

# MSC-LIMS™ *Insights*

The source for news and tips of interest to users of MSC-LIMS,  
an affordable laboratory information management system for small labs.

Issue No. 22

August 2014


## Welcome

Welcome to **MSC-LIMS *Insights***.

This newsletter will help current MSC-LIMS users get the most out of their software, and will complement the product literature and demo that prospective users can find on our web site at [www.msc-lims.com](http://www.msc-lims.com).



Join our mailing list for more information. Sign up at [www.msc-lims.com/lims/maillist.html](http://www.msc-lims.com/lims/maillist.html).

This newsletter is for and about MSC-LIMS users. We welcome your comments, and your suggestions for topics you would like to see addressed in upcoming issues. Please send your thoughts to [newsletter@msc-lims.com](mailto:newsletter@msc-lims.com). 

## Common Microsoft Access Myths

In the business world, Microsoft Access is both cherished and despised. Its accessibility to the casual user has spawned many simple databases that individuals and departments rely on daily. The speed with which a database application can be created and deployed is part of Access' utility and the early success of these databases leads to their greater use. More data and more users often require an IT department's intervention to maintain the application. Unfortunately, Access databases that were not designed for multiple users and a larger volume of data present problems that IT folks are quick to blame on Microsoft Access. In reality, the blame lies not with Access but with the manner in which the databases were created.

Longtime users already know that MSC-LIMS' Access database is fast, stable and reliable. However, prospective MSC-LIMS users, particularly those who encounter resistance from an IT department opposed to Microsoft Access, should arm themselves with the facts. Below are five common Microsoft Access myths or criticisms and the contravening response.

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## From the Developer

Since it all began 20 years ago this month, now is a good time to reminisce. I first met with representatives from the City of Cheyenne, Wyoming in the summer of 1994 to discuss data management problems in their two-person water and wastewater lab. Following those discussions I proposed a custom Microsoft Access application as a solution. The City was interested but their procurement protocol required a competitive bid that would include commercial off-the-shelf systems. In order to even submit a bid I had to request the City extend their normal 30-day delivery date to six months to allow sufficient time for software development. They agreed, I submitted the successful bid, and MSC-LIMS came to life in early 1995. Read more about MSC-LIMS' origins in the Water Online article [A Small Lab Develops a Laboratory Information Management System](#).

Following the success of the City of Cheyenne's installation, I spent the better part of the next year creating MSC-LIMS version 1.0. New MSC-LIMS installations began in 1996 and have increased in number every year since.

I am most grateful for the early adopters who first acquired MSC-LIMS in the 1990s and helped shape our product. Many continue to run the software today. These users' systems are evidence that professionally designed and developed Access-based systems are viable solutions. However, in some circles, Microsoft Access has gained an undeserved reputation as a database unsuitable for all but the most basic tasks. I believe these misguided perceptions of Microsoft Access originate with IT departments unexpectedly tasked with managing databases created by non-programmers. If you are considering MSC-LIMS for your lab, see "Common Microsoft Access Myths" in this issue for the facts.



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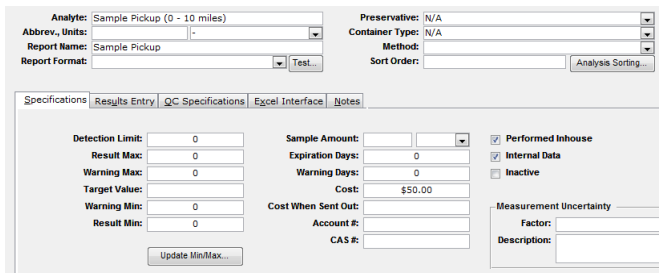
## Use Analytes to Bill for Services

Like any business striving to remain competitive, a lab's range of services may change over time. For example, a lab may decide to provide sample pickup services or offer various consulting services. Of course, the lab must bill their customers for these added services and MSC-LIMS' internal data analytes make it possible.

Adding billable costs to a sample in MSC-LIMS is done entirely through the sample's analytes. Simply create internal data analytes with a cost for each service provided then add the appropriate analyte to projects and samples as necessary. By default, internal data analytes are automatically omitted from analytical reports. All sample analytes need a result to complete a sample so you may also configure your service analytes with a result so they are automatically completed when added to a sample. These auto-complete internal data analytes are the quickest way to add service costs to your customer's samples. In cases where you want your invoices to show what date the service was performed, use an internal data

analyte that does not auto-complete. You can then use either results entry screen to enter a result for the service analyte and use the analysis date field to show the date of the service.

A few examples will help clarify the options available. Assume a lab has decided to offer sample pickup services to certain customers and the rate charged for the pickup is based on the distance to their customer's offices.



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The Analyses setup screen above shows a new Sample Pickup analyte for customers within a ten mile radius. Additional pickup analytes for customers within 11 to 20 and 21 to 30 miles are also added with higher costs to accommodate the additional distance. Alternatively, a single pickup analyte could be used with customer-specific costs. Note that the Internal Data option is enabled to exclude the analyte from any analytical reports. Since it is not necessary to highlight the distance on a customer's invoice, the Report Name field omits the mileage. An appropriate cost to invoice customers is added and the required specifications are all set to zero since they are not applicable. Using the Analysis Sorting button a numeric sort order is added to force the pickup analytes to always appear at the bottom of a sample's list of analytes on all LIMS screens. Finally, the excerpt below from the Results Entry tab of the Analyses setup screen shows that the analyte will automatically be completed with the selected Result Type whenever the analyte is added to a sample.

To add the appropriate sample pickup charge to a customer's samples, add the pickup analyte to each applicable LIMS project as shown below.

If the pickup service is only provided on occasion or the charge is only added to one sample in a batch, simply add the pickup analyte during sample login using the Add Analysis button as shown below.

If the lab also begins providing consulting services for which they must add applicable labor charges to their customer's invoices, use similar cost analytes for these services. Simply create internal data analytes such as Consulting 0.5 hour, Consulting 1.0 hour, Consulting 1.5 hours, etc. for each possible billable hourly increment. Configure the analyte's Auto Complete option so that result entry is not required. Optionally, consider adding the analyte's billable hours as the auto complete result value, which offers the possibility of consolidating the consulting analytes with a single line item on an Excel-based invoice using the sum of the result values.

Now use the Sample Login screen's edit mode to add hourly consulting analytes to the sample as needed. The Results by Sample screen excerpt below shows daily consulting charges added to a sample.


Warn	Analysis	Requirement	17-Jul-14	Date	Time	Type	Value	Report	Units	MDL
	E. coli(species)								cfu/g	0
	Salmonella (Presumptive)								Pos/Neg	0
	Total Coliforms								cfu/g	0
	TPC 20°C								cfu/g	0
	Sample Pickup (11 - 20 miles)		14-Jul-14			Yes		Yes	-	0
	Consulting 1.0 hour		15-Jul-14				1	1	hrs.	0
	Consulting 2.5 hours		16-Jul-14				2.5	2.5	hrs.	0

Since the sample pickup and consulting analytes added to the sample above are internal data analytes, they will not appear on a final report. However, by default

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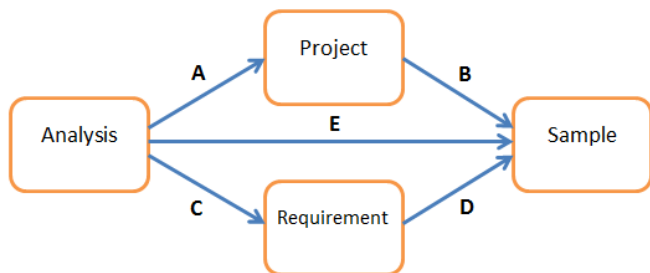
all sample analyses with a cost will appear on an invoice. And like any analyte, customer and project-specific costs and cost multipliers for discounts and premiums also apply to internal data analytes.

If you generate your invoices from MSC-LIMS, explore internal data auto-complete analytes to add additional charges to your customer invoices. 

## Understanding Analysis Specifications

An effective MSC-LIMS implementation will restrict data entry for analysis results to values appropriate for the analyte. Highlighting result values above or below expected limits is also important. In MSC-LIMS, these tasks are accomplished using an analysis' result and warning maximum and minimum and optional target values, which are collectively called the analysis' *specifications*. The result maximum and minimum are absolute limits. Values above the result maximum or below the result minimum cannot be manually entered or imported from Excel. Values above the warning maximum or below the warning minimum generate visual and audible warnings during data entry and import and are flagged on reports.

Properly configured analysis specifications prevent entry of nonsensical results and raise notice to values outside the expected norm such as environmental permit limits. To configure analysis specifications successfully and troubleshoot data entry errors and warnings requires understanding how and where the specifications are used in MSC LIMS. Analysis specifications propagate from the configuration of analyses, projects, and requirements to individual samples as the following diagram depicts.



Let's look at each of the labeled paths in the diagram above to follow the analysis specifications in MSC-LIMS.

**A. Analysis to Project.** Specifications begin on the Analyses setup screen, where an analysis' default specifications are defined. The Analyses setup screen excerpt below shows example default specifications for a pH analyte.

When an analysis is added to a project, the default specifications are copied to the project, where they may be changed. The Projects setup screen excerpt here shows new warning minimum and maximum specifications for pH in this project.

Analysis	Units	Result Max	Warn Max	Target	Warn Min	Result Min
Ammonia	mg/L	300	5		1	1
pH	units	14	10		6	0

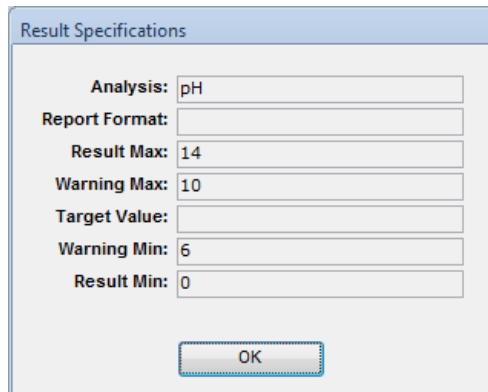
**B. Project to Sample.** When a new sample is logged, the analysis specifications are copied from the sample's selected project to the sample's analyses. Note also that a project with location-specific analyses may maintain different specifications for the same analyte for different sampling locations.

Each sample holds its own analysis specifications, since analysis, project, and requirement (see below) analysis specifications may change over time. For example, any change in environmental permit limits, which are maintained in the warning maximum and minimum fields, will affect all future samples but not existing samples. You can view a sample's analysis specifications by either right-clicking and selecting Result Specifications or double-clicking within the Result Value field on either of the results entry screens. The screen below shows the pH specifications in a sample logged for our example project.

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Analysis:	pH
Report Format:	
Result Max:	14
Warning Max:	10
Target Value:	
Warning Min:	6
Result Min:	0

OK

**C. Analysis to Requirement.** Like project setup, when an analysis is added to a requirement, which is simply a named list of analyses, the analysis' default specifications are copied to the requirement where they may be altered.

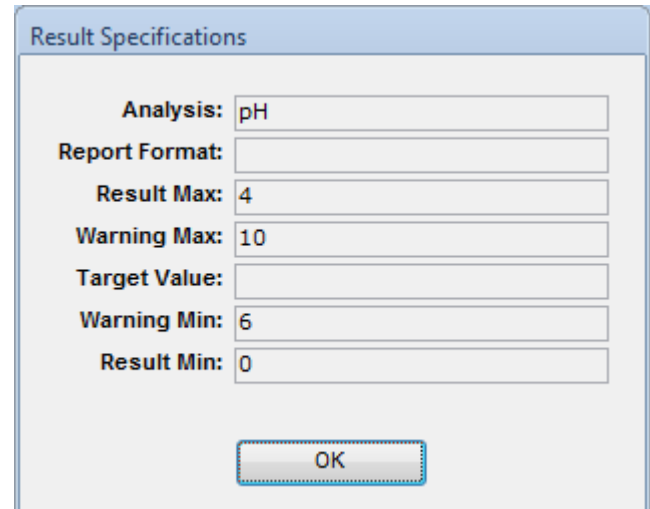
**D. Requirement to Sample.** Whether the requirement is already added to the sample's project or the requirement is selected and added to the sample at login, the requirement's analysis specifications are copied to the sample's analyses just like a project's analyses (see B. Project to Sample above).

**E. Analysis to Sample.** If an analysis is added to a sample during sample login and the analysis is defined in the sample's project, the project's analysis specifications are copied to the sample. This scenario only occurs if the analysis was previously deleted from the sample or the user is adding a duplicate analyte. However, if the analysis added during sample login is not part of the sample's project, the analysis' default specifications are copied to the sample.

## Troubleshooting Results Entry Problems

Now that we understand where analysis specifications are found within MSC-LIMS, let's look at the problems that may occur and how they can be corrected. Continuing with our example pH analysis, assume that while attempting to enter a pH result you receive a "Result value is out of range" warning with the accompanying tip to "Double-click to view result specifications." Your first action to investigate is to follow the warning's tip and either double-click the result value field or right-click and choose Result Specifications to view the specifications for the sample's analysis. For example, if we received the

"Result value is out of range" warning when attempting to enter a pH result of 7.5, viewing the following specifications identifies the problem.



Analysis:	pH
Report Format:	
Result Max:	4
Warning Max:	10
Target Value:	
Warning Min:	6
Result Min:	0

OK

The specifications above reveal a typographical error occurred entering the result maximum for pH, which should be 14 but 4 was entered. Similarly, if you see an unexpected red MAX or MIN warning after entering the result value, viewing the analysis' specifications will reveal the problem.

## Fixing Incorrect Analysis Specifications

Note that the Result Specifications popup screen shown above lists the specifications just for the single pH analyte in the current sample. As long as we don't enter a result we can correct the sample as we'll see below. First, we need to find how the incorrect result maximum of 4 was added to our sample.

Refer to the diagram above and note that our sample received its pH specifications from either the project, requirement, or analysis (i.e. one of the three paths labeled B, D, or E). Since specifications are most commonly added to a sample from its project that's the first place to look for the problem. Assume our project does have the incorrect pH result maximum of 4. We can change the pH result maximum to 14 to fix the project for all future project samples. But a project receives its specifications from the analysis (i.e. path A in the diagram) so it's prudent to also check the analysis' default specifications. If the analysis' default specifications include the same error it's likely that other projects and requirements with the pH analyte also have the incorrect result maximum.

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Update Min/Max for pH

Update

Result Max. Change to: 14

Warning Max.

Warning Min.

Result Min.

Update In

Projects

Requirements

Incomplete Analyses for Standard Samples

Incomplete Analyses for QC Samples


Incomplete Analyses for Single Sample:

WARNING: Use this form with caution since it will update all records for the options selected. If you use different min/max values for different projects or requirements you must use the project and requirement setup forms to set the values appropriately.

OK

Cancel

Use the Analyses setup screen's [Update Min/Max] button to quickly correct analysis specification errors across many projects, requirements, and incomplete samples. The screen above shows how our pH result maximum problem was corrected throughout the system.

Analysis specifications are an integral part of MSC-LIMS. Understand how they work and you can improve your implementation and quickly troubleshoot problems when they arise. 

## Common Microsoft Access Myths

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### Myth 1. Access is too slow

The ability to rapidly create a database application has caused the proliferation of Access databases in many organizations. Often single-user databases, these solve an important problem but are created without consideration for scaling to multiple users or large amounts of data. Such databases are not properly normalized, lack sufficient indexing, and omit referential integrity rules. Poor performance of improperly designed databases leads some to incorrectly conclude that Access is the culprit. These are the databases that earn Access a poor reputation within IT departments.

A properly designed Access application like MSC-LIMS installed on adequate workstation and network hardware provides excellent performance. Certainly, a file-based database like Access where each workstation reads and writes to the database will not perform as well with very large databases or many concurrent users as a client/server database such as Oracle or SQL Server (with a client/server database, workstations pass their database read and update requests to a dedicated database engine running on the server, which is optimized to handle many users and very large databases). However, client/server databases are more costly to purchase, install, and maintain and most small labs cannot justify the added expense.

### Myth 2. Access databases frequently corrupt

We need only look at the many existing MSC-LIMS installations, some of which have been running for over 15 years without any database corruption, to dispel this myth.

Most Access database corruptions occur for one of two reasons. First, when a single-user Access database is deployed to multiple users without properly separating the front end software from the back end data, database corruption is inevitable. Second, sharing file-based databases like Access requires a robust connection to the file server. Slow wide-area networks or wireless networks prone to dropped connections are not suitable environments for a shared Access database. An Access application like MSC-LIMS, which is properly split into front end and back end databases, and installed on systems with sound network infrastructure, will likely never experience database corruption.

### Myth 3. Access is not a professional database

Inefficient applications can be created with any database product. Just because this happens with greater frequency with Access because of its popularity should not imply it is a toy database. On the contrary, many professional database developers use Access because it includes many of the important features of a relational database management system including referential integrity, transaction processing, indexing, record and page locking, SQL queries, and database views.

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## **Myth 4. Access has poor security**


Yes, anyone with sufficient time and skill intent on cracking an Access database's security will probably succeed. However, this myth can be traced to databases that use either a single password or improper user-level security. Although user-level security has been removed from newer Access file formats, it is still available with MDB files, which is the model used by MSC-LIMS. Using a combination of user-level security and Windows file system permissions, administrators can still create a reasonably secure Access database.

## **Myth 5. Access is not an enterprise solution**

It is true that Access is not an enterprise database. But this criticism is misdirected because any commercial application that uses an Access database is not intended to directly serve the entire enterprise.

MSC-LIMS is designed for small departments or workgroup environments of up to 20 concurrent users and still fits well in the enterprise. Even in very large companies, only a small number of lab personnel will use MSC-LIMS on a daily basis. Just a subset of the data in the MSC-LIMS database such as completed sample results may be of interest throughout the company. In this case, it is simple to use MSC-LIMS Messaging to send sample results to other information systems in real time. We have used this technique to integrate MSC-LIMS data with corporate ERP systems, with just a few hours of development.

## **These myths are busted**

Properly designed Microsoft Access applications like MSC-LIMS are cost-effective, robust, and offer good performance in small workgroup environments. Know the facts about Microsoft Access and you can avoid the unnecessary costs of a client/server database when selecting a LIMS for your lab. 


## **Notes from Technical Support**

### **LimsCode Size Warning**

We often receive questions similar to this one:

*I just started LIMS and got a warning message stating that the LimsCode database reached over 15 MB. What should I do to change this? Does it matter?*

The LimsCode startup warning message is harmless. It is a remnant from one of the earliest versions of MSC-LIMS, back when PCs were much slower. The message has nothing to do with your LimsData database, which is the repository for all LIMS data.

To suppress the LimsCode size warning, first open the Workstation Configuration screen on the Admin menu and make sure the "Compact LimsCode at exit" and "Delete temporary records at exit" options are both enabled. Next, you can either disable the "Show Compact startup warning" option or increase its size to 20 MB or higher if necessary. LimsCode contains the LIMS software and its size will increase while you use the LIMS. Compacting and deleting temporary records each time the LIMS exits will keep its size in check. See "Understanding the LimsCode Size Warning" in [MSC-LIMS Insights No. 17](#) for more information. 

### **Values Imported from Excel**

A user recently submitted this question:

*The results reported in my excel spreadsheet and those imported into LIMS don't seem to be matching up. The problem seems to be caused by that value being produced by an equation. When I delete the equation and just enter in a number it seems to import it just fine. Is there a way to fix this so that I can keep the equation but it will just import the value produced by the equation?*


Yes. When importing results from Excel, MSC-LIMS imports the actual value in the workbook's cell, which may be different than the displayed value due to the cell's format. Just modify your formula to use Excel's ROUND function to control what value will be imported.

For example, if a cell's formula is  $=2/3$  and the cell has a number format with two decimal places, the value 0.67 will be displayed. However, the cell's actual value with Excel's default 15 digits of precision is 0.66666666666667, which is the value MSC-LIMS imports. Such a value may be difficult to see completely on both the Excel Data Import and results

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entry screens. The solution is to round the results of the original formula to a specific number of digits. Change the formula to `=ROUND(2/3, 2)` to ensure MSC-LIMS imports 0.67. Search for the ROUND function in Excel's help for a complete description and additional examples. 

## Configuring Instrument Methods


Variations of the following question are common from users just beginning their implementation:

*Suppose I'm running ICP for the entire list of metals for environmental monitoring. What's the best way to set this (meaning a single test that yields several results) up in the Analysis screen?*

*Also, if I have several instrumental methods- say ICP & AA or IC & Titration (which the same analyte can be quantitated under) what is the best way to enter*

*that analyte without running into record duplication errors?*

Each metal analyte must be defined as a distinct analysis in MSC-LIMS and the analyte name must be unique. Consider putting the method number or name in the Analyte name field on the Analyses setup screen to distinguish the same trace metal performed by different methods (e.g. Arsenic - ICP). Use the Report Name field, which does not have to be unique, to specify the analyte name you want to see on a final report.


Next, you can create a named list of analytes (e.g. Metals - ICP) with the Requirements setup screen. Add every metal analyte to the requirement. You can then add the entire list of metals analyses to any project or sample by selecting the single requirement. 

## For Customers Only

This section of *MSC-LIMS Insights* is devoted to current users of MSC-LIMS. Here we briefly introduce only the most recent additions to MSC-LIMS.com Customers Only pages. Use your login name and password to log on to the Customers Only section of our website.

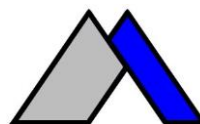
### File Library

#### [Excel Export Templates](#)

This archive file contains all the example Export templates currently installed by MSC LIMS version 4.0. New templates are occasionally added to the list and others may be updated from time to time. Download this file to get all current export templates. See each template's Read Me sheet for more information. 

## Contact Us

Questions, comments, suggestions?  
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