

REFERENCE DOCUMENT: Tutorial for CADS 3.0 Users

- 1. Starting at the Conceptual Design stage – This example will walk you through with the use of CAPS (Casting Alloy & Process Selector) and CADS tools all the way to finding a source using AFS Online Casting Source Directory Tool!**
- 2. Starting with the known generic alloy and process, based on the desired allowable strength requirements; use CADS tool to search and select the right alloy.**
- 3. Knowing the alloy category, group and sub-group; search and select the right alloy grade and export to an FEA Tool.**

1. Starting at the Conceptual Design stage – This example will walk you through with the use of CAPS and CADS tools all the way to finding a source using AFS Online Casting Source Directory Tool!

Example: Steel fabrication being considered for converting into ductile iron casting

Weight: 20 lbs
 Overall length: 15 inch
 Minimum Section Thickness: 0.375 inch
 Maximum Section Thickness: 1”
 Min. Surface Finish Desired: 200 RMS
 Estimated Annual Volume: 5,000 pcs.
 Minimum Ultimate strength at Room Temperature: 48 ksi
 Minimum Tensile Yield Strength at Room Temperature: 27 ksi
 Hardness ranging from 96-140 BHN
 Safety Factor: 2.0 (to calculate the allowable stress)



Please type in or with a Control key, click on this <http://pda.metalcastingvirtuallibrary.net/caps/caps.aspx> ; which will launch CAPS and enter the inputs as shown below.

CASTING ALLOY & PROCESS SELECTOR

[Contact Us](#) - [Casting Alloy & Process Selector](#) - [Casting Alloy Data Search](#) - [MMDS Data Search](#) - [Request For Quote](#)

Casting Alloy and Process Selector (CAPS) v1.0

The Casting Alloy and Process Selector (CAPS) has been developed based on best known data and practices for North American metalcasters. To help select a casting process for your component, enter the known data below. The greater the data provided, the more specific your results. Questions...contact PDA Customer service at info@pda-llc.com.

Alloy Selector

Do you know the Alloy? :

Enter Your Criteria Below

Hint: Begin search with 1 or 2 criteria and narrow the results from there.

<input type="text" value="20"/>	Estimated Weight of New Component (in LBS)
<input type="text" value="20"/>	Overall Length (in Inches)
<input type="text" value="0.25"/>	Minimum Section Thickness (in Inches)
<input type="text" value="1"/>	Maximum Section Thickness (in Inches)
<input type="text" value="250"/>	Minimum Surface Finish Desired (in RMS)
<input type="text"/>	Maximum Surface Finish Desired (in RMS)
<input type="text" value="50"/>	Estimated Annual Production Volume (in Number of Pieces)

Search Results

NOTE: The order below is not indicative of which alloy or process is best for your component. Look to the data to help determine the best combination.

Detailed Results

NOTE: Please contact your casting supplier for their specific capabilities.



Designed by: [PDA LLC](#)

The search results will come up with 3 potential combinations of the alloy and process; down select the first one as shown below - Ductile iron and green sand horizontally parted process.

Select	Green Sand- Horizontally Parted	Ductile Iron	2	5	10	30	1	6	0.03	0.05	39
Select	Green Sand- Horizontally Parted	Low Alloy Steels	2	5	10	30	1	6	0.0625	0.1	40
Select	Green Sand- Horizontally Parted	Lead	2	5	10	30	1	6	0.015	0.02	41
Select	Green Sand- Horizontally Parted	High Copper Alloys	2	5	10	30	1	6	0.015	0.02	42
Select	Green Sand- Horizontally Parted	Compacted Graphite Iron	2	5	10	30	1	6	0.03	0.05	43
Select	Green Sand- Horizontally Parted	Gray Iron	2	5	10	30	1	6	0.03	0.05	44
Select	Green Sand- Horizontally Parted	Corrosion Resistant Iron	2	5	10	30	1	6	0.03	0.05	45
Select	Green Sand- Horizontally Parted	Superalloys	2	5	10	30	1	6	0.0625	0.1	46
Select	Green Sand- Horizontally Parted	Malleable Iron	2	5	10	30	0.5	6	0.03	0.045	47
Select	Green Sand- Horizontally Parted	Nickel-Base	2	5	10	30	1	6	0.0625	0.1	48
Select	Green Sand- Horizontally Parted	Aluminum-Silicon (300 Series)	2	5	10	30	1	6	0.015	0.02	49
Select	Green Sand- Horizontally Parted	Titanium	2	5	10	30	1	6	0.0625	0.1	50
Select	Green Sand- Horizontally Parted	Nickel-Base	2	5	10	30	1	6	0.0625	0.1	51
Select	Green Sand- Horizontally Parted	Heat	2	5	10	30	1	6	0.0625	0.1	52

Then, click on Casting Alloy Data Search Tool at the top main menu or on the right side bar or type in or with Control Key click on <http://afs.metalcastingvirtuallibrary.net/cads/cads.aspx> , which will launch CADS V3.0 and select Search option 1 – Generic Alloy Search as shown below by entering 60-40-18:

CADS PDA LLC Casting Alloy Data Search (CADS) Tool V3.0

Global Alloy Search

Search For Find

Print Results

Alloy Type	Alloy Name	Designation	Designation Number	Casting Process	Thickness
Iron	60-40-18	ASTM A 536 [SAE J434]	60-40-18 [D4018]	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	Select Alloy
Iron	60-40-18	ASTM A 536 [SAE J434]	60-40-18 [D4018]	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	Select Alloy

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After selecting the alloy 60-40-18, all the details will be displayed as shown below, which can be printed or exported as CSV file, which can be imported and viewed into Excel.

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Casting Alloy Data Search (CADS) Tool V3.0

60-40-18 60-40-18 [D4018]

Print Results
Export (csv)
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SEARCH OPTIONS

▼ **Global Alloy Search**

▼ **Strength Property Search**

▼ **Select Alloy from Grade List**

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MMDS (Mold Material Data Search Tool)

Click above to get access to MMDS tool designed to assist foundry, simulation and design engineers with comprehensive mold and core material properties being used in the metal casting industry.

Property Name	Property Value
Abstract_Estore_Link	View in New Tab
Alloy_Grade	60-40-18
CC_Al	CJ .013
CC_C	A) 3.2 B) 4.1 C) 3.65
CC_Ca	CJ .013
CC_Cu	CJ .15
CC_Mg	CJ .036
CC_Mn	A) .1 B) 1 C) .21
CC_Mo	CJ .02
CC_Ni	CJ .02
CC_P	B) .1 C) .016
CC_RE	CJ .013
CC_Reference	View in New Tab
CC_S	A) .005 B) .035 C) .009
CC_Si	A) 1.80 B) 3 C) 2.63
CC_Sn	CJ .005
CC_Sr	CJ .013

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Ductile Iron 60-40-18 Casting Conversion from Steel fabrication



To find a suitable metalcaster in North America, type this or with Control key, click on <https://www.castingsource.com/metalcaster-directory>, Casting Source Directory will show up as shown below automatically; enter the alloy type, select the process, enter the casting weight, select the country and finally state and you will see the list of foundries in your search results. If you know the name of the company, enter in the first search option.

CASTING SOURCE DIRECTORY

Congratulations on coming to the Casting Source Directory (CSD) web page. Thousands of casting buyers, specifiers and designers rely on the online and printed CSD to identify the ideal foundry to cast their needed parts, searching by metal, process, weight or location. If you are a metalcaster and would like to update your information, [click here](#) or contact Barb Jackowski at bjackowski@afsinc.org. All AFS Corporate Member foundries are listed in the CSD. To become a Corporate Member contact Ben Yates at byates@afsinc.org. To purchase the print version of the CSD, [click here](#).

Company Search

[SEARCH NOW](#)

Advanced Search

<p>Alloy</p> <div style="border: 1px solid #ccc; padding: 2px; display: flex; justify-content: space-between; align-items: center;"> DUCTILE IRON ▼ </div> <p><small><i>Need help with your alloy choice? Casting Alloy Data Search Tool</i></small></p>	<p>Process</p> <div style="border: 1px solid #ccc; padding: 2px; display: flex; justify-content: space-between; align-items: center;"> GREEN SAND-HORIZONTALLY PARTED ▼ </div> <p><small><i>Need help deciding on a process? Process Search Tool</i></small></p>	
<p>Casting Weight (lbs)</p> <div style="border: 1px solid #ccc; padding: 2px; width: 100%;"> <p style="text-align: center;">20</p> </div>	<p>Country</p> <div style="border: 1px solid #ccc; padding: 2px; display: flex; justify-content: space-between; align-items: center;"> US ▼ </div>	<p>State</p> <div style="border: 1px solid #ccc; padding: 2px; display: flex; justify-content: space-between; align-items: center;"> IL ▼ </div>

[SEARCH NOW](#)

2. Starting with the known generic alloy and process, based on the desired strength requirements; use CADS tool to search and select the right alloy.

Example: Engine Cradle fabrication being considered for converting into 356 Permanent Mold-Low Pressure Casting

Alloy: Aluminum 300 Series

Weight: 30 lbs

Overall length: 40 inch

Critical Section Thickness: 0.125 inch

Casting Process: Permanent Mold-Low Pressure

Minimum Ultimate strength at Room Temperature: 12 ksi

Safety Factor: 2.0 (so allowable stress would be 24 ksi)



Typical Inputs: Using the slider bar at top, move it till the desired value of 24 ksi and hit search button.

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Search Property Strength

Ultimate Tensile Strength (ksi)

0 350

Value: 24

Yield Strength (ksi)

0 254

Value: 0

Elongation %

0 50

Value: 0

Search by Selected Properties
Print Results

Alloy Type	Alloy Name	Designation	Designation Number	Casting Process	Thickness	
Iron	125-80-10	ASTM A 897/A 897M	125-80-10 [850-550-10]	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	1 in	Select Alloy
Iron	150-100-7	ASTM A 897/A 897M	150-100-7 [1050-700-7]	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	1 in	Select Alloy
Iron	175-125-04	ASTM A 897/A 897M	175-125-04 [1200-850-04]	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	1 in	Select Alloy

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SEARCH OPTIONS



Global Alloy Search



Strength Property Search



Select Alloy from Grade List

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MMDS (Mold Material Data Search Tool)

Click above to get access to MMDS tool designed to assist foundry, simulation and design engineers with comprehensive mold and core material properties being used in the metal casting industry.



Selection of Alloys to Choose from:

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Aluminum Alloys	380		A03080	Pressure Diecasting	0.11 x 0.50	Select Alloy
Aluminum Alloys	356		A03560	Pressure Diecasting	0.10 x 0.60	Select Alloy
Aluminum Alloys	356		A03560	Permanent Mold-Gravity/Tilt Pour		Select Alloy
Aluminum Alloys	356		A03560	Squeeze/Semisolid	1 x 0.83	Select Alloy
Aluminum Alloys	356		A03560	Vacuum Casting	1.29 x 1.60	Select Alloy
Iron	High Silicon Molybdenum	SAE J2582		Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	.625	Select Alloy
Iron	Class 40BNCE	ASTM A 48 [SAE J431]	Class 40BNCE	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	1	Select Alloy
Iron	110-70-11	ASTM A897/A897M-06	110-70-11	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	48 mm by 43 mm by 185 mm section of rectangular casting	Select Alloy
Iron	200-155-1	ASTM A897/A897M	200-155-1	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	1 in	Select Alloy

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Detail Results of the down selected Alloy 356 Permanent Mold

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356 A03560

[Print Results](#) [Export \(csv\)](#) [Back to List](#)

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MMDS (Mold Material Data Search Tool)

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Property Name	Property Value
Abstract_Estore_Link	View in New Tab
CC_Al	Remainder
CC_Ca	Remainder
CC_Composition_Type	Limits
CC_Cu	CJ 0.25
CC_Fe	CJ 0.6
CC_Mg	A) 0.2 B) 0.45
CC_Mn	CJ 0.35
CC_RE	Remainder
CC_Reference	View in New Tab
CC_Si	A) 6.5 B) 7.5
CC_Sr	Remainder
CC_Ti	CJ 0.25
CC_Y	Remainder
CC_Zn	CJ 0.35
CC_Zr	Remainder
FS_Reference	View in New Tab

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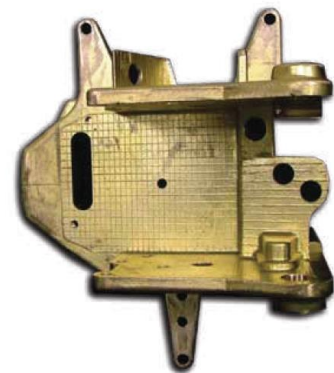
3. Knowing the alloy category, group and sub-group; search and select the right alloy grade and export to an FEA Tool.

Example: Green Sand Cast Ductile Iron seed Boot Grade 65-45-12

Alloy: Ductile Iron Grade 65-45-12

Weight: 15 lbs

Need to get all the strain fatigue properties



Use Select Alloy from Grade List of available data; Option 3 as shown below and pick the alloy grade within iron column as shown; use slider to scroll down the list.


Input Window:

The screenshot displays the 'Casting Alloy Data Search (CADS) Tool V3.0' interface. On the left, there is a navigation sidebar with the AFS AMC logo and options like 'Home', 'Global Alloy Search', 'Strength Property Search', and 'Select Alloy from Grade List'. The main area is titled 'Search Available Grades' and features six columns of alloy categories: Iron Alloys, Aluminum Alloys, Magnesium Alloys, Steel Alloys, Copper Alloys, and Other Alloys. The 'Iron Alloys' column is active, showing a list of grades with '65-45-12' selected. Below this, a 'Print Results' button is visible. The search results are presented in a table with columns for Alloy Type, Alloy Name, Designation, Designation Number, Casting Process, and Thickness. Two identical entries for 'Iron' with '65-45-12' are shown, each with a green 'Select Alloy' button.

Alloy Type	Alloy Name	Designation	Designation Number	Casting Process	Thickness
Iron	65-45-12	ASTM A 536 [SAE J434]	65-45-12 [D4512]	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	Select Alloy
Iron	65-45-12	ASTM A 536 [SAE J434]	65-45-12 [D4512]	Air-Set/Nobake Gas-Hardened/Coldbox Green Sand-Horizontally Parted Green Sand-Vertically Parted Shell Mold V-Process Sand	Select Alloy

Down select Grade 65-45-12 to view and download the engineering data or print or export as CSV for inputting into FEA or Simulation tools.

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Casting Alloy Data Search (CADS) Tool V3.0



SEARCH OPTIONS

- Global Alloy Search
- Strength Property Search
- Select Alloy from Grade List

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65-45-12 65-45-12 [D4512]

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- Chemical Composition
- Flexural Strength
- Impact Properties
- Monotonicc Properties
- Physical Properties
- Processing Data
- Room Temp Static Mech Props
- Strain Life
- ALL

Property Name	Property Value
Abstract_Estore_Link	View in New Tab
Alloy_Grade	65-45-12
CC_Al	CJ .018
CC_C	A) 3.2 B) 4.1 C) 3.84
CC_Ca	CJ .018
CC_Ce	CJ 4.61
CC_Cu	CJ .32
CC_Mg	CJ .029
CC_Mn	A) .1 B) 1 C) .17
CC_Mo	CJ .02
CC_Ni	CJ .02
CC_P	B) .1 C) .02
CC_RE	CJ .018
CC_Reference	View in New Tab
CC_S	A) .005 B) .035 C) .008
CC_Si	A) 1.8 B) 3 C) 2.31
CC_Sn	CJ .005

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PD_Temperature	Room
PD_Test_Bar_Image	View in New Tab
PP_Reference	View in New Tab
RTSMP_Brinell_Hardness_Max	217
RTSMP_Ultimate_Strength_Min	65
SL_Cyclic_Strain_Hardening_Exponent_Typ	.094
SL_Cyclic_Strength_Coefficient_Typ	115
SL_Fatigue_Ductility_Coefficient_Typ	-0.6483
SL_Fatigue_Ductility_Exponent_Typ	-0.6483
SL_Fatigue_Strength_Coefficient_Typ	109.9
SL_Fatigue_Strength_Exponent_Typ	-0.0643
SL_Strain_Life	Download Excel Table

Opening 136396188540848.xls

You have chosen to open:

136396188540848.xls
 which is: Microsoft Excel 97-2003 Worksheet (23.5 KB)
 from: http://3.23.174.181

What should Firefox do with this file?

Open with Excel (default)

Save File

Do this automatically for files like this from now on.

OK Cancel

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AutoSave Off 136396188540848.xls - Protected View

File Home Insert Draw Page Layout Formulas Data Review View Help

PROTECTED VIEW Be careful—files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View.

	A	B	C	D	E	F	G	H	I	J
1	N	Strain/2	N	Plastic	Elastic					
2		Total Strain		Strain	Strain					
3	100	2.286935	100	1.927906	0.359029					
4	300	1.116713	300	0.788072	0.328641					
5	1000	0.593939	1000	0.295655	0.298284					
6	3000	0.393892	3000	0.120855	0.273037					
7	10000	0.293157	10000	0.04534	0.247816					
8	100000	0.212841	100000	0.006953	0.205887					
9	1000000	0.142275	1000000	0.000164	0.142112					
10										
11										



For the reference to the properties source data, if available, is shown highlighted in blue and hyperlinked to the abstract as well as to the source of the full document.

Reference abstract for the mechanical properties:

AFS RESEARCH REPORT

Strain-Life Fatigue Properties Database for Cast Iron

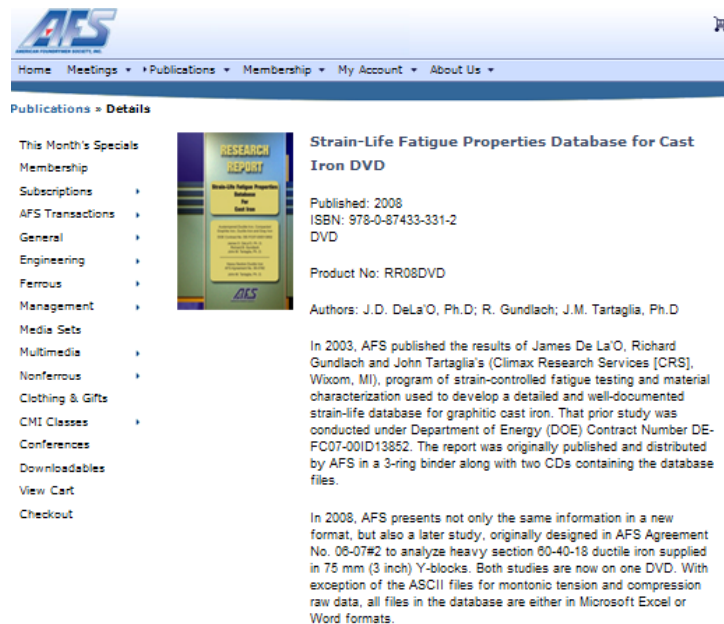
(Austempered Ductile Iron, Compacted Graphite Iron, Ductile Iron and Gray Iron)

DOE Contract No. DE-FC07-00ID13852

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Full reference document destination:



The screenshot shows the AFS website interface. At the top is the AFS logo and a navigation menu with links for Home, Meetings, Publications, Membership, My Account, and About Us. Below the menu, the page title is 'Publications > Details'. On the left is a vertical navigation menu with categories like 'This Month's Specials', 'Membership', 'Subscriptions', 'AFS Transactions', 'General', 'Engineering', 'Ferrous', 'Management', 'Media Sets', 'Multimedia', 'Nonferrous', 'Clothing & Gifts', 'CMI Classes', 'Conferences', 'Downloadables', 'View Cart', and 'Checkout'. The main content area features a central image of the 'RESEARCH REPORT' DVD cover. To the right of the image, the following information is displayed:

- Strain-Life Fatigue Properties Database for Cast Iron DVD**
- Published: 2008
- ISBN: 978-0-87433-331-2
- DVD
- Product No: RR08DVD
- Authors: J.D. DeLa'O, Ph.D.; R. Gundlach; J.M. Tartaglia, Ph.D

Below this information, there are two paragraphs of text. The first paragraph describes the 2003 publication of the results of James De La'O, Richard Gundlach, and John Tartaglia's (Climax Research Services [CRS], Wixom, MI) program of strain-controlled fatigue testing and material characterization used to develop a detailed and well-documented strain-life database for graphitic cast iron. The second paragraph describes the 2008 update, noting that it includes a later study originally designed in AFS Agreement No. 08-07#2 to analyze heavy section 60-40-18 ductile iron supplied in 75 mm (3 inch) Y-blocks. Both studies are now on one DVD. With exception of the ASCII files for monotonic tension and compression raw data, all files in the database are either in Microsoft Excel or Word formats.