GSPC Specification Editor

Graphic Statistical Process Control
by MeltLab Systems
844-MeltLab
www.meltlab.com

Fast • Accurate • Comprehensive

Creating variables and data bases

- The Specification Editor creates definitions for different variables to store such as
  - Numerical Value
  - Date
  - Time
  - Part number (from list)
  - Heat number
  - Comment
  - Name/Value from a list
  - Calculated value (equation)
  - Captured value from an instrument

Specialized input

- Value from a list
  - Spelling is consistent so variable can be searched for
  - Includes 100 item lists for supplier, customer, technician, metal grade, or any other name list needed.
  - Includes special part number list with accompanying special requirements, and information (BHN target/range)

Equations

- Equation Editor includes capabilities of

AbsValue, TruncValue, AvgFunc, SumFunc, SqrFunc, SqrtFunc, SinFunc, CosFunc, AtanFunc, ExpFunc, LnFunc, LogFunc, PiValue, ExpValue, Round, MaxFunc, MinFunc, StdError, PopulError, CountFunc, MeanFunc, PowerOp, AimFunc, SigmaFunc, LowRange, UpRange, DateValF, TimeValF, DateTime, RoundFunc, OddFunc, ModOp

- Also includes logic operators and If clauses.

Example equations

- Example Equations: # indicates a test value

No.	Eq Name	Equation/Desc
1	Alloy Facto	#1+0.25*#2-#4/7
2	Delta Compact	If(#9>0,#9-#3,0)
3	Carbon Riser	(Aim(#5) - #5)*12000/(100*.9)
4	75% FeSi Add	(Aim(#6)-#6)*12000/(100*0.75)
5	Avg Brinell	AVG(#15,#17,#19,#21,#23,#26)
6	Avg MUL	Avg(#32..#34)
7	Avg Push	Avg(#37..#39)
8	Avg Application	Avg(#45,#49,#53)
9	Ultimate1	(#10 /.196)
10	Yield1	(#11 /.196)
11	Elongation1	(#12/2*100)

Comments and character strings

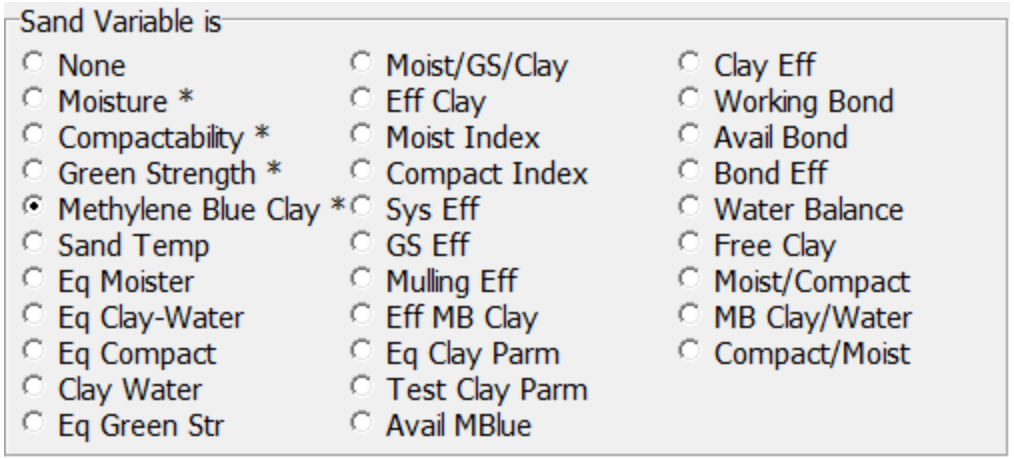
- Commonly called String values in programming, combinations of alpha numerics are sometimes useful for comments.
- Problems include human error, abbreviations and other issues that can make these pieces of information unsearchable.
- Where possible use lists of values instead.
- Exceptions would be heat numbers where unique identifiers must be entered. Just be careful.

Captured Instrument data

- Captured data has the benefit of being untouched (unfudged) by human hands.
- Possible Data Capture includes
  - Spectrometer Data
  - Hartley Data
  - Temperature Data
  - Some Brinell Instruments
  - PLC data from molding and or pouring lines

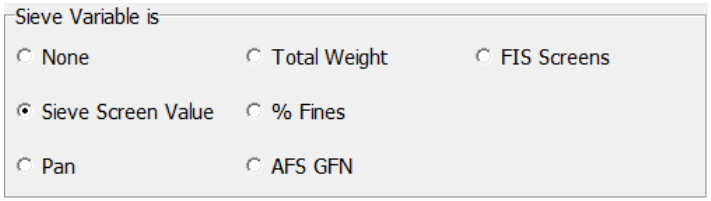
Specialized Calculations – Sand

- GSPC includes the full set of equations developed by Professor Dick Heine and Dick Green. By identifying the 4 basic tests of Moisture, Compactability, Green Strength and MB Clay, these equations are automated.



Specialized Calculations – Sieve Analysis

- All sieve calculations are automated.



Screen 6	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 12	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 20	2	No	Sieve Var	Real Numbe	Sieve Screen
Screne 30	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 40	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 50	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 70	2	No	Sieve Var	Real Numbe	Sieve Screen
Sceen 100	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 140	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 200	2	No	Sieve Var	Real Numbe	Sieve Screen
Screen 270	2	No	Sieve Var	Real Numbe	Sieve Screen
Pan	2	No	Sieve Var	Real Numbe	Pan
Fines	2	No	Sieve Var	Real Numbe	% Fines
AFS GFN	2	No	Sieve Var	Real Numbe	AFS GFN
Total Wt	2	No	Sieve Var	Real Numbe	Total Weight
FIS Screens	1	No	Sieve Var	Real Numbe	FIS Screens

Specialized Calculations – Brinell and Physical Testing

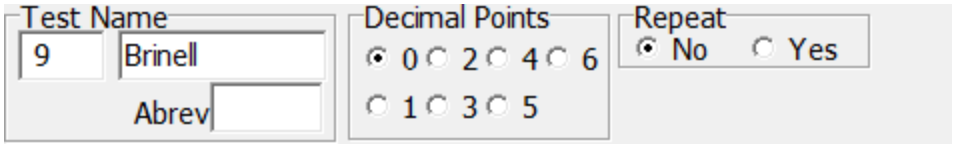
The system understands both BHN and 10 mm ball Brinell diameters and knows how to convert them.

Test#1		No	Inspect Val	List 1	
Brinell		No	Brinell Var	Real Numbe	Brinell
Tensile(#)		No	Brinell Var	Real Numbe	Tensile
Yield(#)		No	Brinell Var	Real Numbe	Yield
Elongation("	3	No	Brinell Var	Real Numbe	Elongation

Physical Testing Variables

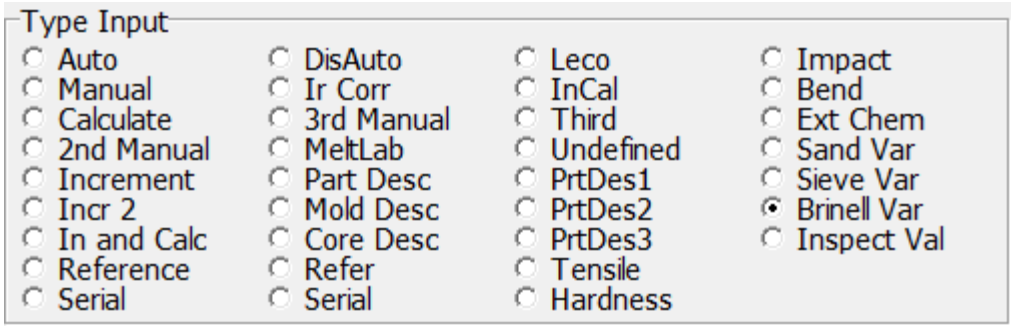
○ None	○ Sigma	○ Comment
○ Part	○ Cp	○ Operator
○ # Samples	○ CpK	○ Tensile
○ Min Value	○ Status	○ Elongation
○ Avg Value	◉ Brinell	○ Yield
○ Max Value	○ Molds	

Test Descriptions



- Test Name – appears next to test value in all programs
- Abbreviation – can be substituted for Test name when space is limited. Also used to match data names in automatic inputs such as Spectrometer capture.
- Decimal Point – Data is stored to what ever degree of accuracy it is received in. But displayed to this level of accuracy. For example, the Spectrometer may report Silicon to 4 decimal points, but you may choose to display it to a more useable 2 decimal points.
- Repeat – This carries over the last value for this test from the previous sample until changed. This is useful for an operators name, or a lot number.

Test Types



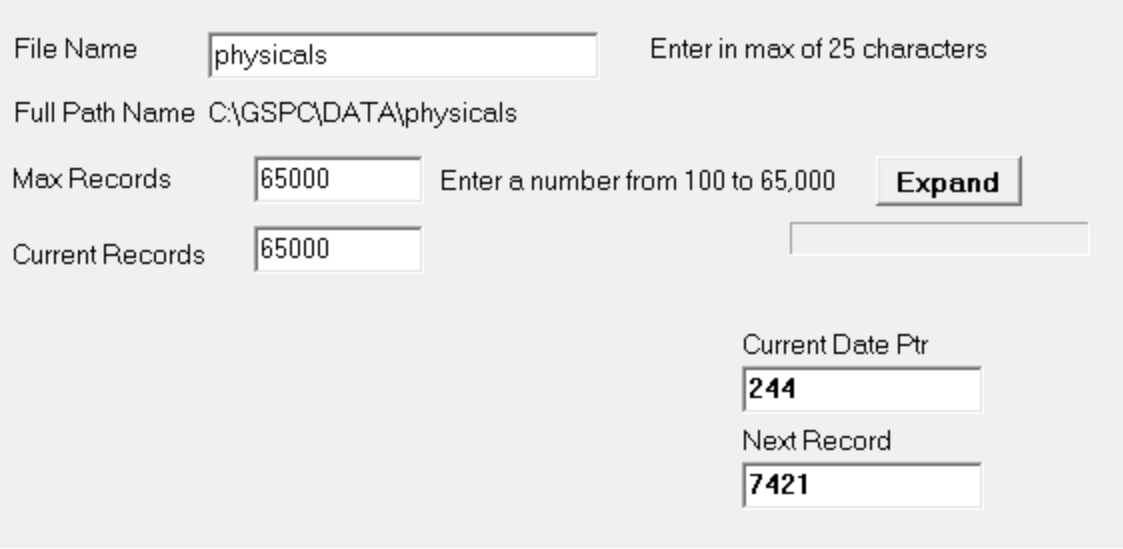
There are many different types of data that can be defined. A few are:
Auto – the specific program knows how to handle these.
Manual – operator input
Calculated – an equation is attached.
Increment – this is usually a counter
MeltLab – from MeltLab instrument
Leco – from LECO instrument.

Variable Ranges

Variable	Dec	Min Input	Min Engr	Min Proces	Aim	Max Proce:	Max Engr
Carbon	2		2.35	2.50	2.60	2.70	2.85
Silicon	2		1.15	1.25	1.35	1.45	1.55
Phosphorus	3					0.050	0.060
Sulphur	3					0.100	0.100
Manganese	3		0.150	0.200	0.300	0.400	0.450

- Each variable may have a set of ranges associated with it.
- Process ranges control flags to foundry personnel.
- Engineering limits are used for customer Cp, and CpK calculations.
- Aims control graphic targets, and process limits and sigma's are used in control graphics.

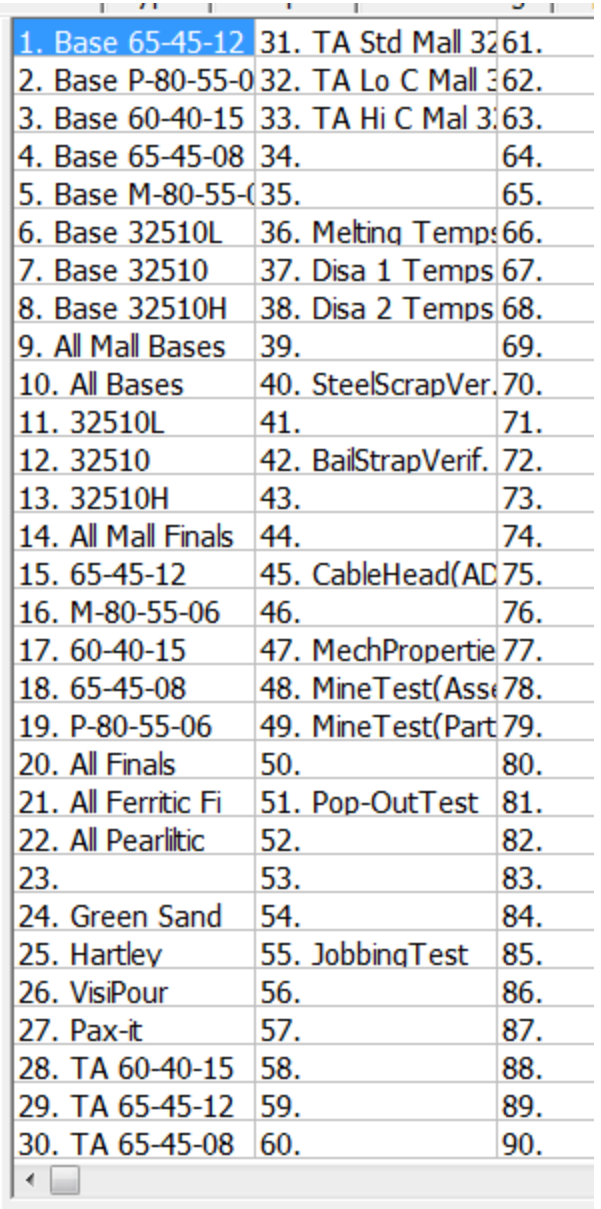
Data Storage



Setup a data base by giving it a name and a number of records to keep.

Name Specifications

- You can rename the different specifications to track a multitude of processes.
- Keep similar processes in the same data base, but keep others separated such as sand and metal should have different data bases.
- For example you might want to search all bases for a given tramp element. For that, they need to be in the same data base.



1. Base 65-45-12	31. TA Std Mall 32	61.
2. Base P-80-55-0	32. TA Lo C Mall 3	62.
3. Base 60-40-15	33. TA Hi C Mal 3	63.
4. Base 65-45-08	34.	64.
5. Base M-80-55-(	35.	65.
6. Base 32510L	36. Melting Temp	66.
7. Base 32510	37. Disa 1 Temps	67.
8. Base 32510H	38. Disa 2 Temps	68.
9. All Mall Bases	39.	69.
10. All Bases	40. SteelScrapVer.	70.
11. 32510L	41.	71.
12. 32510	42. BailStrapVerif.	72.
13. 32510H	43.	73.
14. All Mall Finals	44.	74.
15. 65-45-12	45. CableHead(AD	75.
16. M-80-55-06	46.	76.
17. 60-40-15	47. MechPropertie	77.
18. 65-45-08	48. MineTest(Ass	78.
19. P-80-55-06	49. MineTest(Part	79.
20. All Finals	50.	80.
21. All Ferritic Fi	51. Pop-OutTest	81.
22. All Pearlitic	52.	82.
23.	53.	83.
24. Green Sand	54.	84.
25. Hartley	55. JobbingTest	85.
26. VisiPour	56.	86.
27. Pax-it	57.	87.
28. TA 60-40-15	58.	88.
29. TA 65-45-12	59.	89.
30. TA 65-45-08	60.	90.

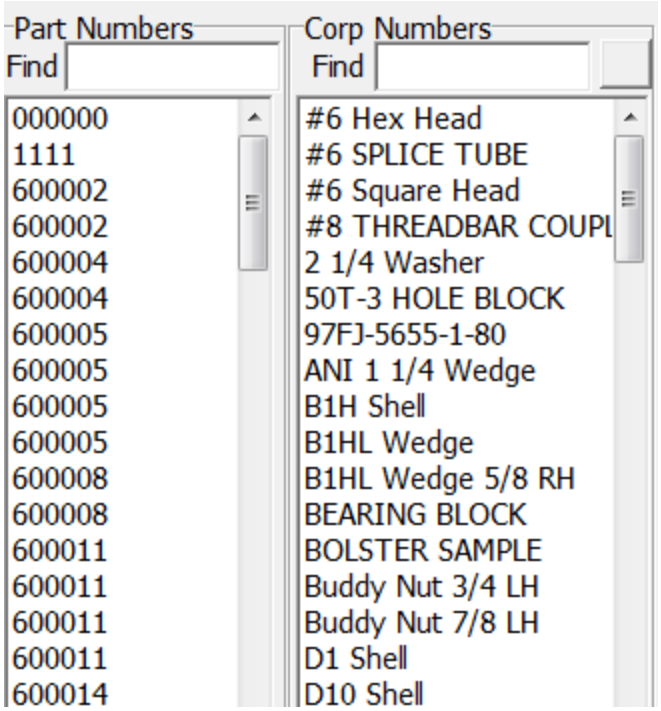
Name Lists

- You do not need to use the entire list for one variable.
- Here several lists can be seen. The Melter variable would be given a range from 10 to 12, but be displayed as a choice of 1 to 3.

1. AFS Washed Sa	26. #1	51. No	76.
2. New Sand	27. #2	52. Yes	77.
3. Dry Sand	28. #3	53.	78.
4. SeaCoal D-4	29. #4	54.	79.
5. Bentonite	30. #5	55.	80.
6.	31.	56.	81.
7.	32.	57.	82.
8.	33.	58.	83.
9.	34.	59.	84.
10. Furn 1	35.	60. Pass	85.
11. Furn 2	36.	61. Fail	86.
12. Furn 3	37.	62. Good	87.
13. Disa 1	38.	63. Bad	88.
14. Disa 2	39.	64. VisionPour	89.
15.	40.	65.	90. Kiln#2
16.	41.	66.	91. Kiln#3
17. Baird	42.	67.	92. Kiln#5
18. Atlantis	43.	68.	93. Kiln#8
19.	44.	69.	94. Kiln#9
20. SuppSandSam	45.	70.	95. Kiln#10
21. SuppSandCert	46.	71.	96. Lindberg
22.	47.	72.	97.
23.	48.	73.	98.
24.	49.	74.	99.
25.	50.	75.	100.

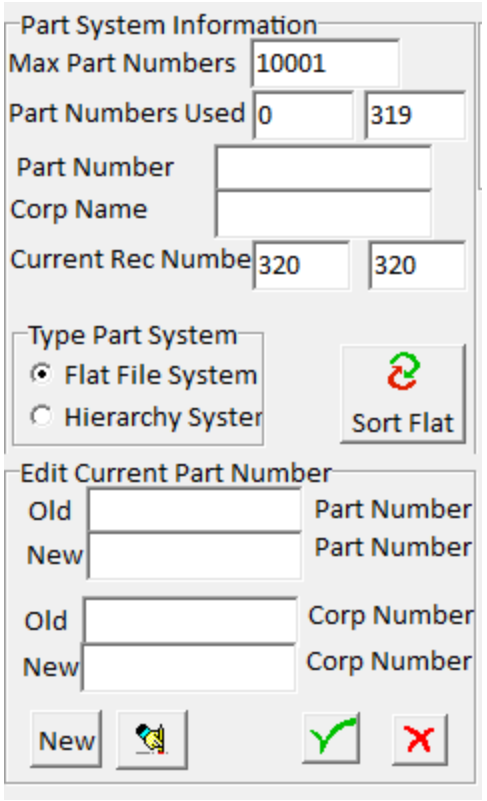
Part Numbers

- Part numbers can be displayed as common names or as computer numbers.



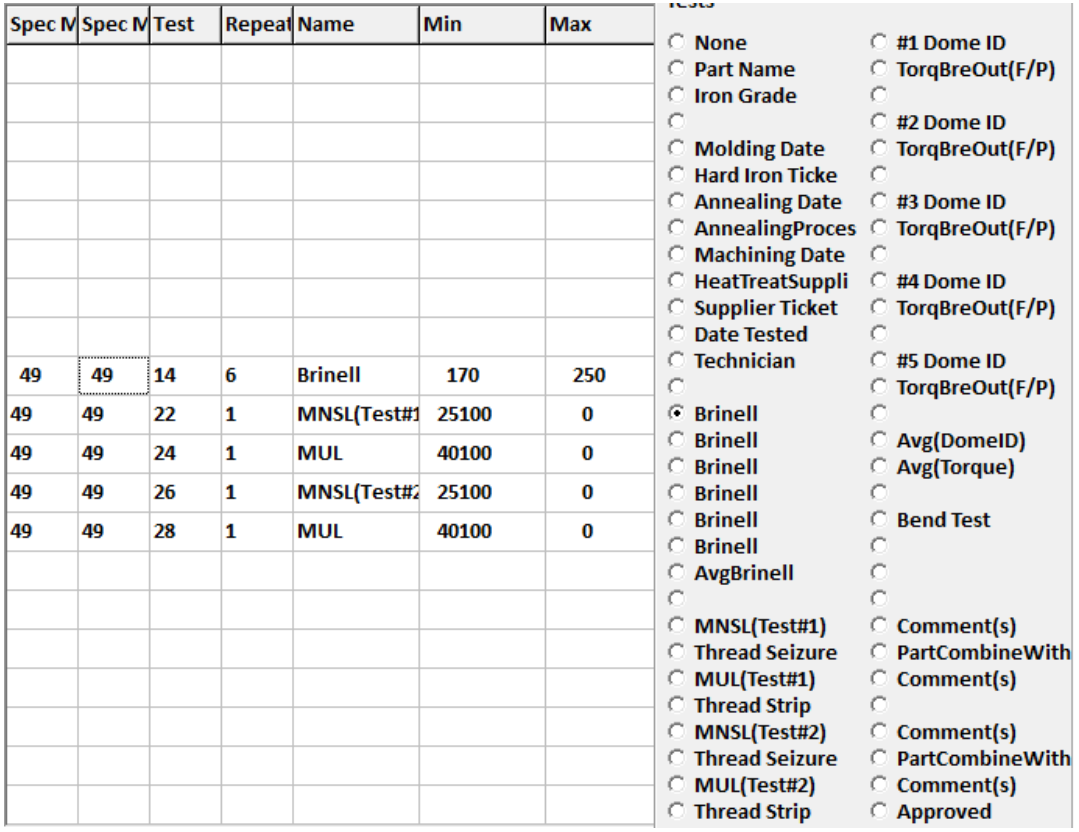
Entering new Part Numbers

- Part numbers can be edited by clicking on the item in either of the two previous columns.
- Use the New button to add a part to the system.
- Add all the parts for the day then sort the file to put both lookup tables into alphabetical order.



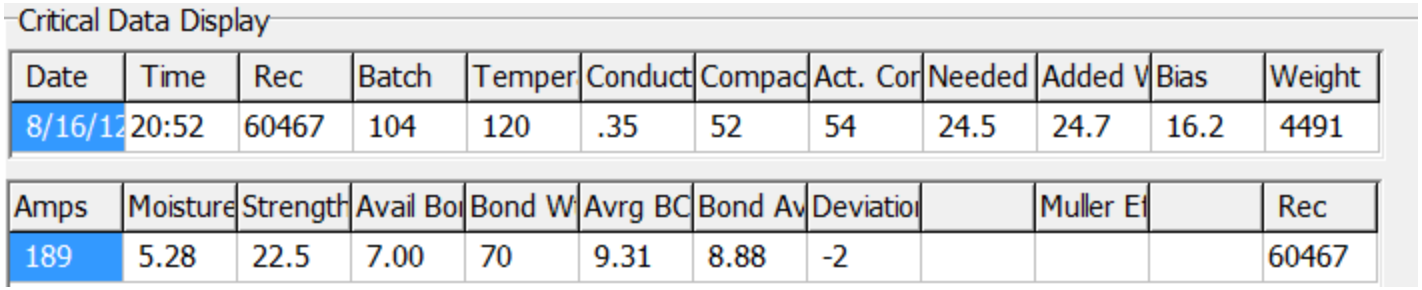
Adding a range requirement to a Part

- A Requirement attached to a part number overrides the normal specification limits when that part number is referenced.



Spec M	Spec M	Test	Repeat	Name	Min	Max
49	49	14	6	Brinell	170	250
49	49	22	1	MNSL(Test#1	25100	0
49	49	24	1	MUL	40100	0
49	49	26	1	MNSL(Test#2	25100	0
49	49	28	1	MUL	40100	0

Data Screen setup


Critical Data Display

Date	Time	Rec	Batch	Temper	Conduct	Compac	Act. Cor	Needed	Added W	Bias	Weight
8/16/12	20:52	60467	104	120	.35	52	54	24.5	24.7	16.2	4491

Amps	Moisture	Strength	Avail Bo	Bond W	Avrg BC	Bond Av	Deviatio		Muller Et		Rec
189	5.28	22.5	7.00	70	9.31	8.88	-2				60467

- The order of display can be set here and maintenance on the data base can be preformed.
- When the historical data base is sorted or rebuild, then the other two data bases need rebuilding as well. Click on the Reform button for one specification or click on Reform All to reform all specifications. This can take a little bit of time if you do all.

Critical Data Screen (Last 20 tests)