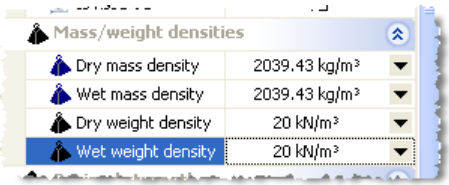
You will find a copy of this project in its current state at `[R]\Projects\Tutorial 1\Step 1.rnx`, where [R] is the folder where your copy of Renown is installed, typically `C:\Program Files\Geocentrix\Renown1`.

Step 2 – create the soil layer, water table, and borehole

In Step 2, you will create a soil layer, water table, and borehole to represent ground conditions at the site.

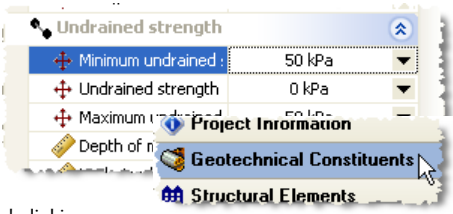


1. Open the Stockyard by clicking on the **Construction Desktop** command on Repute's **View** menu.
2. When the Stockyard appears, right-click anywhere inside it to display its context menu and select the **Open Panel > Materials** command. The Materials panel will open.
3. Create the soil by selecting the item labelled "Clay", right-clicking to display its context menu, and then selecting the command **Create 'Clay'**.
4. The newly-created soil will appear in the Project Manager (under Materials).
5. In the Project Manager, right-click on the newly-created soil ("Soil 1") to display its context menu and select the **Properties...** command. The Property Inspector will appear.
6. In the Property Inspector, change the **Dry weight density** and **Wet weight density** of the soil (under Drained strength) to 20 kN/m^3. *You must set the dry density first, otherwise an error message will appear saying you cannot enter a wet weight density less than the current dry weight density, which by default is 20.1 kN/m^3.*



7. Since you won't be using the clay's drained strength in this worked example, you can leave its **Angle of shearing resistance** and **Cohesion** unchanged. In a real job, you should set these values according to information obtained from the site's ground investigation.

8. If necessary, change the **Minimum undrained strength** of the clay (under Undrained strength) to 50 kPa and the **Undrained strength increase** to 0 kPa. Leave all other properties unchanged.

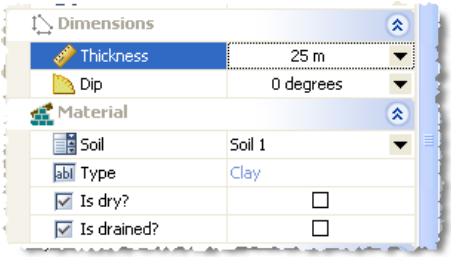


9. Next, click on the Stockyard's Geotechnical Constituents caption. The Geotechnical Constituents panel will open.

10. Create the layer by holding the `Ctrl` key down and clicking on the item labelled "Soil layer". (When the `Ctrl` key is pressed, Renown automatically creates any item that you select in the Stockyard. This saves you the effort of displaying the popup menu each time you want to create a new item.)

11. The newly-created layer will appear in the Project Manager (under Geotechnical Constituents).

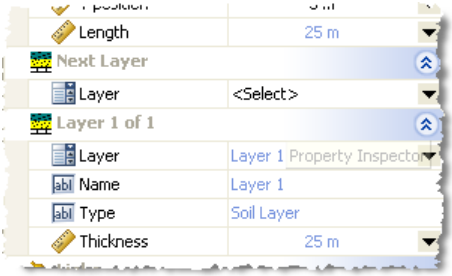
12. In the Property Inspector, change the **Soil name** (under Material Properties) from "Not specified" to "Soil 1". Then change the **Thickness** (under Dimensions) from to 25 m. Leave all other properties of the layer unchanged.



13. Returning to the Stockyard, create the borehole by holding the `Ctrl` key down and clicking on the item labelled "Borehole".

14. The newly-created borehole will appear in the Project Manager (under Geotechnical Constituents).

15. In the Property Inspector, change the **Layer name** (under Next Layer) to "Layer 1". The selected layer will appear under the heading "Layer 1 of 1" and the **Length** of the borehole (under Dimensions) will change to 25 m.



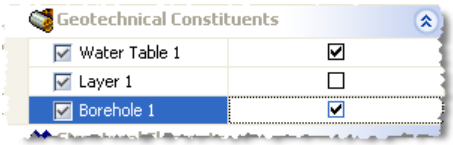
16. Finally in the Stockyard, create the water table by holding the `Ctrl` key down and clicking on the item labelled "Standing Water Table".

17. The newly-created water table will appear in the Project Manager (under Geotechnical Constituents).

18. In the Property Inspector, change the **Level** of Water Table 1 (under Dimensions) to 20 m.

19. Returning to the Project Manager, select Stage 1 (under Scenarios).

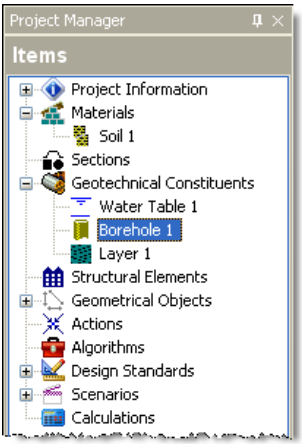
20. In the Property Inspector, place tick marks next to Borehole 1 and Water Table 1 (under Geotechnical Constituents) to add these items to this scenario. Press the `Enter` key to refresh the Drawing Board.



21. Repeat the previous instruction for Stage 2.

In this step, you have added the following items to your project:

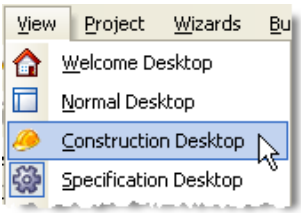
- Materials: Soil 1
- Geotechnical Constituents: Water Table 1, Layer 1, and Borehole 1



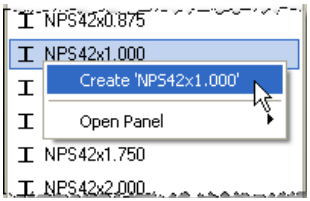
You will find a copy of this project in its current state at `[R]\Projects\Tutorial 1\Step 2.rnx`.

Step 3 – create the pile

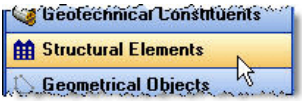
In Step 3, you will create a pipe pile and specify its cross-section and steel grade.



1. Open the Stockyard by clicking on the **Construction Desktop** command on Repute's **View** menu.
2. When the Stockyard appears, right-click anywhere inside it to display its context menu and select the **Open Panel > Sections** command. The Sections panel will open.
3. Create the pipe pile by selecting the item labelled "NPS42x1.00", right-clicking to display its context menu, and then selecting the command **Create 'NPS42x1.000'**.

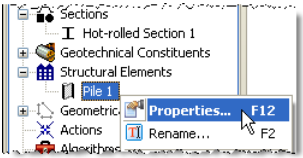


4. The newly-created section will appear in the Project Manager (under Sections).
5. Next, right-click anywhere inside the Stockyard to display its context menu and select the **Open Panel > Steels** command. The Steels panel will open.
6. Create the steel by holding the `Ctrl` key down and clicking on the item labelled "S270GP". (When the `Ctrl` key is pressed, Repute automatically creates any item that you select in the Stockyard. This saves you the effort of displaying the popup menu each time you want to create a new item.)
7. The newly-created steel will appear in the Project Manager (under Materials).

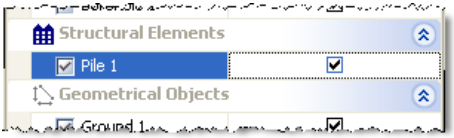


8. Finally, click on the Stockyard's Structural Elements caption (near the bottom of the Stockyard). The Structural Elements panel will open.
9. Create the pile by holding the `Ctrl` key down and clicking on the item labelled "Tubular pile".

10. The newly-created pile will appear in the Project Manager (under Structural Elements).
11. In the Project Manager, right-click on the newly-created pile ("Pile 1") to display its context menu and select the **Properties...** command. The Property Inspector will appear.



12. In the Property Inspector, change the **Material name** (under Material Properties) from "Not specified" to "Steel 1". Then change the **Section name** (under Section Properties) from "Not specified" to "Section 1". Leave all other properties of the pile unchanged.
13. Returning to the Project Manager, select Stage 1 (under Scenarios).
14. In the Property Inspector, place a tick next to Pile 1 (under Structural Elements) to add the pile to this scenario. Press the `Enter` key to refresh the Drawing Board.
15. Repeat the previous two instructions for Stage 2.



In this step, you have added the following items to your project:

- Materials: Steel 1
- Sections: Section 1
- Structural Elements: Pile 1

You have also:

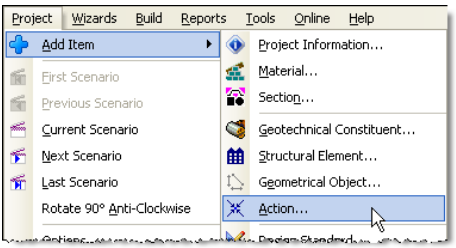
- Linked Pile 1 to Steel 1 and Section 1
- Added Pile 1 to Stages 1 and 2

You will find a copy of the project in its current state at `[R]\Projects\Tutorial 2\Step 3.rpx`.

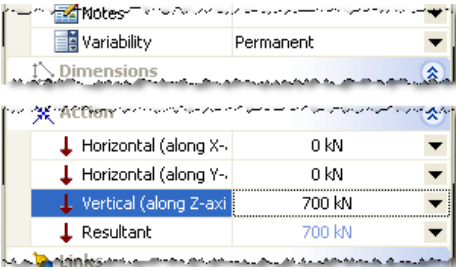
Step 4 – create the forces

In Step 4, you will create compression and tension forces to be applied to the foundation.

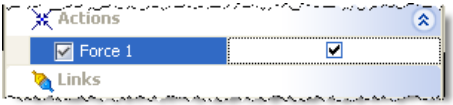
1. Open the Stockyard's Actions panel by clicking on Renown's **Project** menu and selecting the **Add Item > Action...** command.
2. The Actions panel will open.
3. Hold the `Ctrl` key down and click on the item labelled "Force".
4. The newly-created force will appear in the Project Manager (under Actions).



5. In the Property Inspector, change the **Variability** of Force 1 (under General) to "Permanent" and the value for **Vertical (along Z-axis)** (under Action) to 700 kN.



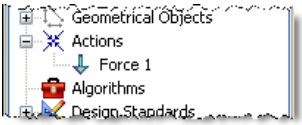
6. In the Project Manager, select “Stage 1” (under Scenarios).
7. In the Property Inspector, place a tick next to Force 1 (under Actions) to add the action to Stage 1. Press `Enter` to refresh the Drawing Board.



8. Create another force by holding the `Ctrl` key down and clicking on the item labelled “Force” in the Stockyard.
9. In the Property Inspector, change the **Variability** of Force 2 (under General) to “Permanent” and the value for **Vertical (along Z-axis)** (under Action) to –700 kN.
10. In the Project Manager, select “Stage 2” (under Scenarios).
11. In the Property Inspector, place a tick next to Force 2 (under Actions) to add the action to Stage 2. Press `Enter` to refresh the Drawing Board.

In this step, you have added the following items to your project:

- Actions: Forces 1 and 2



You have also:

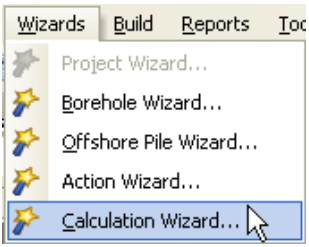
- Added Force 1 to Stage 1
- Added Force 2 to Stage 2

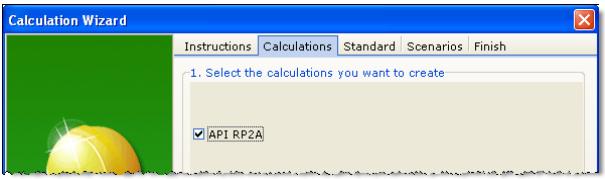
You will find a copy of this project in its current state at `[R]\Projects\Tutorial 2\Step 4.rpx`.

Step 5 – create the calculations

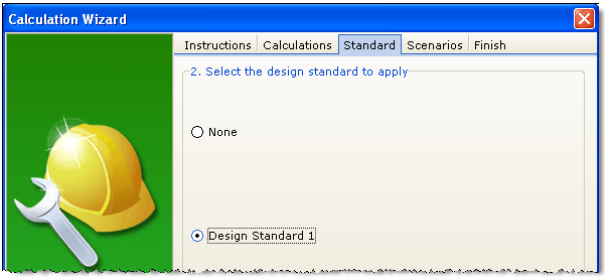
In Step 5, you will use the Calculation Wizard to create the calculations you want Renown to perform.

1. Open the **Calculation Wizard** by clicking the appropriate command on Renown’s **Wizards** menu.
2. When the Calculation Wizard appears, read the instructions on the first page.
3. Click **Next** to display the Calculations page.
4. Select “API RP2A”.

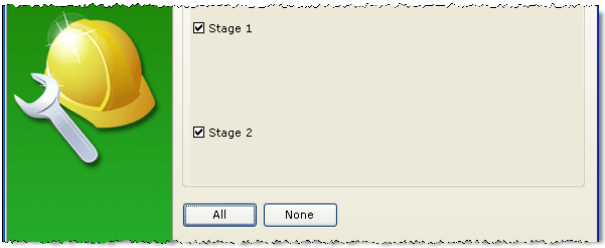




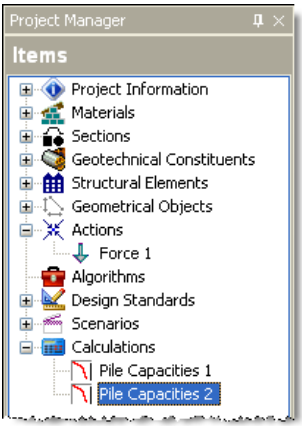
5. Click **Next** to display the Standard page.
6. Select "Design Standard 1" (this is the API RP2A: 2002 design standard created in Step 1 of this tutorial).



7. Click **Next** to display the Scenarios page.
8. Click **All** to select both scenarios.



9. Click **Next** to display the Finish page.
10. If you wish to review any of the settings you have made, click **Back** to return to the relevant page. Otherwise, click **Finish** to generate the calculations.



The Calculation Wizard adds the following items to your project:

- Calculations: Limit States 1 and 2

If you inspect the properties of these items in the Property Inspector, you will find that the Wizard has:

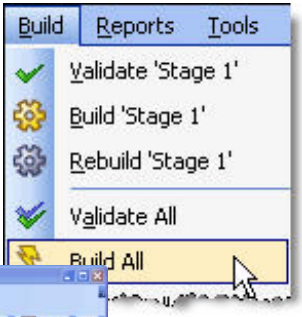
- Linked Limit State 1 to Stage 1
- Linked Limit State 2 to Stage 2
- Linked both limit states to Design Standard 1

You will find a copy of this project in its current state at `[R]\Projects\Tutorial 1\Step 5.rpx`.

Step 6 – perform and review the calculations

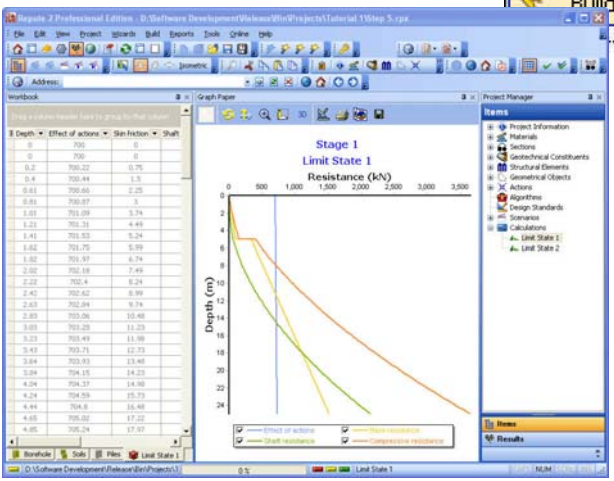
In Step 6, you will perform the calculations and review the results.

1. Run the calculations by clicking the command **Build All** on Renown's **Build** menu.



2. Renown will perform all the calculations that you have specified (i.e. Limit States 1 and 2) and then change its display to show its Workbook, Graph Paper, and Project Manager panels. You can switch to this display at any time by clicking on the **Results Desktop** command on Renown's View menu.

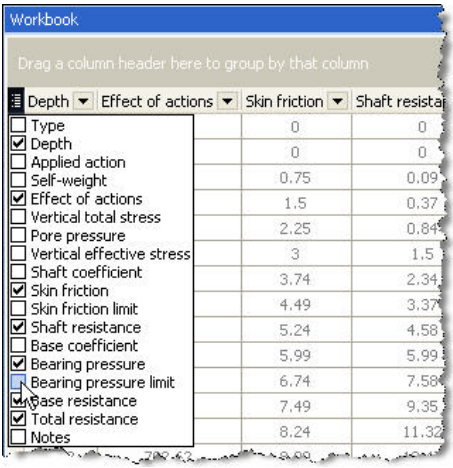
3. Your screen will now look something like this (results shown for Limit State 1):



4. The **Graph Paper** shows:
   - the effect of the actions E (equal to the sum of the applied forces and the self-weight of the pile) increasing with depth
   - the separate components of shaft and base resistances, R_s and R_b, also increasing with depth
   - the total compressive resistance, $R_c = R_s + R_b$, exceeding the effect of actions ($E \leq R_c$) at a depth of about 9m

5. The **Workbook** shows the same information, but in tabular format. To widen the Workbook, click on the divider between it and the Graph Paper and drag to the right.

6. The **Workbook** contains a lot more information than is initially shown. To display this additional information, click on the button in the top-left-hand corner of the Workbook and select the data you want to see.

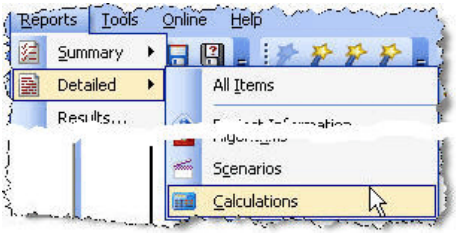


7. To view the results of the second calculation, select Limit State 2 in the Project Manager. Renown will automatically update the Workbook and Graph Paper panels with data from this calculation.

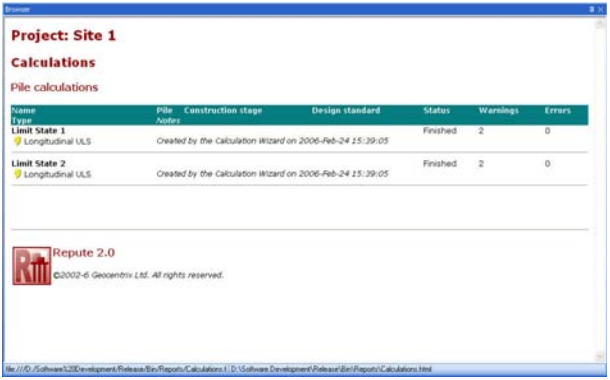
Step 7 – produce a report

In Step 7, you will produce a report summarising the calculations.

1. Create a detailed report summarizing the results of the calculations by clicking the command **Detailed > Calculations** on Renown's **Reports** menu.

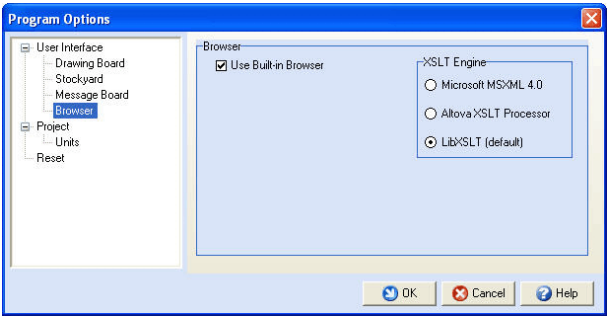


2. Renown will generate the requested report and display it (by default) in the program's built-in Browser or (if the program's options have been changed) in your computer's default browser (e.g. Internet Explorer).



3. You can change the browser used to display reports by clicking the **Program Options** command on

Renown's **Tools** menu. Then select the **User Interface > Browser** option in the left-hand tree list and tick or untick the **Use Built-in Browser** checkbox (as appropriate).

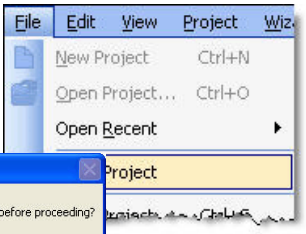


4. You can change print the report by right-clicking on the Browser and selecting the **Print** command.

Step 8 – close the project

In Step 8, you will close and (optionally) save[1] the project.

1. Close the project by clicking on the appropriate command on Renown's **File** menu.
2. If you have made changes to the project since it was last saved, Renown will ask you if you want to save it before proceeding. Answer Yes or No by clicking the appropriate button.



3. Renown will then (if requested) save and close the project.

What next?

Tutorial 2 demonstrates the ease with which you can enter complicated soil profiles in Renown and then customize – on a layer-by-layer basis – the way the calculations are performed..

[1] You cannot save the project in the Trial Edition of Renown

CHAPTER 2
TUTORIAL 2 – PILE IN INTER-BEDDED SANDS AND CLAYS

This tutorial demonstrates the ease with which you can enter complicated soil profiles in Renown and then customize – on a layer-by-layer basis – the way the calculations are performed.

- Ground conditions comprise 92.3m of interbedded sands and clays.
- Sand, with varying thickness, submerged unit weight γ', and angle of shearing resistance ϕ, occurs in:
  - Layer 1, 2.3m, 9 kN/m^3, 30°
  - Layer 3, 3.0m, 9.5 kN/m^3, 30°
  - Layer 4, 6.5m, 9 kN/m^3, 30°
  - Layer 6, 2.6m, 9 kN/m^3, 35°
  - Layer 8, 3.0m, 9.4 kN/m^3, 35°
  - Layer 10, 7.0m, 10.0 kN/m^3, 35°
- The bearing capacity factor in layers 1, 3, and 4 is $N_q = 20$ and in layers 6, 8, and 10 is $N_q = 40$. The end bearing pressure is limited in layers 1 and 3 to 4800 kPa, in layer 4 to 2900 kPa, in layers 6 and 8 to 4800 kPa, and in layer 10 to 2900 kPa.
- The shaft friction angle δ is calculated as $\phi - 5°$ in all sand layers. The resulting shaft friction is limited to 81 kPa in layers 1, 3, and 4 and to 96 kPa in layers 6, 8, and 10.
- Clay, with varying thickness, submerged unit weight γ', and undrained strength C_u (which increases with depth), occurs in:
  - Layer 2, 12.7m, 7.9 kN/m^3, 90 to 100 kPa
  - Layer 5, 9.3m, 10.5 kN/m^3, 265 to 375 kPa
  - Layer 7, 8.6m, 10.0 kN/m^3, 400 kPa (constant)
  - Layer 9, 3.0m, 10.3 kN/m^3, 320 to 480 kPa
  - Layer 11, 34.3m, 10.4 kN/m^3, 545 to 600 kPa
- The strain at 50% ultimate load is 0.4% in all clay layers except layer 2, in which it is 0.7%. The overconsolidation ratio OCR of all clay layers is 5.0.
- The pipe pile has an outside diameter of 48" and wall thickness of 1" and is made from Grade S270SP steel.
- You want to determine load capacity vs depth curves for the pile under compression and tension loads, according to API Recommended Practice 2A-WSD (2002).

Overview

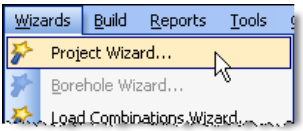
- In Step 1, you will use the Project Wizard to enter project information, select a design standard, and create scenarios to represent compression and tension loading conditions.
- In Step 2, you will use the Borehole Wizard to create a borehole containing the various sand and clay layers.
- In Step 3, you will use the Offshore Pile Wizard to create a pipe pile and specify its cross-sectional properties.
- In Step 4, you will use the Calculation Wizard to create the calculations you want Renown to perform.
- In Step 5, you will perform the calculations and review the results.

- In Step 6, you will produce a report summarising the results of the calculations.
- In Step 7, you will close (and optionally save) the project.

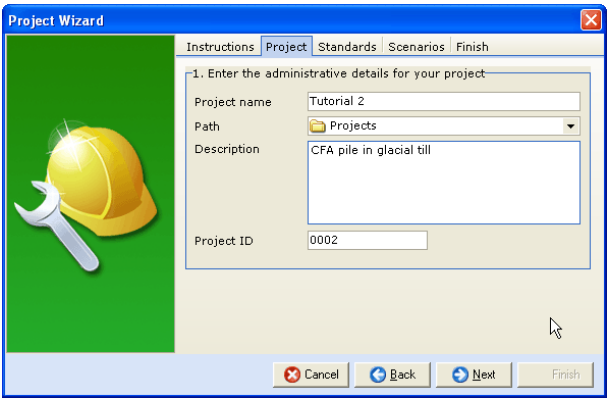
If it Renown is not already running, double-click on the Renown icon on Windows' Desktop to start the program. Once the splash screen has disappeared, Renown displays its main user interface.

Step 1 – create the project

In Step 1, you will you will use the Project Wizard to enter project information, select a design standard, and create a scenario to represent a persistent design situation.

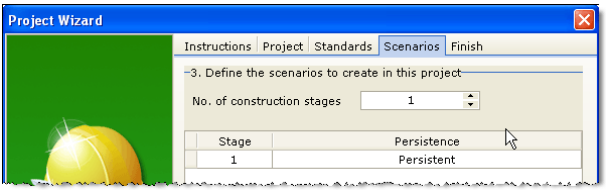


1. Open the Project Wizard by clicking the appropriate command on Renown's **Wizards** menu.
2. When the Project Wizard appears, read the instructions on the first page.
3. Click **Next** to display the Project page.
4. In the **Project Name** box, type "Tutorial 2". Choose the folder where you want to save this project by using the **Path** control. (If you do not change the setting here, the project will be saved in Renown's Projects folder.)
5. Enter "Pile in interbedded sands and clays" in the **Description** box.
6. Enter "0002" in the **Project ID** box.



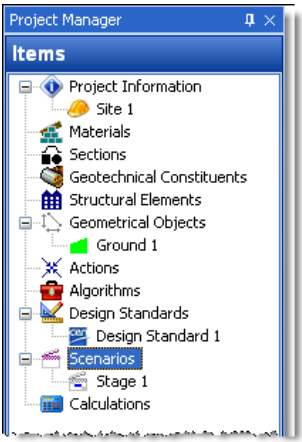
7. Click **Next** to display the Standards page. The design standards that appear on this page depend on which edition of Renown you are running (the Professional Edition supports more design standards than other editions).
8. Select API RP 2A: 2002 by clicking on the relevant checkbox (a tick mark appears next to a standard when it is selected).

9. Click **Next** to display the Scenarios page.
10. Increase the number of construction stages to 2.
11. In the table, change the longevity of both Stage 1 and 2 to "Transient" (this will ensure that the pile's capacity is determined under undrained conditions).



12. Click **Next** to display the Finish page.
13. If you wish to review any of the settings you have made, click **Back** to return to the relevant page. Otherwise, click **Finish** to generate the project.

The Project Wizard creates a new project named `Tutorial 2.rpx` which contains the following items:

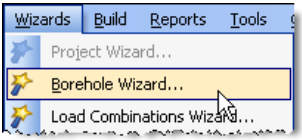


- Project Information: Site 1
- Geometrical Objects: Ground 1
- Design Standards: Design Standard 1
- Scenarios: Stages 1 and 2

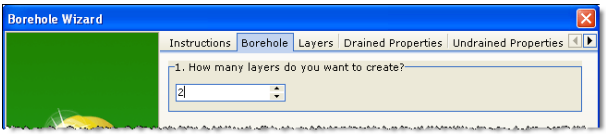
You will find a copy of this project in its current state at `[R]\Projects\Tutorial 2\Step 1.rpx`, where [R] is the folder where your copy of Renown is installed.

Step 2 – create the borehole

In Step 2, you will use the Borehole Wizard to create a borehole containing the fill and glacial till layers.

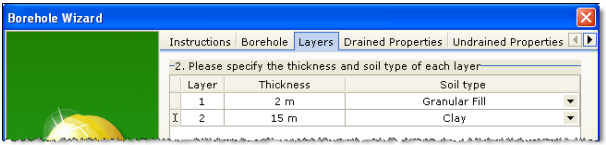


1. Open the **Borehole Wizard** by clicking the appropriate command on Renown's **Wizards** menu.
2. When the Borehole Wizard appears, read the instructions on the first page.
3. Click **Next** to display the Borehole page.
4. Increase the number of layers to 11.



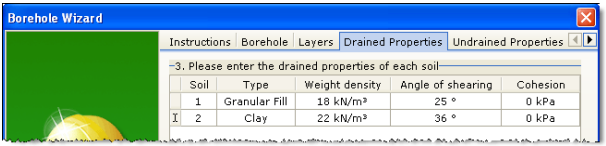
5. Click **Next** to display the Layers page.
6. Change the thickness and soil types of the layers to the following:

- Layer 1: 2.3m, Sand
- Layer 2: 12.7m, Clay
- Layer 3: 3m, Sand
- Layer 4: 6.5m, Sand
- Layer 5: 9.3m, Clay
- Layer 6: 2.6m, Sand
- Layer 7: 8.6m, Clay
- Layer 8: 3m, Sand
- Layer 9: 3m, Clay
- Layer 10: 7m, Sand
- Layer 11: 34.3m, Clay



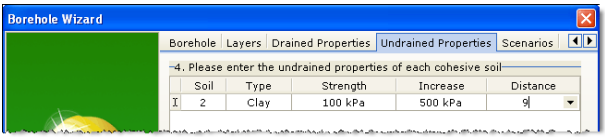
7. Click **Next** to display the Drained Properties page.
8. Change the weight densities and angles of shearing to the following (leave the cohesion of all soils at 0 kPa):

- Layer 1 (Sand): 19.05 kN/m^3, 30°
- Layer 2 (Clay): 17.95 kN/m^3, use default angle of shearing
- Layer 3 (Sand): 19.55 kN/m^3, 30°
- Layer 4 (Sand): 19.05 kN/m^3, 30°
- Layer 5 (Clay): 20.55 kN/m^3, use default
- Layer 6 (Sand): 19.05 kN/m^3, 35°
- Layer 7 (Clay): 20.05 kN/m^3, use default
- Layer 8 (Sand): 19.45 kN/m^3, 35°
- Layer 9 (Clay): 20.35 kN/m^3, use default
- Layer 10 (Sand): 20.05 kN/m^3, 35°
- Layer 11 (Clay): 20.45 kN/m^3, use default



9. Click **Next** to display the Undrained Properties page.
10. Change the strengths, increases, and distances to the following:

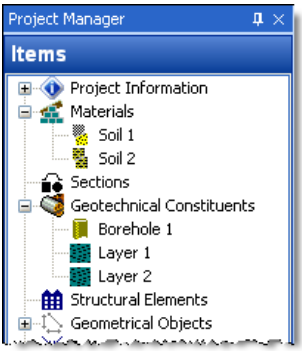
- Layer 2 (Clay): 90 kPa, 10 kPa, 12.7m
- Layer 5 (Clay): 265 kPa, 110 kPa, 9.3m
- Layer 7 (Clay): 400 kPa, 0 kPa, 8.6m
- Layer 9 (Clay): 320 kPa, 160 kPa, 3m
- Layer 11 (Clay): 545 kPa, 55 kPa, 34.3m



11. Click **Next** to display the Scenarios page.
12. Click **All** to select both scenarios.

13. Click **Next** to display the Finish page.
14. If you wish to review any of the settings you have made, click **Back** to return to the relevant page. Otherwise, click **Finish** to generate the borehole.

The Borehole Wizard adds the following items to your project:



- Materials: Soils 1-11
- Geotechnical Constituents: Borehole 1, Layers 1-11

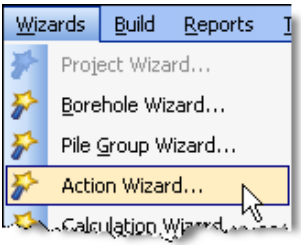
If you inspect the properties of these items in the Property Inspector, you will find that the Wizard has:

- Linked Layer 1 to Soil 1, etc
- Added Layers 1-11 to Borehole 1

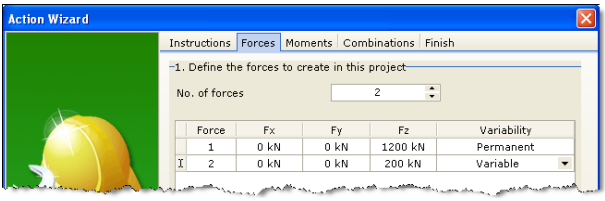
You will find a copy of this project in its current state at `[R]\Projects\Tutorial 2\Step 2.rpx`.

Step 3 – create the pile

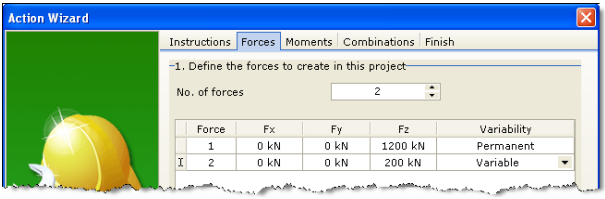
In Step 3, you will use the Offshore Pile Wizard to create a pipe pile and specify its cross-section and steel grade.



1. Open the **Offshore Pile Wizard** by clicking the appropriate command on Renown's **Wizards** menu.
2. When the Offshore Pile Wizard appears, read the instructions on the first page.
3. Click **Next** to display the Elevation page.
4. Change the **Length** of the piles you want to create to 100 m and the **Upstand** to 20 m.



5. Click **Next** to display the Cross-Section page.
6. Tick the box labelled "1067 mm (42")" in the **Outside Diameter** list and the box labelled "25.4 mm (1")" in the **Wall Thickness** list.

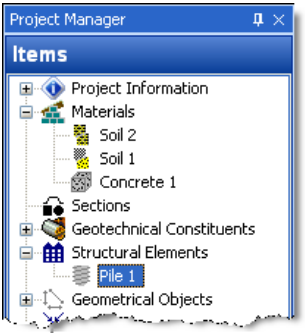


7. Click **Next** to display the Material page.
8. Select "S270GP".

9. Click **Next** to display the Finish page.
10. If you wish to review any of the settings you have made, click **Back** to return to the relevant page. Otherwise, click **Finish** to generate the actions.
11. Returning to the Project Manager, select Stage 1 (under Scenarios).
12. In the Property Inspector, place a tick next to Pile 1 (under Structural Elements) to add the pile to this scenario. Press `Enter` to refresh the Drawing Board.
13. Repeat the previous two instructions for Stage 2.

The Offshore Pile Wizard adds the following items to your project:

- Materials: Steel 1
- Sections: Section 1
- Structural Elements: Pile 1



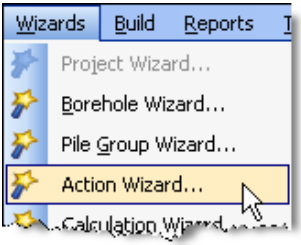
You have also:

- Linked Pile 1 to Steel 1 and Section 1
- Added Pile 1 to Stages 1 and 2

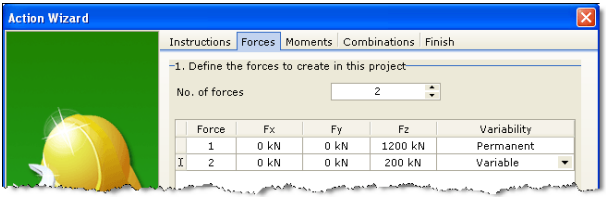
You will find a copy of this project in its current state at `[R]\Projects\Tutorial 2\Step 3.rpx`.

Step 4 – create the forces

In Step 4, you will use the Action Wizard to create the forces applied to the pile.

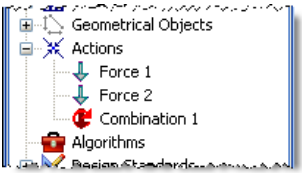


1. Open the **Action Wizard** by clicking the appropriate command on Renown's **Wizards** menu.
2. When the Action Wizard appears, read the instructions on the first page.
3. Click **Next** to display the Forces page.
4. Increase the number of forces to 2.
5. Change the **Variability** of Force 1 to "Permanent" and the magnitude of its **Fz** component to 1000 kN. Change the **Variability** of Force 2 to "Permanant" and the magnitude of its **Fz** component to –1000 kN.



6. Click **Next** to display the Moments page.
7. Since there are no moments to apply in this worked example, leave the number of moments as 0. Click **Next** to display the Combinations page.
8. Since there are no combinations to apply in this worked example, leave the number of combinations as 0. Click **Next** to display the Finish page.
9. If you wish to review any of the settings you have made, click **Back** to return to the relevant page. Otherwise, click **Finish** to generate the actions.
10. Returning to the Project Manager, select Stage 1 (under Scenarios).
11. In the Property Inspector, place a tick next to Force 1 (under Actions) to add it to Stage 1. Press `Enter` to refresh the Drawing Board.
12. In the Project Manager, select Stage 2.
13. In the Property Inspector, place a tick next to Force 2 to add it to Stage 2. Press `Enter` to refresh the Drawing Board.

The Action Wizard adds the following items to your project:



- Actions: Forces 1 and 2

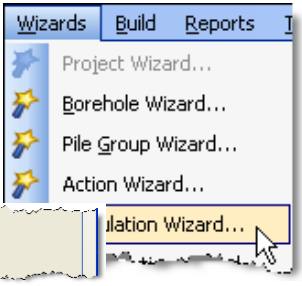
You have also:

- Added Force 1 to Stage 1
- Added Force 2 to Stage 2

You will find a copy of this project in its current state at `[R]\Projects\Tutorial 2\Step 4.rpx`.

Step 5 – create the calculation

In Step 5, you will use the Calculation Wizard to create the calculation you want Renown to perform.



1. Open the **Calculation Wizard** by clicking the appropriate command on Renown's **Wizards** menu.
2. When the Calculation Wizard appears, read the instructions on the first page.
3. Click **Next** to display the Calculations page.
4. Select "Longitudinal ULS".
5. Click **Next** to display the Standard page.
6. Select "Design Standard 1" (this is the Eurocode 7 design standard created in Step 1 of this tutorial).

7. Click **Next** to display the Scenarios page.
8. Select "Stage 1".

9. Click **Next** to display the Finish page.
10. If you wish to review any of the settings you have made, click **Back** to return to the relevant page. Otherwise, click **Finish** to generate the calculation.

The Calculation Wizard adds the following items to your project:

- Calculations: Limit State 1

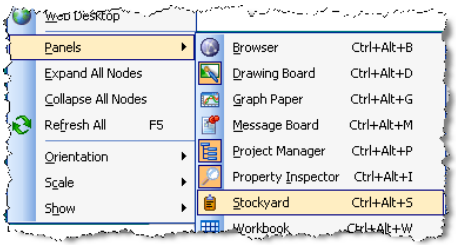
It has also:

- Linked Limit State 1 to Stage 1
- Linked Limit State 1 to Design Standard 1

You will find a copy of this project in its current state at `[R]\Projects\Tutorial 2\Step 5.rpx`.

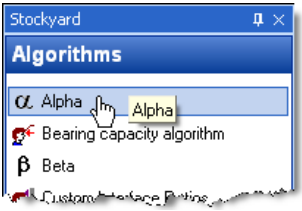
Step 6 – customize the calculation

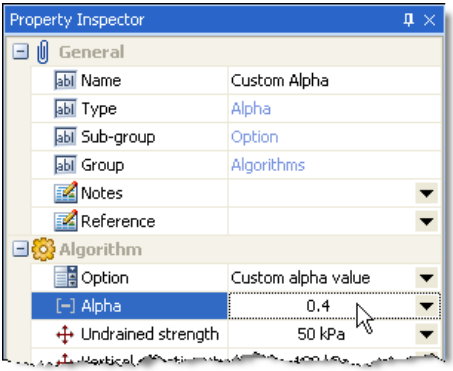
In Step 6, you will change the value of alpha used to determine the pile's skin friction in the glacial till layer.



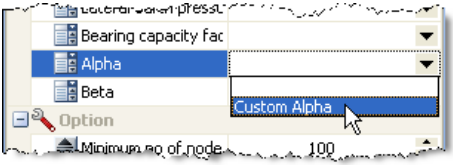
1. Open the Stockyard by clicking on Renown's **View** menu and selecting the **Panels > Stockyard** command.
2. The Stockyard will open.

3. Click on the Stockyard's **Algorithms** caption. The Algorithms panel will open.
4. Create the algorithm by holding the `Ctrl` key down and clicking on the item labelled "Alpha".
5. The newly-created algorithm ("Option 1") will appear in the Project Manager (under Algorithms).
6. In the Property Inspector, change the **Name** of the algorithm (under General) to "Custom Alpha" and its value (**Alpha**, under Algorithms) to 0.4. The **Option** setting (under Algorithms) will automatically change to "Custom alpha value".





7. Returning to the Project Manager, select Limit State 1 (under Calculations).
8. In the Property Inspector, change the setting for Alpha (under Algorithms) to "Custom Alpha".



In this step, you have added the following item to your project:

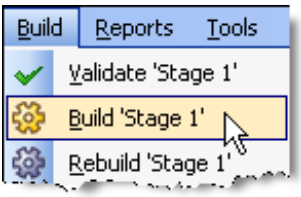
- Algorithms: Custom Alpha

You have also:

- Linked Limit State 1 to Custom Alpha

You will find a copy of this project in its current state at `[R]\Projects\Tutorial 2\Step 6.rpx`.

Step 7 – perform and review the calculation

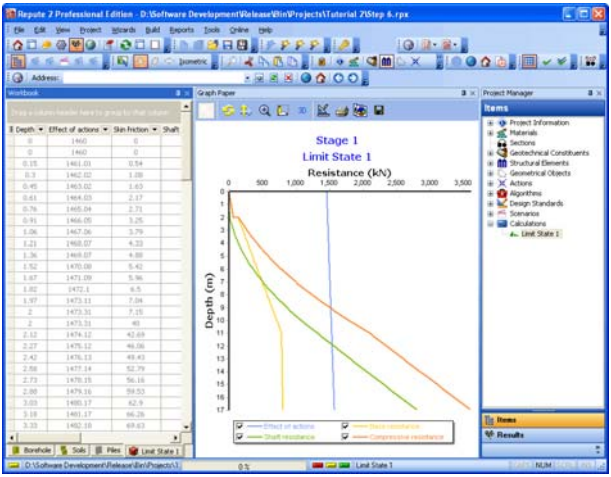


In Step 7, you will perform the calculation and review the results.

1. Run the calculation by clicking the command **Build 'Stage 1'** on Renown's **Build** menu.
2. Renown will perform all the calculations that are linked to Stage 1

(in this case, just Limit State 1) and then change its display to show its Workbook, Graph Paper, and Project Manager panels. You can switch to this display at any time by clicking on the **Results Desktop** command on Renown's View menu.

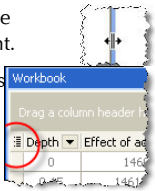
3. Your screen will now look something like this:



4. The **Graph Paper** (centre) shows:

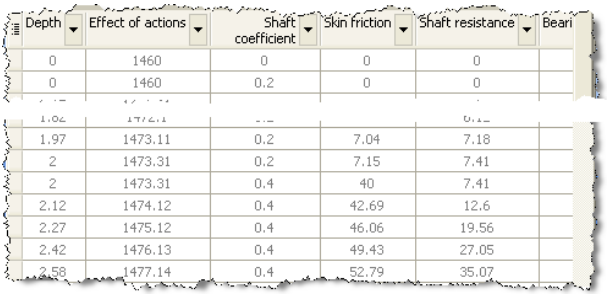
- Effect of actions E (in blue), equal to the sum of the applied forces and the self-weight of the pile (which increases with depth)
- Shaft Resistance R_s (in green), increasing with depth
- Base Resistance R_b (in yellow), increasing with depth
- Compressive resistance $R_c = R_s + R_b$ (in red), increasing with depth (and exceeding the effect of actions at a depth of about 9m)

5. The **Workbook** (left) shows the same information, but in tabular format. To widen the Workbook, click on the divider between it and the Graph Paper and drag to the right.



6. The **Workbook** contains a lot more information than is initially shown. To display this additional information, click on the button in the top-left-hand corner of the Workbook and select the data you want to see. For example, if you want to verify that the custom alpha created in Step 6 has been applied, tick the checkbox labelled "Shaft Coefficient".

- in the granular fill (at depths up to 2m), the value shown is the default value (= 0.2) for the β-value of the pile-soil interface; and
- in the glacial till (at depths greater than 2m), the value shown (= 0.4) is the custom α-value set in Step 6.

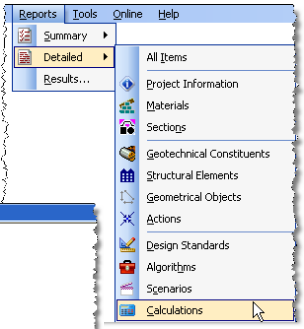


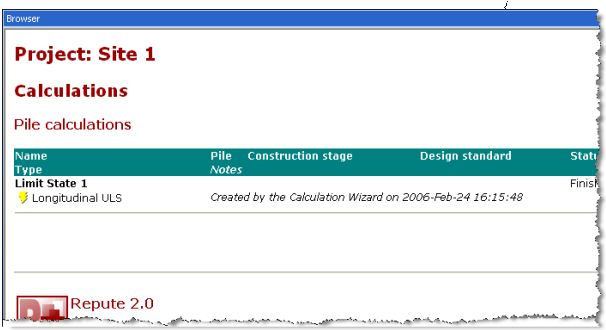
Depth	Effect of actions	Shaft coefficient	Skin friction	Shaft resistance	Beari
0	1460	0	0	0	
0	1460	0.2	0	0	
1.97	1473.11	0.2	7.04	7.18	
2	1473.31	0.2	7.15	7.41	
2	1473.31	0.4	40	7.41	
2.12	1474.12	0.4	42.69	12.6	
2.27	1475.12	0.4	46.06	19.56	
2.42	1476.13	0.4	49.43	27.05	
2.58	1477.14	0.4	52.79	35.07	

Step 8 – produce a report

In Step 8, you will produce a report summarising the calculation.

1. Create a detailed report summarizing the results of the calculations by clicking on Renown's **Reports** menu and selecting the **Detailed > Calculations** command.
2. Renown will generate the requested report and display it (by default) in the program's built-in Browser or (if the program's options have been changed) in your computer's default browser (e.g. Internet Explorer).

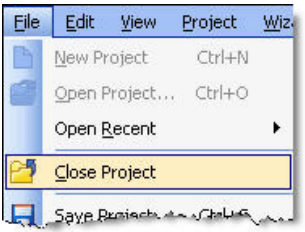




3. You can print the report by right-clicking on the Browser and selecting the **Print** command.

Step 9 – close the project

In Step 9, you will close and (optionally) save[2] the project.



1. Close the project by clicking on the appropriate command on Renown's **File** menu.
2. If you have made changes to the project since it was last saved, Renown will ask you if you want to save it before proceeding.

[2]You cannot save the project in the Trial Edition of Renown

Answer Yes or No by clicking the appropriate button.

3. Renown will then (if requested) save and close the project.

What next?

You will find further information about Renown, including example projects, in the program's help file, which you can open from Renown's **Help** menu.