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# ***Advanced Spring Design***

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## **User Manual**

Version 7.14

Brought to you by:

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**Table of Contents**

<b>Introduction.....</b>	<b>4</b>
What's New in ASD7 .....	8
What ASD7 Will Do for You .....	16
System Requirements .....	16
<b>Overview.....</b>	<b>17</b>
Menu System.....	17
Toolbar .....	18
Definitions .....	19
Passwords .....	19
<b>Using ASD7 .....</b>	<b>19</b>
Getting Started .....	26
Save Design .....	27
Open Design .....	28
Materials Database .....	29
Changing Variables in Steps .....	32
Design Status Window .....	32
Working with Profiles .....	32
Viewing Reports .....	33
Creating a Report .....	34
Designed Spring Images in DXF Format .....	35
3D Images .....	36
<b>Help Menu .....</b>	<b>37</b>
About .....	37
Online Help.....	38
Check for Updates .....	38
Technical Support.....	39

## Introduction

Advanced Spring Design Version 7 (ASD7) is a joint effort of the Spring Manufacturers Institute, Inc. (SMI) and Universal Technical Systems Inc. (UTS). ASD7 is the successor product of ASD6, GSDS 5.x and The Spring Designer 2.1, the previous versions of spring design software developed and marketed by SMI. ASD7 is based on extensive input of the SMI Technical Committee and follows the design conventions of the SMI Handbook of Spring Design and the SMI Encyclopedia of Spring Design. ASD7 also benefits from the feedback and suggestions of many users of ASD6 and we greatly value the relationships we continue to build with SMI and ASD users.

ASD7 also reflects the engineering and software expertise of UTS, developer of TK Solver and a number of other popular engineering applications.

**If you have used GSDS**, you will find that many functionalities have been consolidated and simplified. The explanations below will make the transition easy for you.

**If you are a new user**, you will find the flexible sequence of operations clear and logical. Just input what you know and ASD will tell you what it can.

### ***What's New in ASD7.14***

Rocket-Missile Wire has been added to the list of available materials. Two entries were added; one for wire sizes less than 0.08 inches and another for wire sizes from 0.08 to 0.12 inches. This is because of a significant discontinuity in the tensile strength data. The data was provided by Mapes Wire Corporation and was originally developed by National Standard.

Two new entries for Chrome Silicon have been added to the list of available materials. Class B is also known as Chrome Silicon Vanadium. Class C&D is also known as Chrome Silicon Molybdenum. Tensile strength data for both comes from ASTM A877.

The Minimum Tensile Strength (MTS) material property data for Chrome Silicon Valve wire has been updated based on ASTM A877. The resulting MTS values will be higher. This will also impact fatigue life calculations, resulting in increased estimates. The Max Diameter value changed from 0.625 to 0.375 and extrapolation for larger wire should NOT be done.

A new DXF image control is now used in the Show DXF window and in the reports. The old control was conflicting with some display configurations.

Improved formatting of the email addresses on reports.

Left-hand wound extension spring 3D images were not displayed properly. This has been fixed.

### **CalcEdge Apps**

We will be using CalcEdge to share preliminary versions of spring design calculations before they are considered for additions to the Advanced Spring Design program (ASD). This will help us in testing and gathering feedback. See the CalcEdge Apps section of the help for more information

### **Torsion Springs**

- Improved formatting of the reports keeps the DXF image and design notes on page 1.
- Input of arm angle or angle between arms is now permitted and impacts the design if the optional allowable body length value has been input.
- Double torsion springs can now be pitched and not just close wound.

### **Extension Springs**

- 3D image rendering has been improved. Hooks are centered more accurately, for example.
- Swivel hook wire diameter is now saved with the design.
- Tapered dead coils are now properly accounted for in the rate calculation.
- Rectangular wire weight calculation is more accurate.
- "Full Loop" has been added as an end type. This is the same as selecting "Machine" with an input of 0 for the hook gap value.
- Two different end types can now be specified.

### **Washer Springs**

- The reports have been corrected and correctly formatted.

### **Materials**

- Hastelloy C276 has been added to list of materials in the "Round" category and is available for use in helical spring designs.
- The APB value for Stainless 17-7 has been changed from 60% to 75%.
- (Pending) Users can now control the sequence in which materials are displayed in the forms. So if you add a new material, it no longer has to remain at the bottom of the list.
- A bug was fixed which caused the program to crash if you tried to save more than one material at a time.

### **Spiral Torsion Springs**

- The 3D image is now rendered more accurately.
- The labels and formatting on the form are improved.
- The program now solves for the strip thickness if the torque to set is specified.

### **Two Conical Springs in Series**

- For the case of one end small and the other large, the 3D image is now rendered more accurately.

### **Tolerance Grade Default Setting**

- The default for new designs has been changed from Commercial to Precision. This results in smaller default tolerances.

### **Series Compression Springs**

Variable TPavg has been added to set the transition pitches equal to the average of the surrounding pitches. A check box in the forms allow users to activate this.

## Design Notes

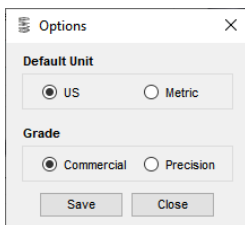
- A quirk in the programming prevented users from using the Enter key to add lines to notes when saving designs. This has been fixed.

## 3D Coordinates Export

- A new option is available in the Tools menu – 3D Coordinates Export. Users can now export the coordinates to a CSV formatted file. Such files can be imported into other programs such as spreadsheets or solids modeling software. So, for example, the data used in the ZX, ZY, and XY centerline plots in the extension spring programs is now available for export and use in other software.

## Tolerance Grade Default Setting

The user is now able to set the default for Tolerance Grade to either Commercial or Precision.



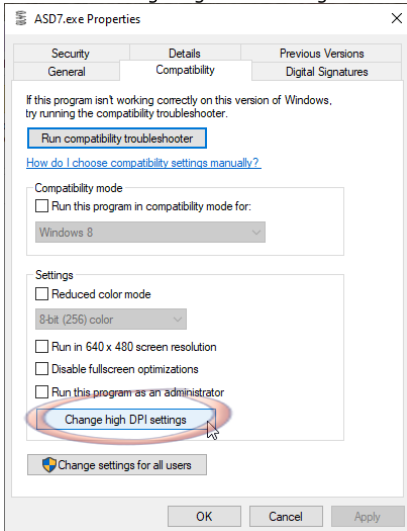
## Fix for Scaling problems

Microsoft has introduced a setting to fix scaling problems for users with high DPI settings. This fix will allow the user to continue to use high DPI settings without causing ASD forms to be cut off.

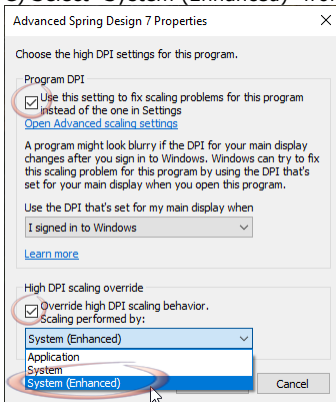
To activate this setting:

1. Locate the ASD7.exe file on your local hard drive. Typically this is found in the folder "C:\Program Files (x86)\UTS\Advanced Spring Design 7 \"
2. Right-click on ASD7.exe and select "Properties"
3. Click the "Compatibility" tab

4. Click the "Change high DPI settings" button



5. A) Check the box "Use this setting to fix scaling problems for this program instead of the one in Settings"  
B) Check the box "Override high DPI scaling behavior. Scaling performed by:  
C) Select "System (Enhanced)" from the dropdown box



6. Click "OK"  
7. Click "OK"

## What's New in ASD7.13

### Calculator icon



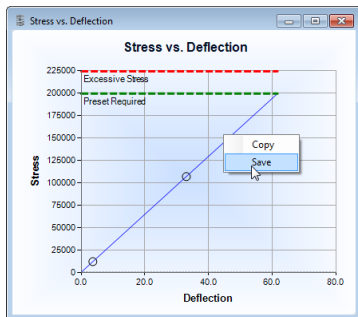
A calculator icon has been added to the toolbar. Click the icon to launch your computer's calculator program. Numbers can be copied from the calculator (right click and select "Copy") and pasted in any form field (right click and select "Paste").

### Form Fields Copy and Paste

All form fields can now be copied from and pasted into. To copy, right click and select "Copy". To paste, right click and select "Paste".

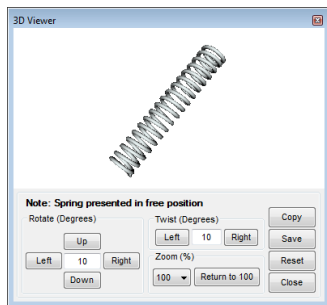
### Copy and Save Plots

Plots can now be copied or saved from ASD7. Right click on the plot and choose "Copy" to place the plot in your clipboard where it will be available to paste into another program. Right click on the plot and choose "Save" to save the plot in picture format.



### Copy and Save 3D Images

3D images can now be copied or saved from ASD7. Click the "Copy" button to place the 3D image in your clipboard where it will be available to paste into another program. Click the "Save" button to save the 3D image in picture format.



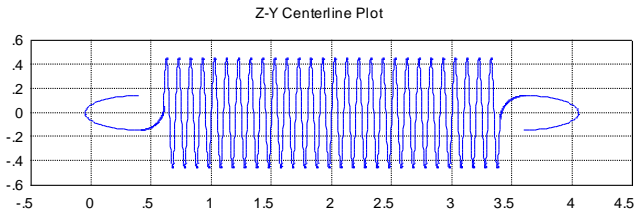


### Plot DPI in Reports

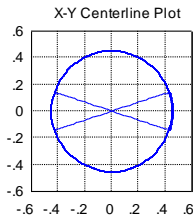
A DPI setting has been added to the Standard Report Configuration form. The DPI field determines the resolution of the plots in the report. DPI must be between 96 and 200. DPI of 96 makes the details of the plot larger whereas DPI of 200 makes the details smaller.

### Round Wire Extension Springs

The program will generate accurate plots of 3D centerline coordinates. A check box has been added to the form, defaulting to on. It should only be unchecked if a spring has too many coils to plot. Three new plots are now available, displaying the centerline coordinates in each of three planes – ZY, XY, and ZX. The ZY plot is automatically included at the bottom of page 1 of the report, replacing the DXF image. The DXF image is no longer supported for extension springs.



Here is the corresponding X-Y plot for this spring:



Springs can now be specified with a hook on only one end.

Hook geometry variables now includes angle and gap dimensions. The angle dimension is the angle from the load point to the tip/end of the wire. A 90 degree angle is assumed unless specified.

### Round Wire Conical Extension Springs

This model exists in the current version but has been enhanced with the same features as the cylindrical round wire extension spring model. That is, it can have only one hook and new variables were added for the gap sizes and loop angles. The same plots were added as well.

### Rectangular Wire Extension Springs

A new form (and report) is available for this new program. It is the same as the round wire version, except that instead of a single wire diameter variable, this program has radial and axial wire thicknesses.

**Rectangular Wire Double Torsion Springs**

A new model is included. It is very similar to the round wire version, replacing wire diameter with axial and radial wire thicknesses.

**Two Round Wire Compression Springs in Series (both cylindrical and conical programs)**

A check box has been added to the forms to force the pitches to be equal for all sections of the spring. The default condition is unchecked, allowing the pitches to be different. This will be useful for designs having variable diameters and a given/desired free length.

**Belleville Washers**

A new check box labeled "Flat Bearing Surface" has been added with the default condition being unchecked. The length of the flat bearing surface can optionally be specified.

The diagram has been removed from the form to make room for a second set of load data. The plot is still available as a menu selection and/or on the report. The second set of load data permits the calculation of estimated cycle life, assuming the spring will cycle between the two load points.

**Spiral Torsion Springs**

Two new variables – Turns to Solid and Torque at Solid – have been added to the program.

**Various Spring Forms**

For ALL spring types, the labels "Minimum Cycle Load" and "Maximum Cycle Load" have been replaced with "Cycle Load 1" and "Cycle Load 2".

**All Multiple-Tab Spring Forms**

There were some issues with the multi-tabbed forms not getting updated when a checkbox was checked or unchecked. We believe this problem has been corrected.

**Extension Springs**

Added Swivel Hooks as new end type option. These can have different wire size and material from the body coils.

**Parallel Compression Springs**

Changed the scaling for the envelope diagram from isotropic to linear.

**Synchronization of Forms Fixed**

Some of the check boxes on the forms were not causing the designs to recalculate automatically.

**Truncation of Notes Fixed**

Notes and descriptions were getting truncated by the database during storage.

**User-Defined SN Data Saved**

This is now saved with designs in the database.

**Hot Coiled Springs Torsion Modulus**

The torsion modulus now accurately defaults to 11500000 psi and the program includes a correction factor for the spring rate. Prior versions had a reduced value for the torsion modulus in addition to the correction factor which had the effect of doubling up on the correction.

## External Snap Rings

The forms displayed the tolerance signs incorrectly.

## Material Properties

The MTS coefficients are updated for ASTM A679.

Material property data is now available for ASTM A227 Class II

If equation type Constant is selected, parameters P1 to P4 are correctly displayed as 0.

## Spiral Torsion Springs

Equation PS-21 is no longer included as a default constraint but the forms adds an option to include it if so desired.

## Double Torsion Springs

Wire length was incorrectly calculated based on active coils per side but is updated to be a function of body coils per side.

## Enhanced Math Models

Significant effort has gone into both enhancing the existing math models and adding a number of new ones. Here is a summary of the results of that effort.

## Adding Users

Users can now be assigned different privileges. Click on the Tools menu and select "Users".

## Checkbox: .....When checked means:

- Active .....The user is able to log in and use the software.
- Administrator .....This user can add users, change users, and change company information. This user can delete and archive any user's designs.
- Add Corp Profile .....This user is allowed to add corporate profiles.
- Full Access (Designs) .....This user can open and edit designs created by any other user. This user cannot delete or archive another user's designs.
- Add User .....This user is able to add new users.
- Add Customer .....This user is able to add customers.
- Add Project .....This user is able to add a project.
- ReadOnly Access (Designs) ..Designs created by another user will open as read-only. Read-only designs can be viewed and reports can be generated but they cannot be edited, saved, deleted or archived. This user may create, edit, save, delete and archive his or her own designs.

### **Blocking Designs**

A user may block other users from opening a design he or she created. In the "Open Design/Part Number" dialogue box, select a design and click the "Block User" button. Select the users to be blocked.

### **Archiving Items**

A design may be archived. In the "Open Design/Part Number" dialogue box, select a design and click the "Archive" button.

An archived design cannot be changed, saved or deleted. Reports can be generated.

### **Exporting Designs**

Designs can be exported as text files or XML files for processing by external programs.

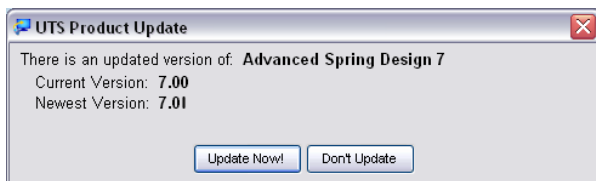
### **3D images**



ASD7 provides 3 dimensional images of all spring designs. The image can be rotated and resized. Left-click, hold, and drag to rotate the image. Left-click on a corner or edge of the window to resize the image.

### **Automatic Updates**

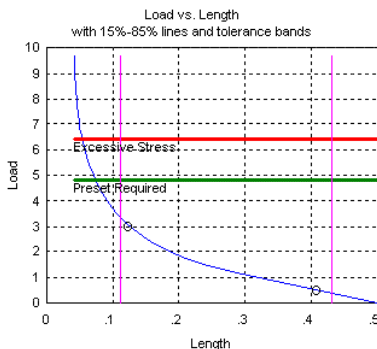
ASD7 automatically checks for updates each time the program is opened. If updates are available, the following dialog box will appear.



Clicking the "Update Now!" button will download and install the files necessary to bring your ASD7 software to the current version. You can choose not to update by clicking "Don't Update". If you choose not to update, the update dialog box will appear again the next time you open ASD7.

### Round Wire Conical Compression Springs

Nonlinear spring rate formulas have now been included. The updated model runs fast and is fully backsolvable. Here is a sample plot.



### Round Wire Cylindrical Compression Springs

An option has been added to adjust the number of inactive coils for closed end springs with relatively few coils. In the extreme case, this increases the number of active coils by 0.44. Note that it is still possible to use the dead coils variable to manually influence the number of active coils. Dead coils can be input as a positive or negative value.

### Minimum Weight Design Scenario - Round Wire Cylindrical Compression Springs

ASD includes a check box for specifying a minimum weight design. This scenario assigns several default values and requires just four inputs. The stress at solid defaults to the maximum allowable fraction of the minimum tensile strength. The stresses at the cycle loads default to the 10,000,000 cycle condition. Inputs are required for the free length (or solid length), minimum cycle load, maximum cycle load, and the length (or deflection) at that load.

Typically, it is best to select the Minimum Weight Design option prior to making other inputs. If you start from an existing spring design and then click the Minimum Weight Design option, you will likely get an Inconsistent message in the Design Status window and you will need to remove some existing inputs.

### Hot Coiled Compression Springs

A model has been added which accounts for the different materials and processes that are used. For example, the spring can be designed using a bar with tapered ends. Different tolerance calculations can also be done. The model is based on the formulas from both the SMI Handbook and the Tolerance booklet.

### Round Wire Torsion Springs

Arm length no longer defaults to 0 and can now be computed from other inputs such as force at arm.

### Rectangular Wire Torsion Springs

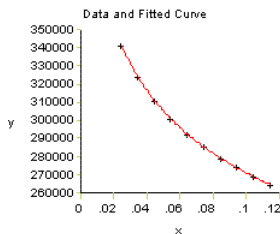
Rectangular wire torsion springs now include the effects of keystoneing on the body length and a bug in the body length calculations was fixed.

### Round Torsion Bars

Hollow bars are now possible.

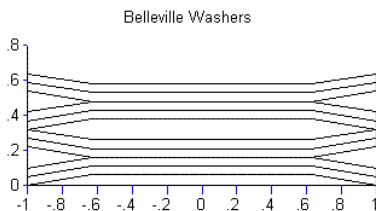
### Curve-fitting program to find the minimum tensile strength parameters $P_0 - P_4$

Many ASD users like to add materials to the existing database; however, they have difficulty determining how to compute the minimum tensile strength parameters. The new model allows users to enter experimental data (wire size and minimum tensile strength) into a table and get the parameters as outputs. Here is a sample plot from this program.



### Belleville Washers

The model now does calculations involving stacks of washers in series and parallel. A plot has been added to illustrate the configuration.



### Power Springs

Optional constraints have been added to the model to account for the so-called 50% space rule and other suggested ratios.

### Constant Force Springs

Two models were created based on the formulas in the SMI handbook. The models handle extension and motor type springs.

### Snap Rings

Six new math models are available for snap rings of different shapes and wire types.

- "C" shape – rectangular wire, internal or external
- "C" shape – round wire, internal or external
- "C" shape – round wire, external, installed via the gap
- "C" shape – rectangular wire, external, installed via the gap

### Round Wire Garter Springs

Two models were added to handle compression and extension garter springs. These models include formulas for radial loads and deflections.

## Nested Compression Springs

By nesting two or more compression springs in parallel, a designer can achieve a variable rate over different ranges of loads and deflections. A mixture of cylindrical and conical springs is allowed, as is a mixture of round and rectangular wire springs. Here is a summary of the possible designs and a sample plot of the stresses in a 3-spring nest.

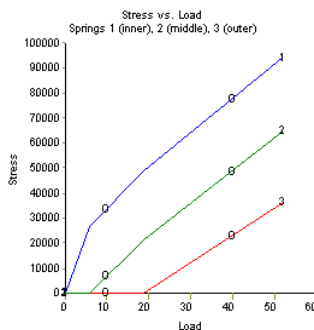
Two nested cylindrical round wire springs

Two nested cylindrical rectangular wire springs

Three nested cylindrical round wire springs

Three nested cylindrical rectangular wire springs

Two nested cylindrical springs – rectangular wire on one, round on the other



## Compression Springs in Series

By combining two or more compression springs in series, either stacked with spacers or continuously coiled, a designer can achieve a variable rate over different ranges of loads and deflections within space constraints. A mixture of cylindrical and conical springs is allowed. Here is a summary of the new models available in this area.

Two cylindrical round wire springs in series, continuous

Two cylindrical round wire springs in series, with spacer

Three cylindrical round wire springs in series, with spacers

Three cylindrical round wire springs in series, continuous

Two cylindrical rectangular wire springs in series, continuous

Two cylindrical rectangular wire springs in series, with spacer

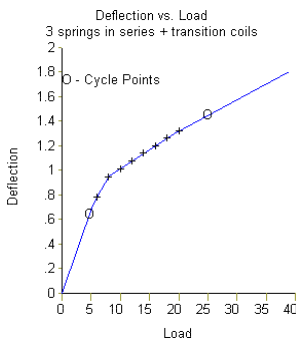
Three cylindrical rectangular wire springs in series, with spacers

Two round wire conical springs in series, continuous

Two rectangular wire conical springs in series, continuous

The continuous coil models allow for transition coils between the two springs so in effect, a model listed as handling three springs in series actually deals with five. The last one is particularly interesting in that it allows for "barrel" or "hourglass" designs and takes into account the nonlinear rate and telescoping possibilities of conical springs.

All the new variable rate compression spring models include life estimates. These models allow users to include extra load points in addition to the life cycle load points.



## What ASD7 Will Do for You

ASD7 represents a broad range of capabilities and benefits:

ASD7 now includes an expanding number of spring types, doubling the number from the previous version.

The SMI Encyclopedia of Spring Design is now included as part of the ASD7 Help System. Hundreds of pages of text, tables and diagrams are available and searchable, including direct, context-sensitive links from the related ASD7 forms.

Messages and status information guide you throughout the design process. A broad base of SMI's accumulated design knowledge has been built into ASD7. It appears as cautionary messages and warnings in the Design Status Window.

A number of plots are available to pick from a drop-down list. You can keep one or more plots open during a design session and they automatically update as you make design changes.

You can pick from standard report formats or you can customize a format to include only the parameters and plots you want. You can add your company's name and logo, and you can save your customized reports as "templates" to use again. Reports can also be exported to RTF and PDF file formats for further editing in word processing software.

Spring drawings in DXF format are automatically included in reports. You can also export drawings in DXF format for subsequent import into a CAD system.

TK Solver drives ASD7 with unique calculation and optimization power. TK Solver gives ASD7 the power to "backsolve" giving you maximum design flexibility.

## System Requirements

ASD7 operates on Windows XP, Vista, and Windows 7. ASD7 requires 512 MB of RAM. The application is optimized to run at a 1024x768 screen resolution. Higher resolutions will improve the usability, particularly when viewing plots during the design process.



## Overview













### Menu System

Menu	Submenu	Action
<b>File</b>		
	New Design	Starts a new design.
	Open Design	Opens a previously saved design.
	Save	Saves the current design to the existing location in the database. If the design is new this shows the Save As form.
	Save As	Saves the current design as a new database entry.
	Profiles	Opens a form for listing profiles and for adding and editing existing profiles.
	Save As Profile	Saves the current design as a profile in the database.
	Exit	Exits the program.
<b>View</b>		
	Toolbar	Shows/hides the toolbar.
	Status Bar	Shows/hides the status bar.
<b>Tools</b>		
	Solve	Solves the current design model (when Instant Solve is switched off).
	Show DXF	Shows the DXF drawing for the current design.
	Show 3D	Shows the 3D image for the current design.
	Export DXF	Exports the drawing in DXF format
	Standard Report	Opens a form for generating a report.
	Materials	Displays the material details form for adding and editing material data.
	Users	Opens form for entering user information.
	Customers	Opens forms for listing and archiving information on customers.
	Projects	Opens forms for listing and archiving information on projects.
	Company Information	Opens a form for listing and editing the user's company information.
	Change My Password	Opens a dialogue box to change the user's password.
	Import Data from ASD6	Imports data from a design saved in ASD6.
	Options	Allows the user to choose default units and tolerance grade.
<b>Help</b>		
	Contents	Shows the application's Help file, Contents tab.
	Index	Shows the application's Help file Index tab.
	Search	Shows the application's Help file Search tab.
	About...	Shows copyright and version information.
	Check for Updates...	Accesses the internet to check if software updates are available.

## Toolbar

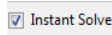


### (Left-hand portion)

	Starts a new design.		Shows DXF drawing of the current design model.
	Opens a previously saved design.		Shows the 3D image for the current design.
	Saves the current design using the same filename.		Opens the Notes form.
	Solves the current design model.		Generates Standard Report.
	Converts an output value to an input value.		Shows the application's Help file.
	Opens the Data Entry form.		Exits the ASD7 application.



### (Right-hand portion)



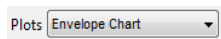
When checked, outputs are solved after each input.



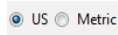
Increments or decrements the value of selected variable.



Launches the calculator.



Drop-down list of available plots.



Changes the unit system used in the current design.

## Definitions

**Backsolve**—The ability to solve a mathematical model backward as well as forward; the ability to solve with any combination of inputs and outputs.

**Category**—A particular spring design type—for example, compression or torsion.

**Default value**—An input value supplied by ASD7 directly or by a profile. A user can override any default.

**Design**—A design session or design project. Also, a particular, unique spring design created in such a session or project.

**Inconsistent**—Having two or more contradictory input values, so as to be incapable of being solved.

**Input value**—Data, supplied by the user or default that is used as a starting point for calculation.

**Model**—A mathematical simulation.

**Optimized design**—A design that satisfies the defined criteria or requirements.

**Output value**—Results of a calculation.

**Profile**—A group of default settings to be used within a particular spring design category. In ASD7, individual profiles can be grouped by type.

**Solved**—Reaching a solution that is without error or interruption.

**Unique design**—A design that is singular in every particular and, therefore, cannot be changed in any particular without changing the design.

## Passwords

ASD7 allows for designs to be saved and grouped by user. That is, different users can store designs to the same database and those designs can be searched later with user as the criteria. Each user has their own login name and password. Initially, the default login name is "admin" and the password is "admin". The admin user is permitted to view all other users' designs. The password can be edited using the ASD7 Tools menu and clicking Users. This is also where additional users can be added, each with their own login and password.

## Using ASD7

In ASD7, any of the design variables may be used as inputs or outputs, creating the "back-solving" capability. When values are input they are displayed in boldface. You can try different combinations of inputs and outputs and view the plots along the way. Some variables are indicated to be optional inputs. They are labeled in italics.

The software attempts a solution after each input and displays values for any outputs it could find. Default values also appear. For example, when working with compression and extension springs, there is a dead coils variable. By default, the value is 0. You can replace the default value if necessary.

Adding too many inputs produces an error message. "Inconsistent" means you have at least two inputs that contradict each other. Blank one or more inputs and the message disappears. You can avoid such error messages by blanking input values you want to "backsolve" before entering any new inputs.

Here is the round wire compression spring form.

Compression Spring - Cylindrical - Round Wire

MaterialMusic Wire

Buckling ConstraintsEnd fixation not known.

HandOptionalRightLeft

End TypeClosedGround

GradeCommercialPrecision

ConditionPresetPeened

User-defined SN data

Autoadjust Inactive Coils

Input / Output Scenarios

Power UserTwo LoadOne LoadRate BasedDimensionalMin. Weight

Note: Italicized labels indicate optional inputs.

Wire Diameterin

Wire Dia. Tolerancein

Wire Lengthin

Wire Weightlb

Minimum Tensile Strength (MTS)psi

Spring Ratelb/in

Spring Index

Natural FrequencyHz

Wire Available

Next Smaller Wire

Next Larger Wire

Coil Arbor Diameterin

Coil IDin

Coil Mean Diameterin

Coil ODin

Coil Dia. Tolerancein

Min. Coil ID (Free)in

Shaft Diameterin

Hole Diameterin

Active Coils

Total Coils

Dead Coils0.0000

Pitchin

Pitch Angledeg

Free Length Tolerancein

Allowable Solid Lengthin

	Free	Minimum Cycle Load	Maximum Cycle Load	Other Load	At Solid	At Buckle	
Load	0						lbf
Load Tolerance	0						lbf
Length							in
Deflection	0						in
% of Max. Deflection	0				100		
Corrected Stress	0						psi
Corrected % of MTS	0						
Uncorrected Stress	0						psi
Uncorrected % of MTS	0						
Expanded Coil OD							in

Starting at the top of the form, we see a material selection pull-down menu. To the right of that is a button for displaying the properties of the selected material. Buckling constraint options are listed to the right of that in another pull-down listing. Various buttons and check boxes allow you to specify the coiling direction, tolerance grade, end type, and condition. If you have your own fatigue data for the wire to be used in this design, check the User-defined SN data box and fill in that form. By default, ASD7 will “autoadjust” inactive coils if your spring has closed ends and fewer than four active coils. Click to uncheck the box if you would like to turn off this feature. Note that designs saved in prior versions of ASD will automatically uncheck that box when they are loaded.

The Input/Output Scenarios are listed next. ASD allows you to input values for any variables. Scenarios are provided to assist in choosing which variables to input. When a scenario is clicked, several of the fields in the form turn green. If those fields are provided inputs, you get a complete solution. Here’s the form with Minimum Weight Scenario selected.

Compression Spring - Cylindrical - Round Wire

Material: Music Wire Buckling Constraints: End fixation not known.

Hand: ☒ Optional ☐ Right ☐ Left End Type: ☒ Closed ☒ Ground ☐ User-defined SN data

Grade: ☒ Commercial ☐ Precision Condition: ☐ Preset ☐ Peened ☒ Autoadjust Inactive Coils

Input / Output Scenarios

☐ Power User ☐ Two Load ☐ One Load ☐ Rate Based ☐ Dimensional ☒ Min. Weight (Inputs for these five cases are indicated by green backgrounds)

Note: *Italicized labels indicate optional inputs.*

Wire Diameter		in	Coil Arbor Diameter		in	Active Coils	
Wire Dia. Tolerance			Coil ID		in	Total Coils	
Wire Length		in	Coil Mean Diameter		in	Dead Coils	0.0000
Wire Weight		lb	Coil OD		in	Pitch	
Minimum Tensile Strength (MTS)		psi	Coil Dia. Tolerance		in	Pitch Angle	
Spring Rate		lb/in	Min. Coil ID (Free)		in	Free Length Tolerance	
Spring Index			Shaft Diameter		in	Allowable Solid Length	
Natural Frequency		Hz	Hole Diameter		in		

Wire Available: Next Smaller Wire: Next Larger Wire:

	Free	Minimum Cycle Load	Maximum Cycle Load	Other Load	At Solid	At Buckle	
Load	0						lbf
Load Tolerance	0						lbf
Length							in
Deflection	0						in
% of Max. Deflection	0				100		
Corrected Stress	0						psi
Corrected % of MTS	0				45.0		
Uncorrected Stress	0						psi
Uncorrected % of MTS	0						
Expanded Coil OD							in

Most ASD forms include geometry and performance sections. In some of the more sophisticated spring types – springs in series or in parallel – these sections may be on different tabs in the form to keep the form from getting too long or wide to fit on your screen.

In the form below, we stayed in the Power User mode and have input values of the wire size and coil diameter. You can see that those values are in boldface. The resulting outputs are not.

Wire Diameter	<b>0.1000</b>	in	Coil Arbor Diameter	0.6980	in	Active Coils	
Wire Dia. Tolerance	0.0008	in	Coil ID	0.8000	in	Total Coils	
Wire Length		in	Coil Mean Diameter	0.9000	in	Dead Coils	0.0000
Wire Weight		lb	Coil OD	<b>1.0000</b>	in	Pitch	
Minimum Tensile Strength (MTS)	270866	psi	Coil Dia. Tolerance	.035	in	Pitch Angle	
Spring Rate		lb/in	Min. Coil ID (Free)	0.7650	in	Free Length Tolerance	
Spring Index	9.0000		Shaft Diameter		in	Allowable Solid Length	
Natural Frequency		Hz	Hole Diameter		in		

Wire Available: Yes Next Smaller Wire: 0.0990 Next Larger Wire: 0.1010

Several of the fields are labeled in *italics*. Those are optional inputs. Many of them obtain default values during the solution process. Tolerances are optional inputs that get default values. Others, such as shaft diameter and hole diameter are used for comparison only and if the solution conflicts with them, caution messages will be displayed.

ASD formats the numbers in each field but if you click in the field you can see the full precision of the calculation. Notice the Coil Arbor Diameter field below.

Wire Diameter	0.1000	in	Coil Arbor Diameter	.698031564	in	Active Coils	
Wire Dia. Tolerance	0.0008	in	Coil ID	0.8000	in	Total Coils	
Wire Length		in	Coil Mean Diameter	0.9000	in	Dead Coils	0.0000
Wire Weight		lb	Coil OD	1.0000	in	Pitch	
Minimum Tensile Strength (MTS)	270866	psi	Coil Dia. Tolerance	0.0350	in	Pitch Angle	
Spring Rate		lb/fin	Min. Coil ID (Free)	0.7650	in	Free Length Tolerance	
Spring Index	9.0000		Shaft Diameter		in	Allowable Solid Length	
Natural Frequency		Hz	Hole Diameter		in		
Wire Available	Yes		Next Smaller Wire	0.0990		Next Larger Wire	0.1010

You can double-click in a field to highlight its contents and delete or type over them. If you simply click once in a field, you are in "edit mode" and must use the cursor, delete and/or backspace keys to edit or remove each character.

Next, we input the free length and the two loads the spring will cycle between.

	Free	Minimum Cycle Load	Maximum Cycle Load	Other Load	At Solid	At Buckle	
Load	0	12.000	24.000				lbf
Load Tolerance	0						lbf
Length	1.9000						in
Deflection	0						in
% of Max. Deflection	0				100		
Corrected Stress	0	31960	63919				psi
Corrected % of MTS	0	11.8	23.6				
Uncorrected Stress	0	27502	55004				psi
Uncorrected % of MTS	0	10.1534	20.3067				
Expanded Coil OD							in

ASD is able to compute the stresses based on the inputs we've made. We see that the corrected stress is at 23.6% of the minimum tensile strength (MTS) when the 24 pound load is applied. For music wire, this percentage should not exceed 45% (more about this when we talk about material properties).

Next, we specify that we will allow the stress to go to 40% of MTS at solid, giving our design a little cushion at that extreme condition. This provides enough information for a complete solution. We see that ASD computed the coils and pitch and the lengths at various loads.

Compression Spring - Cylindrical - Round Wire

Material: **Music Wire** Buckling Constraints: **End fixation not known.**

Hand: ☒ Optional ☐ Right ☐ Left End Type: ☒ Closed ☒ Ground ☐ User-defined SN data

Grade: ☒ Commercial ☐ Precision Condition: ☐ Preset ☐ Peened ☒ Autoadjust Inactive Coils

Input / Output Scenarios

☒ Power User ☐ Two Load ☐ One Load ☐ Rate Based ☐ Dimensional ☐ Min. Weight  
(Inputs for these five cases are indicated by green backgrounds)

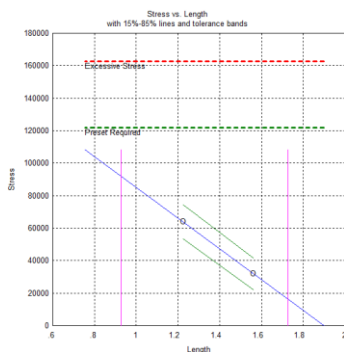
Note: *Italicized labels indicate optional inputs.*

Wire Diameter	0.1000 in	Coil Arbor Diameter	0.6980 in	Active Coils	5.550
Wire Dia. Tolerance	0.0008 in	Coil ID	0.8000 in	Total Coils	7.550
Wire Length	21.4315 in	Coil Mean Diameter	0.9000 in	Dead Coils	0.0000
Wire Weight	0.04780 lb	Coil OD	1.0000 in	Pitch	0.3063 in
Minimum Tensile Strength (MTS)	270866 psi	Coil Dia. Tolerance	0.0350 in	Pitch Angle	6.1830 deg
Spring Rate	35.5294 lbf/in	Min. Coil ID (Free)	0.7650 in	Free Length Tolerance	0.0946 in
Spring Index	9.0000	Shaft Diameter		Allowable Solid Length	
Natural Frequency	313 Hz	Hole Diameter			

Wire Available: ☒ Yes Next Smaller Wire: 0.0990 Next Larger Wire: 0.1010

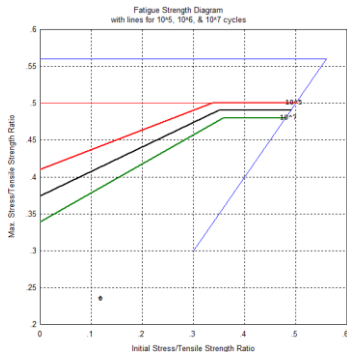
	Free	Minimum Cycle Load	Maximum Cycle Load	Other Load	At Solid	At Buckle
Load	0	12.000	24.000		40.681	lbf
Load Tolerance	0	3.6490	3.9370			lbf
Length	1.9000	1.5623	1.2245		0.7550	in
Deflection	0	0.3377	0.6755		1.1450	in
% of Max. Deflection	0	29.5	59.0		100	
Corrected Stress	0	31960	63919		108346	psi
Corrected % of MTS	0	11.8	23.6		40.0	
Uncorrected Stress	0	27502	55004		93234.5028	psi
Uncorrected % of MTS	0	10.1534	20.3067		34.4209	
Expanded Coil OD		1.0375	1.0397		1.0426	in

ASD plots can be used to give us a better feel for the overall performance of the spring. Click the Plots menu on the toolbar to display a plot. Here is a plot of the stress vs. the length at load.



The plot conveys a lot of information. The blue line shows the relationship between the length at load and the stress. The two circles on the blue line correspond with the two load points we specified. The two parallel green lines indicate the tolerance bands for the stress. Those are based on the load tolerances computed for the spring. The two vertical pink lines are at 15% and 85% of the maximum possible deflection. The two dashed horizontal lines in the upper portion of the plot indicate the maximum allowable stress levels for springs which are not preset (green) and those that are preset (red).

Next, let's go back to the Plots menu and have a look at the Fatigue Strength Diagram.



The Fatigue Strength Diagram provides a visual estimate of how many times the spring might be expected to cycle between the two input loads. The blue diagonal line represents virtually infinite life. The sloping red, black, and green lines represent expectation of 100,000, 1,000,000, and 10,000,000 cycles. For our spring, we see that the design point is located well below the green line, indicating that we should expect over 10,000,000 cycles from this spring at normal operating conditions. On the input/output form we see that ASD reported the Estimated Cycle Life as "> 1E7" – that is engineering notation for "greater than one times ten to the power seven".

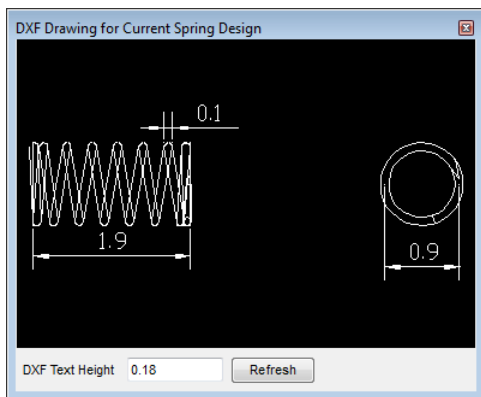
The numbers look good but what about the spring itself? What would it look like? ASD provides a 3D visualization tool. We click the Tools menu and select Show 3D.

Click and hold the left mouse button with the pointer in the 3D window and you can rotate the image in any direction you like. Click and drag on a corner of the window to change the size.





ASD also provides a DXF image of the spring. This image is accessed using the Tools menu.



The DXF image is automatically included in the reports and can also be exported to a DXF file for use with CAD software. The DXF Text Height field can be edited. The default value is based on the spring geometry. If you increase the text height value, it will make the drawing appear larger. Decreasing the text height will make the drawing appear smaller. Click the X box in the upper right corner of the drawing window to close the DXF drawing.

ASD cautions us if our design is out of bounds in any way. To test this, we input 1.03 for the optional Hole Diameter value. ASD responds with a caution message in the Design Status Window.

Wire Diameter	0.1000	in	Coil Arbor Diameter	0.6980	in	Active Coils	5.550
Wire Dia. Tolerance	0.0008	in	Coil ID	0.8000	in	Total Coils	7.550
Wire Length	21.4315	in	Coil Mean Diameter	0.9000	in	Dead Coils	0.0000
Wire Weight	0.04780	lb	Coil OD	1.0000	in	Pitch	0.3063 in
Minimum Tensile Strength (MTS)	270866	psi	Coil Dia. Tolerance	0.0350	in	Pitch Angle	6.1830 deg
Spring Rate	35.5294	lb/in	Min. Coil ID (Free)	0.7650	in	Free Length Tolerance	0.0946 in
Spring Index	9.0000		Shaft Diameter		in	Allowable Solid Length	
Natural Frequency	313	Hz	Hole Diameter	1.03	in		
Wire Available	<input checked="" type="checkbox"/> Yes		Next Smaller Wire	0.0990		Next Larger Wire	0.1010



This message is an indication that when the spring is compressed to solid, the expanded outer diameter will be greater than the diameter of the hole in which the spring is installed. This could impact the performance. Any messages displayed in the Design Status Window are automatically included in the reports.

## Getting Started

When ASD7 is launched, the main window and New Design form open, as shown below. From here you select a spring category by clicking the corresponding spring image. If you use profiles, select a profile type and profile, also from drop-down lists. (If there are no profiles, or you're not using them, you can ignore these.) Click the radio buttons in the Toolbar for the units you want. Once you've made all your selections, click the Continue button to open the actual design data window for calculation.

**Select Spring**

**New Design**

**Compression Springs**

**Arrangement**

- ☒ 1
- ☐ 2
- ☐ 3

**Spring Shape**

- ☒ Cylindrical
- ☐ Hot Coiled
- ☐ Conical

**Wire Type**

- ☒ Round
- ☐ Rectangular
- ☐ Inner Round, Outer Rectangular
- ☐ Inner Rectangular, Outer Round

**Extension (Round Wire)**

**Wire Type**

- ☒ Round
- ☐ Rectangular

**Washer**

**Belleville**

**Curved**

**Wave**

**Torsion**

**Wire Type**

- ☒ Round
- ☐ Rectangular

**Standard**

**Double**

**Snap Ring**

**Wire Type**

- ☒ Round
- ☐ Rectangular

**Internal**

**External**

**Gap Installation**

**Beam**

**Bar Type**

- ☒ Round
- ☐ Rectangular

**Simple**

**Cantilever**

**Spiral Form**

**Spiral Torsion**

**Power Spring**

**Constant Force**

**Motor Spring**

**Use Profiles?**

☒ No ☐ Yes

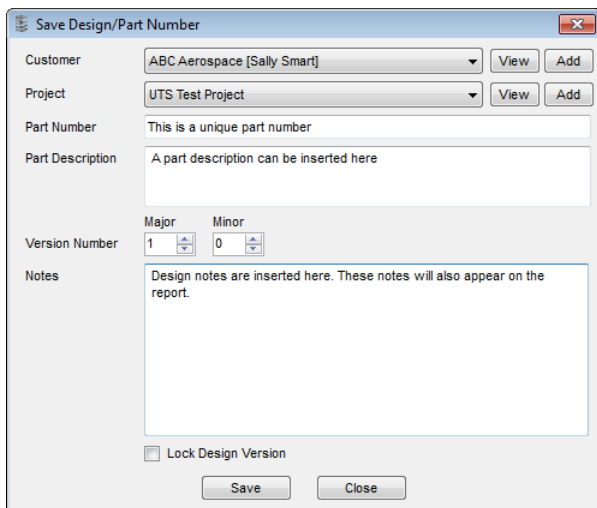
**Continue**

**Cancel**

If the New Design form is not displayed, open it by clicking the Toolbar button or by selecting the New command in the File menu.

## Save Design

A design can be saved with several levels of groupings. This makes it easier to locate the design later.

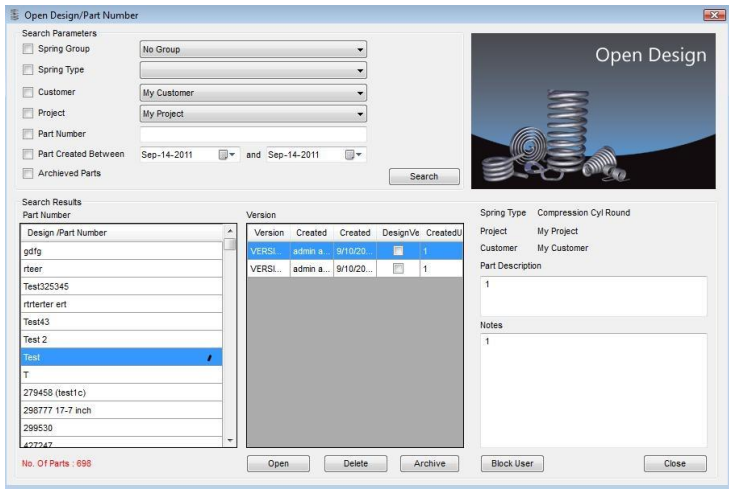


The dialog box titled "Save Design/Part Number" contains the following fields and controls:

- Customer:** A dropdown menu showing "ABC Aerospace [Sally Smart]" with "View" and "Add" buttons.
- Project:** A dropdown menu showing "UTS Test Project" with "View" and "Add" buttons.
- Part Number:** A text field containing "This is a unique part number".
- Part Description:** A text area containing "A part description can be inserted here".
- Version Number:** Two spinners for "Major" (set to 1) and "Minor" (set to 0).
- Notes:** A text area containing "Design notes are inserted here. These notes will also appear on the report."
- Lock Design Version:** An unchecked checkbox.
- Buttons:** "Save" and "Close" buttons at the bottom.

### Open Design

ASD7 provides a versatile form for selecting from previously saved and/or archived designs. An archived design becomes read only and cannot be modified.



- The **Open** button ..... opens a previously saved design
- The **Delete** button ..... deletes a previously saved design
- The **Archive** button ..... a saved design is made read only. This design can no longer be edited. The design can be viewed still.
- The **Block User** button.... prevents a user from being able to open a design.


You may search based on any of the following criteria:

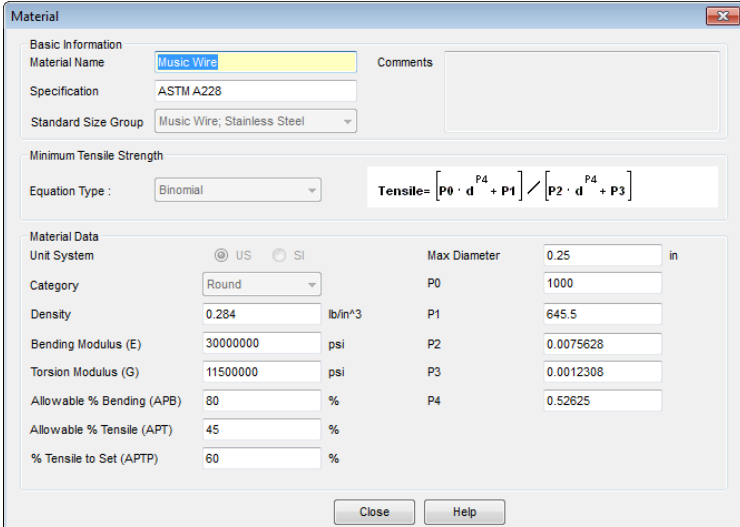
- Spring Group*      Beams, Compression, Compression Series, Compression Parallel, Extension, Garter, Spiral, Snap Ring, Torsion, Torsion Bars, Washers.
- Spring Type*      If a Spring Group is selected, a spring type within that group can also be selected. For example, if the Group is Extension, then the Type can be cylindrical or conical.
- Customer*          Designs can be organized by customer.
- Project*            Designs can be organized by project.
- Part Number*      The part number is a unique identifier for the design.
- Creation Date*    You can specify a range of dates that the design was created.
- Archived Parts*   Only shows designs that have been archived.

When the Search button is clicked, ASD displays a listing of matching designs in the Search Results windows. Click to select one, then click Open to load the design. Alternatively, you can click Share to allow all other users to have access to the design. By default, only users with “Admin” access have access to all users’ designs. Click Delete to remove the design from the database.

## Materials Database

### Viewing Materials

The button just to the right of the Material field  opens a form that displays the properties of the selected material. This form is shown below. Any of the data fields can be edited if necessary.



**Material**

Basic Information

Material Name:  Comments:

Specification:

Standard Size Group:

Minimum Tensile Strength

Equation Type:  
$$\text{Tensile} = \left[ P_0 \cdot d^{P_4} + P_1 \right] / \left[ P_2 \cdot d^{P_4} + P_3 \right]$$

Material Data

Unit System: ☒ US ☐ SI

Category:

Density:  lb/in<sup>3</sup>

Bending Modulus (E):  psi

Torsion Modulus (G):  psi

Allowable % Bending (APB):  %

Allowable % Tensile (APT):  %

% Tensile to Set (ATP):  %

Max Diameter:  in

P0:

P1:

P2:

P3:

P4:

You can choose among three equation types for defining the tensile strength as a function of wire diameter. The first equation is a simple equality, which indicates that the tensile strength is constant and does not vary with wire diameter. The second equation is called a binomial and it requires values for each of the five parameters. The third equation is called a polynomial. It also requires values for the five parameters.

Curve-fitting software must be used to estimate the unknown parameters for the binomial and polynomial equations, given sample data for tensile strengths at various wire diameters.

## Adding Materials

By default, ASD works with the list of materials provided with it. You can add materials in this list according to your requirements. This is done with the Materials command in the Tools menu. On clicking this command, the screen displays a list of materials in the database.

Name	Category	Specification	Equation Type	Torsion Modulus (psi)	Bending Modulus (psi)	Density (lb/in <sup>3</sup> )
Music Wire	Round	ASTM A228	Binomial	11500000	30000000	0.284
Hard Drawn	Round	ASTM A227	Binomial	11500000	30000000	0.284
High Tensile HD	Round	ASTM A679	Binomial	11500000	30000000	0.284
Hard Drawn - Valve	Round	SAE J172	Binomial	11500000	30000000	0.284
OT, Commercial	Round	ASTM A229	Binomial	11500000	30000000	0.284
OT, Class 2, Commercial	Round	ASTM A229	Binomial	11500000	30000000	0.284
Chrome Vanadium, Commercial	Round	ASTM A231	Polynomial	11500000	30000000	0.284
Chrome Vanadium, Valve	Round	ASTM A232	Polynomial	11500000	30000000	0.284
Chrome Silicon, Commercial	Round	ASTM A401	Polynomial	11500000	30000000	0.284
Chrome Silicon, Valve	Round	ASTM A877	Polynomial	11500000	30000000	0.284
Carbon Valve	Round	ASTM A230	Binomial	11500000	30000000	0.284
Stainless 302	Round	ASTM A313-302	Binomial	10000000	28000000	0.286
Stainless 316	Round	ASTM A313-316	Polynomial	10000000	28000000	0.286
Stainless 17-7	Round	ASTM A313-631	Binomial	11000000	29500000	0.282
Phosphor Bronze	Round	ASTM B159	Binomial	6250000	15000000	0.32
Beryllium Copper	Round	ASTM B197	Binomial	7000000	18500000	0.298

US Metric Add Copy Add View Delete Help Close

When you click the Add, Copy Add or View buttons, the following form appears.

**Material**

Basic Information

Material Name:  Comments:

Specification:

Standard Size Group:

Minimum Tensile Strength

Equation Type:

$$\text{Tensile} = [P_4 \cdot d^4] + [P_3 \cdot d^3] + [P_2 \cdot d^2] + (P_1 \cdot d) + P_0$$

Material Data

Unit System: ☒ US ☐ SI Max Diameter:  in

Category:

Density:  lb/in<sup>3</sup>

Bending Modulus (E):  psi

Torsion Modulus (G):  psi

Allowable % Bending (APB):  %

Allowable % Tensile (APT):  %

% Tensile to Set (AFTP):  %

P0:   
P1:   
P2:   
P3:   
P4:

Min. Tensile Strength Curve Fitter

Save Close Help

If you have clicked the Add button in the Material Details form, all text entry fields in the Add Materials form are blank, as shown. Enter material data and click the Save button to add the data to the database.

**Material Name** -- Whatever is entered in the Material Name field will appear in the material selection menus throughout the program.

**Specification** – ASME and other organizations refer to materials by codes as exemplified by the default materials in the database. When adding a new material, such a code is not required but may be useful.

**Standard Size Group** – ASD checks designs for standard wire sizes. When adding a new material, you can group it so that ASD will assume the same standard wire sizes as the other materials in that group.

**Minimum Tensile Strength Equation** – ASD assumes that the minimum tensile strength can be a function of the wire diameter. Three options are provided – Binomial, Polynomial, and Constant – and the equations are shown in the form. Parameters P0, P1, P2, P3, and P4 are required for the binomial and polynomial options while only P0 is required for the constant option. ASD includes a curve-fitter for estimating the parameter values for the best fitting curve through experimental data you provide. You can also use the constant option to force the minimum tensile strength to a particular value regardless of the wire diameter. The Constant option is the only one available for flat material used in spiral springs and washers.

**Category** – Round and Flat are the two options. Select round for materials used in compression, extension, garter, and torsion springs. Select flat for materials used in spiral springs, beams, rings, and washers. The remaining properties (density, E, G, APB, APT, APTP) are required as they are used in designing the various spring types in ASD.


If you have selected Copy Add, text fields fill with data for a selected material. Data can be edited and saved under a different name.

If you have selected View, all data fields are locked for editing and the save button is not provided.

Check the material specifications form for the associated "APT" and "APTP" percentages.

**Design Note:** The Life Plots are available only for specific materials: music wire, hard drawn (valve), chrome vanadium (valve), chrome silicon (valve), carbon (valve) and some of the stainless steels. This plot applies only to carbon steel designs. Consult your spring maker for guidance. This plot is for reference only. Actual service life is a factor of many variables, including corrosion, cyclic frequency, and temperatures.

## Changing Variables in Steps

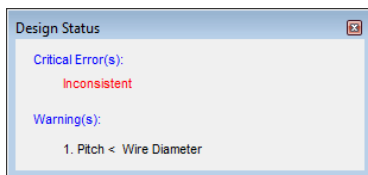
There is also a feature for changing the value of a particular variable in steps. Two buttons and two text entry fields are provided on the Toolbar  for this purpose. When you select a particular variable in the input form, its name appears in the left text field. Enter the step value in the right text field. By clicking the increment/decrement command buttons, you increase or decrease the value.

The second example in the Examples section will give you some practice using this feature.

When you increase/decrease the value, the plot automatically refreshes. You view the plot with the latest data. This is particularly useful when you want to see the effect of the value of a particular variable in the plot.

## Design Status Window

Messages about the status of the design appear automatically. These messages will also appear on the reports.



## Working with Profiles

After you finalize a design, you can save it. If some or all of these variable values will be frequently required in other designs, you can save such data sets as profiles and name them.

The profile concept permits the reuse of data for a particular set of spring design parameters. Thus, instead of starting with a blank input form, you can open a previously saved profile and use it as a starting point.

ASD7 is shipped with a system profile for each design category. This profile furnishes default values for the category. The system profile cannot be edited or deleted.

You can, however, create as many new user-defined profiles as you wish. For example, you might create profiles in each spring category for each customer or design type. You can set values for whatever variables you wish—some or all. And the values can, if desired, be beyond limits set in the system variable. There will be no conflict. The profile system is completely flexible.



## Adding a New Profile

To add a profile based on the current design, go to the File menu and select Save as Profile. Type a name for the profile and click Save.

To edit a previously saved profile, go to the File menu and select Profiles. Select the profile and click Edit. Default minimums and maximums can be set as desired. To establish these as firm limits for a particular variable, click its "Firm Limits" checkbox.

The 'Profile' dialog box contains a table titled 'Default Inputs' with the following data:

Variables	Description	Value	Unit	MinValue	MaxValue	FirmLimit
Grade: 1 for Precision or 2 for Commercial		2				<input type="checkbox"/>
Preset/Peened Condition (1=N/N, 2=N/Y, 3=...		3				<input type="checkbox"/>
User-defined S-N curve provided? (0=no,...		1				<input type="checkbox"/>
Spring End Type (1=O/NG, 2=O/G, 3=C/N...		4				<input type="checkbox"/>
Autoadjust inactive coils? (default for AS...						<input type="checkbox"/>
Direction of Coiling ( 0-Right / Optional , 1-...						<input type="checkbox"/>
Hole Diameter			in			<input type="checkbox"/>
Shaft Diameter			in			<input type="checkbox"/>
Dead Coils						<input type="checkbox"/>
Allowable Solid Height			in			<input type="checkbox"/>
Sm. Coil ID		.5	in			<input type="checkbox"/>
Small Coil Mean Diam.			in			<input type="checkbox"/>
Sm. Coil OD			in			<input type="checkbox"/>
Lg. Coil ID			in			<input type="checkbox"/>
Large Coil Mean Diam.			in			<input type="checkbox"/>

At the bottom of the dialog are 'Save' and 'Close' buttons.

If you want validation for minimum and maximum values, set a firm limit with the checkbox. If this box is checked, the user of this profile will get an error message during calculations if the input data is outside the specified range.

Once the profile values are set, save the profile by clicking the Save button.

## Viewing Reports

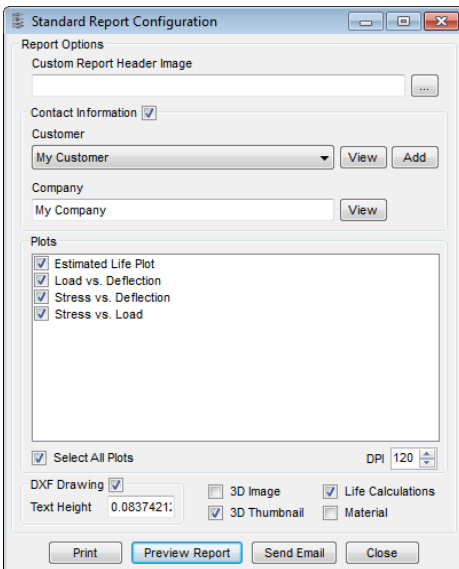
You have the choice of using standard reports, with preset content and format, or you can choose only the content you want to be included in your report.

A **standard report** is generated by selecting Standard Report from the Tools menu or by clicking the Standard Report button in the Toolbar.

You can **customize a report** by including company identifiers, including a logo or picture, and selecting plots for inclusion in the report. (Use the View and Add buttons to insert company and customer details you've previously saved.) Clicking "Preview Report" displays the report onscreen; from there it can be printed or exported in RTF or PDF formats.

## Creating a Report

Click Standard Report in the Tools Menu. Here is a report configuration form for a torsion spring.



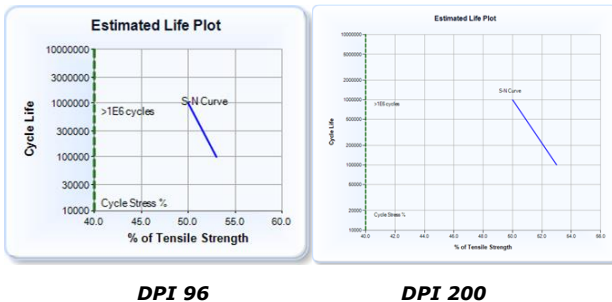
The image shows a 'Standard Report Configuration' dialog box. It has several sections: 'Report Options' with a 'Custom Report Header Image' field and a browse button; 'Contact Information' with a checked checkbox, a 'Customer' dropdown menu (showing 'My Customer'), 'View', and 'Add' buttons, and a 'Company' text field with a 'View' button; 'Plots' with a list of four checked items: 'Estimated Life Plot', 'Load vs. Deflection', 'Stress vs. Deflection', and 'Stress vs. Load'; 'Select All Plots' (checked), 'DPI' (120); 'DXF Drawing' (checked), 'Text Height' (0.0837421); '3D Image' (unchecked), '3D Thumbnail' (checked), 'Life Calculations' (checked), and 'Material' (unchecked). At the bottom are 'Print', 'Preview Report', 'Send Email', and 'Close' buttons.

Click the browse button next to the Custom Report Header Image field if you want to browse for an image file (bmp, gif, jpg, or png) to insert at the top of the report. Although any image can be inserted there, for best results we suggest that the image size be approximately 632 pixels wide and 22 pixels tall.

Contact information is optional. If you click the box, you can select from the customers you have stored in the database, along with your company information.

The report can also include plots, material properties, a 3D image, and a fatigue life estimate.

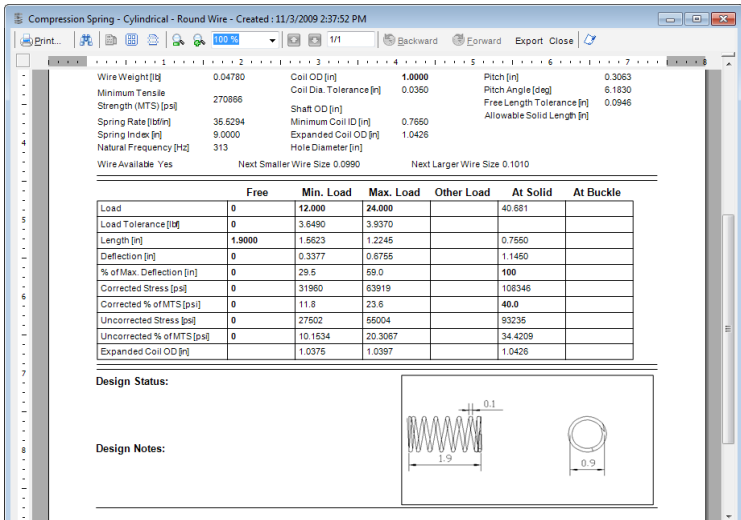
The DPI field determines the resolution of the plots in the report. DPI must be between 96 and 200. DPI of 96 makes the details of the plot larger whereas DPI of 200 makes the details smaller. See below for a comparison.



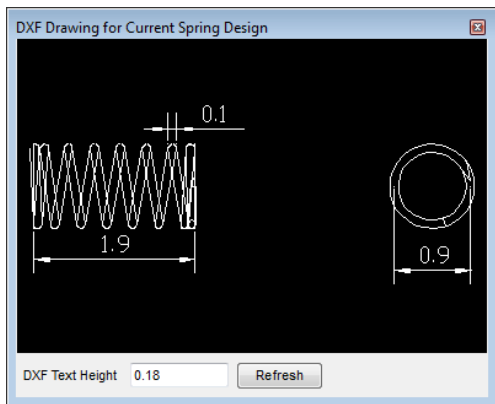
Click Preview Report to view the report and optionally store it as a PDF or RTF file.

### Designed Spring Images in DXF Format

A DXF drawing of your spring design is included in the Standard Report, as shown below. This data can also be saved in the popular DXF format for merging into a CAD drawing.



You can use the Show DXF command of the Tools menu or the Show DXF toolbar button to view a designed spring in DXF format.



If you are satisfied with the image, store it for use in a CAD program by using the Export DXF command.

Use the Regen command in AutoCAD, or its equivalent in other CAD programs, to be certain the image is shown correctly.

(Please note that the DXF image provided by ASD7 is not a precise engineering drawing, particularly in the end view. If you need a very accurate representation, you might need to make appropriate changes in the CAD environment.)

### 3D Images



ASD7 provides 3 dimensional images of all spring designs. Images are shown in the free position. The image can be rotated and resized. Left-click, hold, and drag to rotate the image. Left-click on a corner or edge of the window to resize the image.

## Help Menu

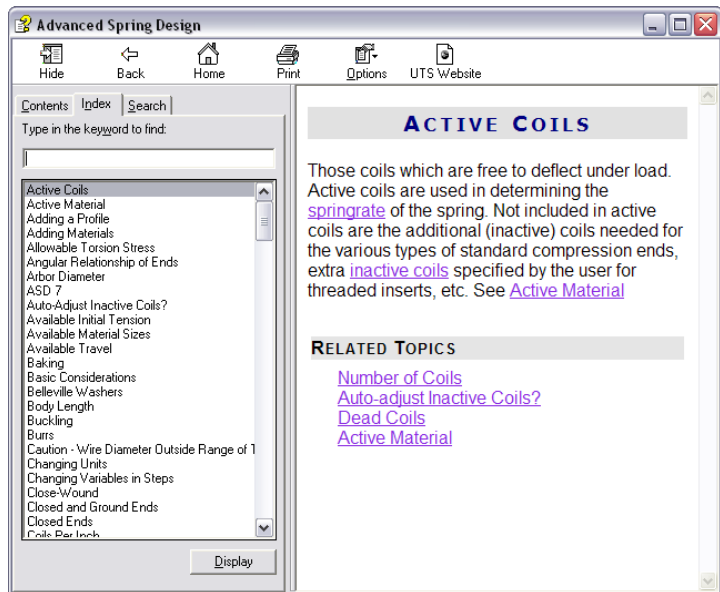
### About

Clicking About in the Help menu displays the following information about this software.



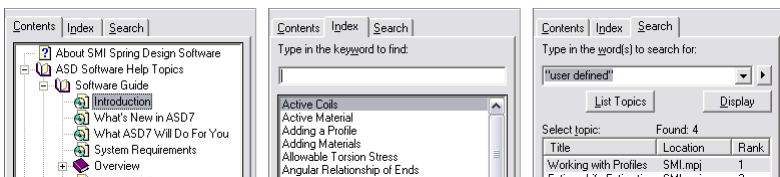
## Online Help

Pressing F1 in any field of the ASD program will open Help to the related page.



Detailed Help is provided with the software in compiled HTML format. This Help information explains terms used in the spring design. Also included in the help is a collection of Design Notes. These Design Notes summarize some of the new design functionality for certain spring types. As updates are made, look for new entries.

The left pane of the help contains 3 tabs. Click on the "Contents" tab to browse through topics in a Table of Contents format. Click on the "Index" tab for a glossary style listing of topics. Or click on the "Search" tab to search for keywords.



## Check for Updates

Select this help item to see if your ASD7 software is the most current version.

## Technical Support

Depending on the kind of problem you are experiencing with ASD7, please contact UTS or SMI as follows:

For installation problems, printing, software crashes or other problems with the proper working of the software, please contact UTS:

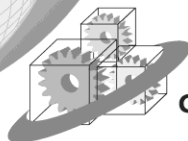
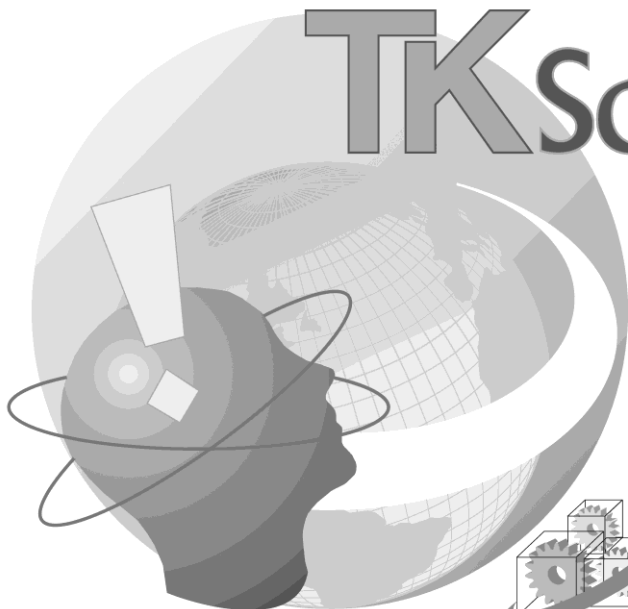
Email: [support@uts.com](mailto:support@uts.com)  
Telephone: +1-815-963-2220  
Fax: +1-815-963-8884

For any other questions such as which formulas are used, selection of spring materials, various limits used in the software, other questions regarding how to design springs, etc. please contact SMI at:

Email: [info@smihq.org](mailto:info@smihq.org)  
Telephone: +1-630-495-8588  
Fax: +1-630-495-8595

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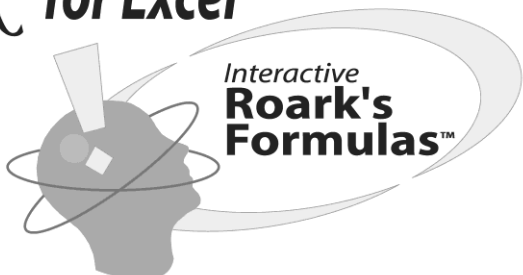
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# SMI Handbook of Spring Design



A composite of information from the more extensive four-volume Encyclopedia of Spring Design, the Handbook concentrates on the most important elements of spring design and provides answers to the most frequently asked questions. Suggested specification forms are presented for the three most common spring types: compression, extension, and torsion. Includes both metric and U.S. units of measure.

It's the perfect reference to keep in a briefcase or at a workstation, and makes an excellent customer gift.

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