Sabbatical Report

Spring 2008

Learning Modules

to

Teach Professional Skills

Charles G. Newman

Department of Chemistry

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Acknowledgements

I would like to acknowledge the following person for their assistance on this sabbatical project. Without their help, this project would not have been possible. My thanks go out to George Marcines Director of Quality of Custom Building Products, Terry Catlin, Vice President, Board of Directors and Nel Groenvelt, Laboratory Director, of Inland Empire Utility Agency for allowing me the opportunity to work as a technician in their laboratories and to better understand the skills necessary to be a solid contributing employee. I only wish more college faculty would volunteer or work as an intern in a business or industrial environment.

I would also like to acknowledge my laboratory supervisors. They were Juan Flores, Carlos Martinez and Periaswamy Arjunan from Custom Building Products and Kevin Tang and Jennifer Huber from Inland Empire Utility Agency. Thank you for treating as you would any entry-level employee. I greatly appreciated the opportunity and the experience.

I would like to thank the faculty and staff in the Department of Chemistry and the Natural Science Division for their support and encouragement.

I would also like to express my gratitude to the administration at Mt San Antonio College for their insight and wisdom recognizing that there is more to a solid entry-level employee that just a technical education.

Statement of Purpose

A few precious minutes are all a candidate has in a job interview to demonstrate technical competence, professional skills, and how he/she intends to contribute to an organization. According to our Chemical Laboratory Technician Program Advisory Committee, representing about fourteen local businesses, employers want candidates that have solid fundamental technical skills and excellent professional skills. Many of the professional skills employers look for in potential candidates are: organization, integrity (character), dependability, personal responsibility, good communication skills (written, verbal and computer), problem solving ability and a positive attitude. These skills all add up to a productive team member that works well with others and shows initiative.

Consistent with the aim of the Advisory Committee, this sabbatical sought to identify and quantify, first hand, the professional skills that employers desire in their employees and, to build learning modules that cultivate professional skills into a laboratory based curriculum. The goal was to construct scientific laboratory activities where students could learn and practice professional skills in a teamwork environment. According to Advisory Committee recommendations, if students could learn and integrate professional skills into their everyday work habits, they would be better equipped to enter the work force.

Adapting applied project based learning modules into a classroom setting would provide students the opportunity to integrate professional skills into a scientific laboratory environment. Conducting these project based learning modules as a professional laboratory, would offer students the opportunity to put these professional skills into practice. Integrating traditional laboratory activities with project based learning modules would allow students to gain the necessary technical, professional and interpersonal skills that employers insist upon in entry-level applicants.

The results of this sabbatical project are intended to offer students vision into a laboratory workplace environment and to equip them for immediate success in their new entry-level position. Project findings will be disseminated to other departments, divisions and the college. In addition sharing results with our Advisory Committee and community would build relationships with local employers who could hire our graduates and become more involved with this program.

To accomplish this goal, I volunteered, or interned, at two different laboratories in two different industries. The first was the Research and Development laboratory at Custom Building Products, Inc. in Santa Fe Springs, CA. The second was the Analytical Laboratory for Inland Empire Utility Agency in Ontario, CA. To gain the maximum experience and gather the most information on professional skills, the two laboratories were chosen from entirely different industries. Custom Building Products is a for-profit Corporation whose products

are sold around the world, mostly through Home Depot stores. Inland Empire Utility Agency is a public Agency that treats and processes waste water for over 400 square miles in the Ontario area. It was believed that job assignments in both a private corporation and a public agency would provide a wider background and a better overall understanding of professional skill expectations in very different laboratory workplace environments.

This sabbatical project intended to construct two different project based learning modules that could be integrated into a class offered in spring 2009 (Introduction to Chemical Laboratory Technology, (CHMT 1). Each learning module, as part of the class, would be designed to be 15 to 20 hours in length. Students would be treated as laboratory employees and be subject to similar rules and expectations as a laboratory workplace. A focus on communication skills and teamwork skills would be highlighted. As a final project, students would be required to present their learning module project findings in both written report format and as a presentation seminar to the entire class.

Section One

Sabbatical Request

Sabbatical Request

Spring 2008

Learning Modules to Teach Professional Skills

Charles G. Newman

Department of Chemistry

Sabbatical Request

March to June 2008

Summary

This sabbatical project will concentrate on understanding the professional and technical roles of Chemical Laboratory Technicians. During spring semester, 2008, considerable effort will be placed on identifying critical areas where professional skills are required to be successful in the work place. This project will combine first-hand knowledge working as a laboratory technician, and surveys collected from both faculty and local employers. Sabbatical findings will be utilized to build Learning Modules expected to improve professional skills for those students within the Chemical Laboratory Technician program and to other degree programs within the college.

Justification

Academic intuitions stress technical knowledge based skills and do little to stress professional working or interpersonal skills. Although workplace technical competency is critical, non-technical skills may be equally or more important in a business environment. To confirm this, data will be collected and measured against the metric of employer expectations.

Plan

I intend to volunteer as a Chemical Laboratory Technician at two different businesses, in two different industries, and learn as much as I can what employers expect from entry-level employees. Required and highly desired skills will be

identified, documented, categorized and ranked by importance. The information gained during this sabbatical project will be distilled into Learning Modules and taught to our Chemical Laboratory Technology students so they are aware of employer expectations. This first hand knowledge will be supplemented with surveys from industrial employers and chemistry faculty. If these Learning Modules are shown to be beneficial, they will be shared with other degree programs on campus.

The Proposed Sabbatical Project

Objectives:

Part 1: Acquire Technical and Non-technical Skill Set Information through Work Experience.

1. I've offered to volunteer as a Laboratory Technician at several local businesses.
2. Two facilities have responded (See emails attached to the original proposal.)
    a. Inland Empire Utility Agency – Waste Water Treatment Facility in Ontario, CA
    b. Custom Building Products – Manufacturer of cements, grouts, tile adhesives and ceramic material cleaners in City of Industry, CA
3. With prior written consent from each employer, collect information on desired working skills.
4. Document essential technical, non-technical skills and competency levels.

5. Gain first-hand information on all skill set requirements for entry-level lab technicians.
6. Using an "Activity Journal" (diary format), document the activities performed and the necessary skills required for success.
7. Rank essential and desired skill set requirements by each employer.

Part 2: Verify Required and Highly Desired Skill Competencies by Survey.

1. With assistance from Research and Institutional Effectiveness (RIE), construct a survey to be given to Chemistry Department faculty and local employers.
2. Compare the responses from faculty and employers, identify the specific skill areas where discrepancies exist and determine the magnitude of the discrepancy.
3. The results from survey respondents will define the specific areas that may be included as Learning Module topics.

Part 3: Construct Learning Modules for the Chemical Laboratory Technician Program

1. Based on first-hand observations and survey respondent results, build Learning Modules that illustrate the skill sets necessary for success in a working environment.
    a. Construct hands-on laboratory based technical skill set activities.
    b. Construct Learning Modules that illustrate Professional skills.

c. Construct Learning Modules that illustrate Interpersonal skills.

2. Test Learning Modules during fall 2008.
3. Based on employer and student responses validate Learning Module importance.
4. Plan to make the Learning Modules available to other disciplines at the college.

Project Goals:

The overriding goal of this sabbatical project is to:

- better equip our students for a professional career,
    - provide real world examples, through Learning Modules, that illustrate typical workplace situations,
    - provide credible, verifiable and essential skill sets requirements for the workplace,
    - teach students the necessary technical, professional and interpersonal skills that employers desire,
- disseminate project findings to the department, division and college,
- disseminate findings to the educational community at large,
- build stakeholder commitment with the community and local employers

Project Timeline:

Sabbatical Project Timeline is found on page 6.

Final Report and Findings:

The final report will be submitted on-time for review and presentation. The following information will be available for dissemination:

- Survey Results from Chemistry Faculty, Employers and Supervisors
- Professional skill Learning Modules - both lecture and hands-on laboratory activities

Benefit to the Community

Along with the goal to better equip our students to enter the workforce comes the opportunity of grow our industrial contact base, to gain increased stakeholder involvement by local industries and to further identify industrial sectors that seek to hire our Chemical Laboratory Technician graduates.

Benefit to the College and the Department of Chemistry

This proposed sabbatical project complements the existing department and division goals with respect to supporting the Chemical Laboratory Technician program. The completion of this project will provide an increased understanding into the technical and professional skill set competencies necessary to becoming a successful Chemical Laboratory Technician. These findings will be integrated into

the existing Chemical Laboratory Technician curriculum so our program graduates are sought after by local employers.

Having a tenured faculty gain first hand experience working as a technician underscores our dedication and commitment for all program stakeholders. From an employer's perspective, this sabbatical project is a statement of assurance to maintain a current and relevant program content in a changing professional environment. By working in their facilities, employers will feel more connected to the college. They will feel their voices are being heard where specific professional skill needs are being addressed and integrates into our program. The results of this sabbatical project would increase stakeholder involvement between the community and the college.

Since most chemistry faculty have little industrial experience, sharing this sabbatical experience would benefit the entire department. Since the overwhelming majority of our students will work in some sort of a for-profit business, the industrial experience gained by this sabbatical project would be valuable to all our students as well. Again, these sabbatical project findings would be available to everyone to use or integrate into their specific programs throughout the college.

Benefit to the Instructor

Ever since I began graduate school, I questioned the standard education model used in the sciences to equip graduates for a career. It became painfully

obvious that the State University and University of California systems educate students to become academic researchers. In a sense, University professors were propagating themselves. Since most academicians have never worked in an industrial environment, it is reasonable that they would teach what they know, basic research from an academic perspective. However, more that 80% of science majors begin their careers in a business environment. Therefore, we as educators should realize this fact and make provisions to address this disconnect.

This sabbatical would benefit me by increasing my understanding of the businesses that surround our community. This experience would also add confidence and authority to my presentations to industrial members and to potential employers of our graduates. Even though I have 21 years of industrial experience and have supervised numerous technicians, a current fresh experience could only refresh, compliment and validate my lecture presentations.

Benefit to the Students

The overriding goal of this sabbatical project is to provide students with the best educational experience possible so program graduates not only become successful entry-level employees, but that employers would request to hire our graduates.

Comment:

Prior to the submission of this proposal, project goals, objectives and outcomes were shared with two consultants from College Chemistry Consultants, (an advisory group that works closely with the American Chemical Society). (One these consultants, was a former laboratory technician and now a Ph.D. in Chemical Engineering who was a key participant in the formation of the Technician branch of the American Chemical Society. The other consultant initiated and was a Program Director of the Chemical Technician program and later became the Dean of Sciences and Letters at City College of New York.) Both consultants believed this sabbatical project would benefit our program and our students.

Projected Timeline

The following is a projected timeline for the proposed sabbatical project scheduled for spring 2008.

Month	Proposed Projects				
	Industrial Site	Observations	Surveys	Findings	Learning Modules
March	Custom Building Products	Document skills necessary	Construct Survey with RIE Complete and test Survey with RIE		
April	Custom Building Products	Draft summary findings	Disseminate Survey	Data Collection	Build Modules
May	Inland Empire Utility Agency	Document skills necessary	Disseminate Survey	Data Collection	
June	Inland Empire Utility Agency	Document skills necessary Draft summary findings		Data Reduction Draft Formal Report of Findings	Build Modules

This Sabbatical Project final report will include the all observations made on-site at the industrial facilities previously mentioned.

Section Two

Work Activities

Work Activities

To validate the importance the Professional Skills I volunteered/interned as a laboratory technician at two different facilities. Working in a professional laboratory provided me the opportunity to observe and to practice the skills required to be a professional technician. The following portions of this report are my experiences.

Observations That Validate the Statements Above: Custom Building Products

Volunteering as a Laboratory Technician at Custom Building Products (CBP), I found that most instructions were verbal. I had to pay close attention and quickly ask questions when I was unclear about my assignment. Typically, I was shown how to do something once, then asked to demonstrate it. If I did well, I was allowed to complete the task on my own. My supervisors, other professional laboratory technicians, would check-up on me to insure I was performing up to their expectations.

Certain aspects of my first assignment I completed to the expectations of CBP. On other occasions, I needed assistance. On tasks where I needed more explanation, my supervisors became visibly frustrated. As long as I tried my best, and remained engaged in explanations, I was able to diffuse the frustration. After the first four hours, I was turned loose to continue on my own.

My first week was spent preparing samples and measuring both peel strengths and shear strengths of a product called EasyMat®. My supervisor was satisfied with the quality and quantity of work I completed. After a few days of data collection, I assisted

with the construction of a graph that served as a pictorial reference as to EasyMat® product consistency. I was able to build Excel charts easier than my supervisor, so I helped him, so he could impress his boss. After a bit of teaching him about graphing spreadsheet data, he was on his own. See **Appendix B**.

During my second assignment, color matching of tile grouts, I was asked to prepare several formulations and make batches of product using approved and unqualified raw materials. My supervisor on this project wanted me to be exact in all my measurements and work fast. Even thought I was familiar with the equipment and the techniques, I found I was not as fast as I had hoped. I tried to work as fast as possible without making mistakes. That next day I had a bit more confidence and began to work faster but ultimately made a mistake. My supervisor caught my mistake and reworked that formulation to arrive at the answer he expected.

This second assignment proved challenging. Part of requirements for this task was to see subtle color differences between the grouts that contained the

different raw materials. This was something that was challenging. I struggled to discern very subtle color differences. CBP wisely changed my assignment to a different project.

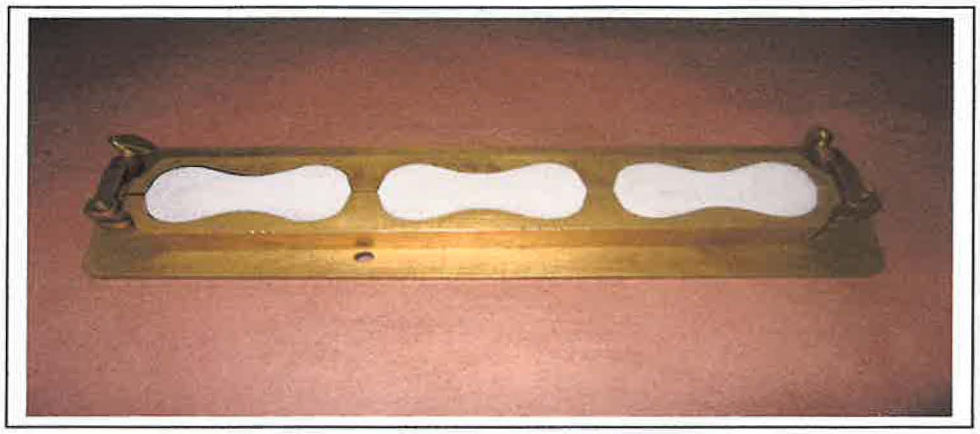
The third assignment was to work with a different technician and a Research and Development Manager to improve one specific feature within an existing product (Prism® product improvement). After discussions with the technician and the R&D manager they designed a set of experiments to test various formulations with the goal of improving shear strength of Prism®.

Willard Hotel, Washington D.C.

The tile work above was completed using grout made by Custom Building Products.

The Prism® improvement matrix involved over 38 different formulations. See **Appendix C** and the functional testing of the Prism® product is found in **Appendix D**.

The goal was to strengthen the Prism® product so it would resist breakage. To test for improvement, different formulations were prepared, mixed with water and cast into molds to achieve a specific shape and dimensions. (Shown below) The shapes were affectionately known as "dog bones."



With each trial Prism®-like formulation duplicate castings were made. Once the dog bones had dried for 12+ hours, the dried Prism®-like products were removed from their molds and labeled with a specific laboratory code number. To test for strength, the dog bones were allowed to cure for seven and 28 days. At both the seven and 28 day times, the dog bones were evaluated for strength using a destructive testing technique. To produce the most reproducible controlled testing method, the destructive technique was computer controlled. (Shown Below)

The image on the left is the dog bone sample before testing. The sample is mounted in a set of steel jaws and stretched until the dog bone breaks. The image on the right is the broken dog bone after the test was complete. During the test, as the dog bones are stretched, electronic strain gages are continuously measuring and recording the force on the sample. At the breaking point, the computer records the maximum force placed on the sample and that is considered to be the breaking or shear strength force.

By June the Prism® project had not yet been completed. Indications of follow on work suggested that even with 40 or so formulation variations the shear strength showed no appreciable increase in shear strength.

At CBP, the technicians arrive and "clock-in" to work between 6:30 and 7:00 AM. They were allowed one 15 minute morning break and another in the afternoon. Lunch was 30 minutes and employees took their lunch break at a time that was convenient with their project. Most employees brought their lunches and ate in the lunch room. The technicians "clocked-out" when their tasks were complete which could be anywhere from 3:30 to 5:00 PM. This type of work is time sensitive and once begun, it had to be completed. Therefore, breaks and lunch were fit into the workday, not vice versa.

Sample Daily Log at Custom Building Products

Day 1 – Product Testing (EasyMat® shear and peel strengths)

- Adhesion Testing (Shear and Peel strengths)
    - Received anywhere from 12 to 20 samples of coated material for adhesion testing
    - Cut 3-1"x6" and 3-1"x12" samples from each product sample.
    - Label the paper back with the appropriate lot number and test piece
    - Pre-clean the steel and copper testing panels. (to bake off all residual organic, asphalt and other contamination)

Day 2 – I recommended making a tool holder to increase panel throughput. The method of heat treating and cleaning test panels was to heat two panels to 600°C for 8 minutes. The Director of Quality and the Laboratory Manager drew a picture and had it made. Present throughput is now 10 to 12 panels to 600°C for 24 minutes.

Day 7 – Summarize data from the EasyMat evaluation

- Two suppliers – one East Coast and the other West Coast
- The West Coast Supplier delivers good material, whereas, the peel strengths from the East Coast Supplier is low and erratic.
- Entered data onto an Excel spread sheet and constructed a run chart of the average shear and peel strength values.

While at Custom Building Products I began to record specific "Professional Skills" that were necessary to be successful at this job. These observations were to:

- Follow verbal instruction
- Pay attention at ALL times to the best of your ability
- Pay attention to detail – even the smallest detail may have an effect on the outcome.
- Follow ALL safety rules –written or unwritten (specifically safety glasses and don't eat or drink in the lab or manufacturing areas)
- Be precise – consistent with each sample to be tested or measured. The method must be consistent and followed exactly each time. Erratic testing procedures will result in confusion and may cost the company money, time and reputation.
- Multitask when possible and if no project would be in jeopardy. Make the best use of your time at all times.
- Do what you're asked and do it well. Someone is always watching even if you don't realize it.
- Be flexible – situations in business are fluid. Your goal is to satisfy (meeting and exceeding) your internal (supervisor) or external customer's needs while maximizing profits so the company can grow.
- Pay attention to detail – how others view the quality of your work and your capability and value to the company.

- Always stay busy – don't have others see you goofing off or taking long breaks.
- Always look for ways to improve what YOU are doing. Tell your supervisor when you have a good idea. Get your supervisor's approval before you act on your idea. (This may require additional work. Conduct both processes concurrently. Collect data from both ways and then compare.)
- Have pride in your work. The quality of your work is a reflection on you.
- Get your supervisor's opinion and find out for certain if you are meeting their expectations.
- Always strive to be better, more accurate and more efficient at your job.
- Look for ways to better express or more clearly show your data and results.
- Learn to be computer literate. (Microsoft Office suite of products) Stay current or you'll be left behind.
- Always continue to learn. (Continuing education such as cross-training, seminars, workshops, college courses and teaching yourself.)
- Be thorough and check your work.
- Keep your work and work area neat and organized
- Complete all tasks
- Be dependable because people are depending on you and your work results.
- Stress accuracy and precision
- Become an expert at your job no matter how routine or repetitive that job is.

My volunteer experience at Custom Building Products R&D Laboratories was great. The staff was dedicated, optimistic and committed to doing their best. The laboratory environment was professional, supportive and organized. My supervisors (Juan, Carlos and Arjun) were patient, congenial and clearly communicated their expectations. One of the more impressive aspects about CBP was that questions were answered immediately. The staff really valued time. From Laboratory Assistants to Research Managers, everyone participated and was willing to do whatever was necessary to achieve the desired project outcome. This was a valuable experience, one that I will share with my students.

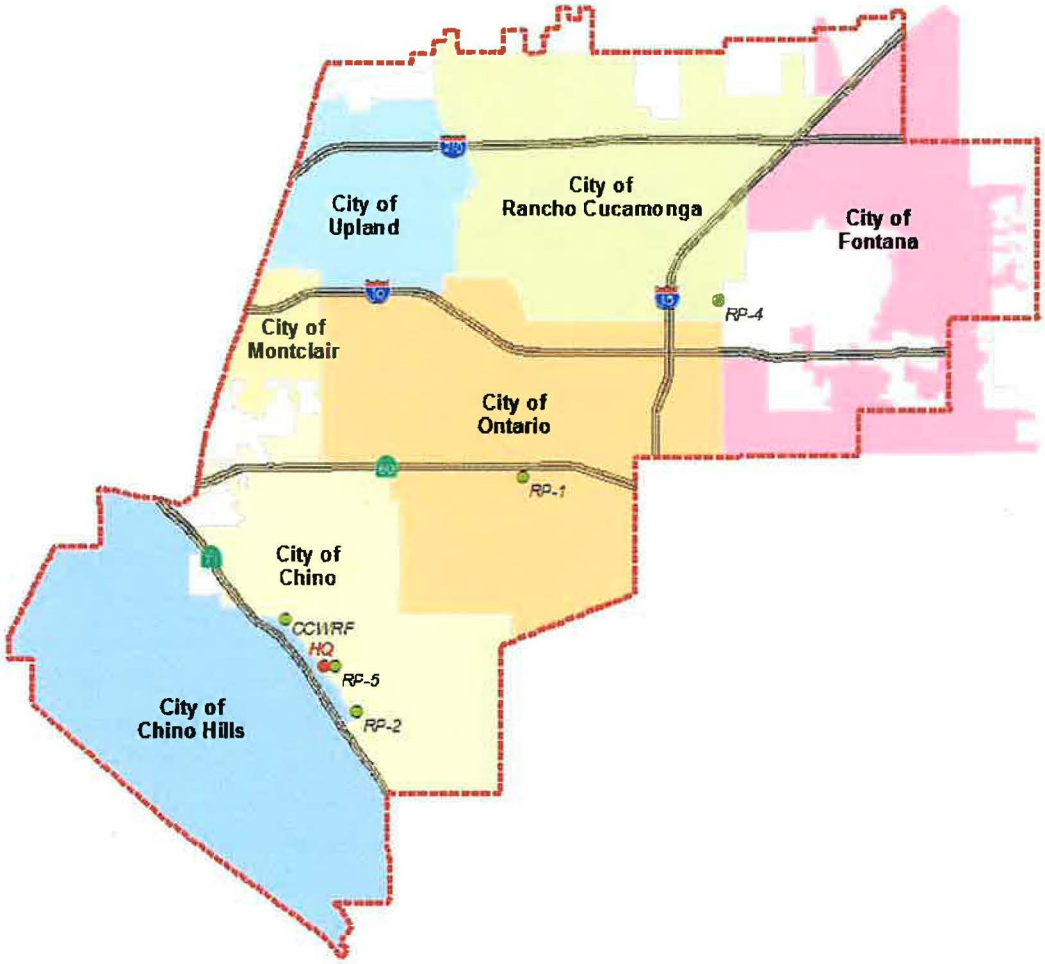
Observations that validate the statements above: Inland Empire Utility Agency

As with volunteering at CBP, being an Intern at Inland Empire Utility Agency proved to be challenging and hard work.

Many people take for granted the treatment and recycling of sewer water. In general, people are unaware that many groups of highly trained professionals are processing and cleaning waste water so it can be recycled and used again. (Federal laws, Title 22, California Code and Regulations for Drinking Water, clearly states pollutant concentration levels for drinking water and treated water) In accordance to Title 22, the professionals at IEUA are responsible for ensuring public health and safety of treated waste water.

Inland Empire Utility Agency is responsible for the collection and treatment of sewer water from a 242 square mile area of southwestern San Bernardino County. (See Map below) All of the sewer water is brought into the agency's five treatment

plants. Employed at each treatment facility are experienced technical, operational and scientific personal to insure public health in compliance with Federal and State Regulations.



The process of treating waste water, sewer water, is complicated and employs many sophisticated chemical and engineering operations. A detailed outline of waste water processing can be found on the Inland Empire Utility Agency website[4]. For brevity sake, I have summarized some of that information.

Raw sewage, from surrounding sewer systems, is received by the treatment plant and passed through screens to removal grit that could damage downstream equipment. These collected materials are then transported to a local landfill for disposal. The waste water stream then flows through a biological environment for nitrification and de-nitrification. In this process, the waste water flows through a series of tanks that contain moderate and low levels of dissolved oxygen where biological microorganisms reduce nitrogen concentrations.

The waste water then flows through different clarifying processes to further separate suspended solids from the treated water. From this point the waste water proceeds to a tertiary treatment facility where additional chemical agents and processing steps further cleanse the water. As part of the final process, the treated water is chlorinated, then de-chlorinated and then flows through a sand filter to remove suspended particulates. After filtering, the treated water from Regional Plant No.1 enters the Cucamonga Flood Control Channel. This flood control channel is a tributary to the Santa Ana River.

The solids removed from the treatment process are concentrated then processed in a "digester" to stabilize the solid materials. Once stabilized, the solids are dried and the dried materials are trucked to an agency composting site. This digestion process produces several byproduct gases that are contained (reducing odors) and collected. Some of the collected gas is methane, natural gas, which is used to produce electricity. About half of the facility's electricity requirements are produced from these gases.

Regional Plant No.1 (RP-1) is highly dependent upon computer controlled processing equipment. A state-of-the-art computer system provides control for various plant equipment and operations, such as the oxygen reduction potential system. Plant operations must be tightly controlled in order to effectively treat and discharge several million gallons of treated water per day.

Samples from various locations within RP-1 and the other treatment plants were collected by trained process technicians and delivered to the Ontario facility. At the start of the day the samples from RP-1 were already in the lab. Samples from the other facilities arrived at about 9:00 AM. All of the samples delivered required a variety of chemical and physical tests. To satisfy "chain of custody" requirements and all governmental agency requirements, the results from each analysis were logged into a central computer at the end of each day.

Laboratory test results are a clear indicator of how efficiently the waste water treatment process is operating at each specific location within the facility. Plant operators depend upon timely and accurate laboratory results as a guide or measure to confirm plant treatment operations and efficiencies of each treatment unit. Since the materials contained in the waste water streams vary on a daily basis, continuous monitoring, accurate and timely analysis are required to make the appropriate adjustments that are essential to discharge treated water that meets Federal Standards.

My first laboratory assignment was to prepare water samples for two different automatic computer controlled Total Organic Carbon (TOC) analyzers. Six or more half to one-gallon samples were delivered each morning from multiple sites within the facility. Generally, the samples consisted of an Inflow (incoming water), Primary Effluent (water after primary separation), three samples from the aeration basins (digestion), Secondary Effluent and two or more additional samples. Often additional industrial based samples were sampled, analyzed and reported.

Most of the liquid samples were obtained from the same location on different days. However, Monday and Wednesdays there were more samples to analyze than Tuesday and Thursdays. Once all the samples had been prepared for TOC analysis, somewhere between thirty and sixty samples, the analyzers began the computer controlled analysis process. At the end of each analysis set, the computer stored results were down loaded to the central computer.

Often specific samples required grinding with an industrial strength kitchen blender to homogenize the water solution before testing. To protect the small piping and tubing in the TOC analyzers from becoming plugged up, larger particles were physically removed. For me, sample set up time ranged from three to seven hours depending upon how many samples were to be analyzed and which of the two instruments were being operated.

My second and last assignment, an essential laboratory test, was solids analysis. Solids analysis is an important metric used to access the efficiency of plant operations. It determines the quantity of suspended solids at each location within the plant. At certain locations concentrations of suspended solids should be low. If this value were high, it is possible the lab made an error or the treatment process was not operating at peak efficiency. Solids analysis includes total suspended solids and inorganic solids, the material that does not burn.

To do a good job in solids analysis the technician must be fast, accurate and save time by multitasking. Multitasking requires that the technician pay attention at all times. (On a few occasions my mind wondered causing me to be unsure of exactly what I did. Rather than taking the risk of producing bad data, I would repeat the entire test.) Mixing up samples or sample locations could cause different solids value results that could mislead plant operators that were controlling plant operations. On the surface this assignment appeared easy, but it was not.

Part of solids analysis was the analysis of sludge. As I began my first sludge analysis, my supervisor reminded me that sludge was not the solid material that goes down the toilet. Sludge was the result of bubbling air through treated waste water. Even so, it didn't smell pleasant. Determining the amount of solids and water contained in the sludge was important to efficient plant operations.

Occasionally, other samples would arrive for solids analysis. Some samples originated from food processing plants and other industrial sites. Either way, the same tests routinely done on sludge was done on these samples.

Both of my IEUA assignments required me to stand the entire day. Other than using the bathroom and lunch, I usually did not take breaks. However, when someone would bring in a homemade dessert, I made sure to take a break.

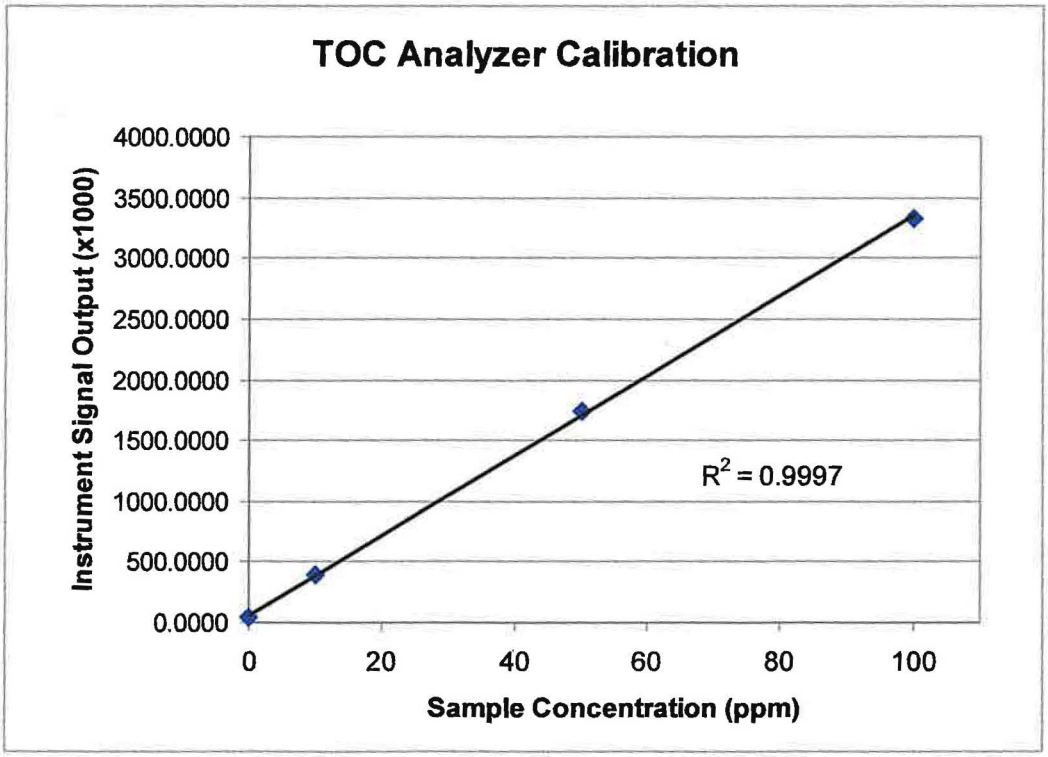
Both assignments required adhering to all safety procedures, attention to detail, and following sample protocol, exactly. I had to pay attention all the time. I tried not to chit chat so I would not be distracted.

To decrease the repetitive nature of these analyses, technicians were rotated to a different assignment stations about every three months. This allowed each technician to stay focused. Rotation, also, insured that all technicians were trained in all the analysis procedures in the laboratory. This cross training provided technical back-up if someone were out ill or on vacation. Since waste water treatment is a seven day operation, technicians rotated on weekends.

The IEUA laboratories began operation at 6:00 AM. Most laboratory staff arrived ready to work between 6:30 and 7:00. Depending on the schedule, quitting times were between 3:00 and 4:30. The laboratory staff was allowed to take breaks

when time permitted. Lunch was between 30 and 45 minutes and on the honor system.

Near the end of my assignment at IEUA, I had the opportunity to set-up an instrumentation calibration test on one of the total organic carbon (TOC) analyzers. In the lab the technicians had a cardboard Burger King crown with the number 0.9999 written on the front. This 0.9999 represents the correlation coefficient received when an instrument calibration is done exceptionally well. (The closer to 1.0000 the better) Technicians that calibrate instruments to 0.9999 get to wear the crown. I really wanted to wear the crown. I tried my best to calibrate the instrument and received a correlation coefficient of 0.9997. Even though I did not get to wear the crown I was pleased with my accuracy. (The results of my calibration test are shown below.)



Sample Daily Log at Inland Empire Utility Agency, RP-1

Day 1: New Employee Orientation

Computer learning and training modules on various workplace issues.

Computer guided Study Lessons

- Disaster Preparedness
- Water Industry Driving Safety
- General Ergonomics
- General First Aid
- Water Industry Lab Safety
- Office Safety
- Water Industry Personal Protective Equipment
- Sexual Harassment

A short quiz was given at the end of each section. (Passing was 70% on each quiz)

Day 2: Observed Kevin Tang prepare (simpler) samples for Total Organic Carbon (TOC) analysis. (High and low level instruments)

- Transferred samples to a TOC auto sampler for analysis at a later time.
- Assisted with data input of TOC results into the Laboratory Information Management (computer) System (LIMS).
- Observed final testing of samples for Biological Oxygen Demand (BOD) using a dissolved oxygen meter.

Day 3: With Kevin Tang and Jen Huber as my supervisors, continued preparing sample for Total Organic Carbon (TOC) analysis.

Samples were prepared for two different methods, (high and low TOC concentrations) from samples at various locations within the plant and from different plant facilities within the Agency.

Observed, for a second time, Dissolved Oxygen probe calibration for Biological Oxygen Demand (BOD)

Day 4: Phoenix samples were neat (straight) (visibly inspect and remove any particles)

Spiked RP-1 Samples were prepared by diluting 25.0mL of sample with 250µL of the Laboratory Control Standard (LCS) then fill to the 50.0mL mark with "Nano" water.

A Laboratory made Control Standard was also run. To prepare control samples use an Eppendorf, pipet to transfer 250µL of LCS into a 50mL dilution tube and dilute to 50.0mL

For further calibration purposes, another standard is run using 500µL (2X250µL) of a purchased Quality Control Standard (QCS) and is prepared by using fill to the 50.0mL mark with "Nano" water.

My overall impression of the Inland Empire Utility Agency laboratory at RP-1 was fantastic. The people were bright, optimistic, serious about their work, and they

understood the consequences for poor analysis. The laboratory environment was professional, supportive and organized in an efficient design. My direct supervisors (Kevin and Jen) were patient, clearly share their expectations and would jump in if I got into a jam. All of the lab workers that I worked with were organized, dependable and dedicated to doing their best to meet or beat the standards of their particular job function. All the lab workers showed excellent lab technique and worked safely in all their dealings with sample materials.

As an instructor, I teach students about precision and accuracy. At the RP-1 laboratory they live by precision and accuracy. I felt fortunate to have worked with the laboratory staff at Inland Empire Utility Agency. I will never forget this experience and the first hand knowledge I gained.

Section Three

Professional Skills

Professional Skills

Part One – Background, Chemical Laboratory Technician Advisory Committee

About three years ago, at our Chemical Laboratory Technology Advisory Committee Meeting, one of our Industrial members stated that if they found a candidate that had good professional skills and lacked some of the required technical skills; they would hire that person and train them in the technical areas. This statement was quite telling. As educators we train students in the technical areas with little emphasis on the "softer" professional skills. If educators were requested to teach students professional skills, most educators would feel unqualified to teach in areas outside their discipline.

At a different Advisory Committee Meeting, another member stated that more employees are terminated for unprofessional behavior than for lack of technical expertise. Usually employees with extreme cases of unprofessional behavior are terminated, fired, whereas, minor cases are recommended for further training. American business moves fast, requires employees that are flexible, have good communications skills and work well in a team environment under pressure.

By the time employees have passed their probationary periods, companies prefer to retrain their employees than to terminate them. During the employee's annual performance reviews, both technical and professional skill deficiencies are discussed and documented. (More serious deficiencies are usually discussed on an as-needed basis.) For professional areas that require minor improvement,

managers will outline improvement plans that include specific measureable goals and milestones dates for progress reviews.

Many business continuing education programs are available that teach Time Management, Professional Organization, Interpersonal Communications, Teamwork and Teambuilding, Conflict Resolution. Interestingly, these are the very areas that employers say their employees need additional education and training. These are the foundational characteristics that form most professional skills.

Part Two – Essential Professional Skills

Results from our Industrial members of the Chemical Laboratory Technician Advisory Committee listed the following Professional Skills as essential to successful workplace performance[1]. Employers were looking for candidates that have:

- Organizational Skills
- Integrity and Character
- Dependability and Personal Responsibility
- Communication Skills: both Written, Verbal and Computer
- A Positive Attitude – A "Can-Do" Spirit
- A Productive Team Member – works well with others
- Problem Solving Abilities – not just from books
- Initiative (Self Motivation – Self Starter) and show it

Chemical and Engineering News, a weekly magazine by The American Chemical Society[2,3] lists the more important professional skills for laboratory professionals as follows:

- Communication Skills
- Leadership and Teamwork Skills
- Problem Solving Abilities
- Flexibility and Creativity
- Initiative and Follow-through
- Interpersonal Skills
- Computer Literacy
- Business Orientation

Surprisingly the professional skills list from our Advisory Committee and that of the American Chemical Society are quite similar. The importance of professional skills can not be emphasized enough. Shortcomings in any of the above skill areas may jeopardize, or at the least limit, an employee's future. Employees lacking professional skills run the risk of limited future earning potential, future promotions and if sever enough become detrimental to job security.

Professional Skills Survey: Educator & Employer Responses

Skill Competency Survey

Rather than build a new skills set survey, that would be suspect to scrutiny, I was given permission to modify and existing American Chemical Society Skill Set Standards survey. The construction of this existing American Chemical Society Skill Set Standards survey was supported by the National Science Foundation (DUE-0053250 at a cost of $1,260,300.00) and has been successfully used for the past eight years. The title of the survey is Chemical Technician Skills Standards. (http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_SUPERARTICLE&node_id=1195&use_sec=false&sec_url_var=region1&__uuid=0ccaaf7a-2b54-4f19-bf21-582e954da9f3) This survey was developed using input from over 1,000 technicians, supervisors, and managers that ultimately defined in what was to be called the ***ChemTechStandards***.

This modified survey consists of four major blocks of questions all dealing with professional skills in a chemical laboratory. Each question block contains several question sub-blocks within that specific area. (The numbers within the parenthesis indicate the number of questions within each sub-block) Each individual question targets a specific skill area.

Workplace Skills for Success – total of nine questions

Working as a Team Member (3)

Problem Solving (6)

Quality in the Chemical Laboratory – total of nine questions

Concepts of Total Quality Management (9)

Communications for the Chemical Technician – total of 36 questions

Maintaining a Laboratory Notebook (4)

Communicating Results (19)

Gathering Information (13)

Maintaining a Safe and Clean Laboratory Adhering to Environmental/Health and Safety Regulations – total of 55 questions

Overview of the Impact of Federal, State, Local and Company Regulations (14)

The Technicians Role in Implementing Regulations, Polices and Practices (11)

Developing and Executing a Safety Plan (10)

Personal and Coworker Safety (11)

Fire Safety (9)

This modified Skill Set survey contains 109 questions dealing with professional skills in a scientific laboratory.

With each question there are three possible answer choices. These answers are, ***Mastery (3 pts)*** or ***Basic (1 pt)*** or ***Not Included (0 pts)***. Associated with each question is an area where comments can be posted. At first glance, the size of the survey appears a bit overwhelming. However, most respondents will need about 30 minutes to complete the survey which includes creating a User Profile.

Before beginning the survey, each respondent must complete a small "profile". The profile allows me to view the results of each person and track if that respondent was an educator or an industrial employer. At the conclusion of the survey, the average numerical scores for all educator responses were compared against the average numerical scores for all the employer responses. The eight questions with the greatest differences will be analyzed and discussed.

A complete list of the survey questions, the response averages for each question by both the industrial employers and educators and the numerical GAP number between the two average values (industrial and educators) can be found in **Appendix A**.

Survey Response Analysis

The survey was forwarded to seven Mt SAC chemistry faculty and ten industrial employers. (Encouraging people to complete this survey was an exercise in follow-up skills.)

Special attention should be paid to skill areas where industry respondents rate the importance higher than educators. This difference indicates a greater industry need for those skills and indicates that our program should increase emphasis in those areas to increase the employability or our graduates. Areas where educators rate the importance of a skill higher than industry respondents may indicate that too much educational emphasis is being placed on that specific skill for technician graduates. This type of difference is an indication that industry professionals do not consider that skill as important for employment. As educators, the importance of any skill should be balanced with respect to our technician program and those students desiring course transferability to a 4-year College or University.

In reviewing the industry responses, I found that larger publically held companies and Government Agencies routinely provided in-house safety training for all laboratory employees. In these businesses new employees are required to undergo Health and Safety training as part of their initial new employee orientation process. The initial portion of new employee orientation is routinely completed before the new lab employee begins work in the lab.

For example, before I began working at Inland Empire Utility Agency, I was required to complete one full day of new employee orientation and training. New employee orientation included reading training modules and passing quizzes, with a 70% or better. Theses computer training modules specifically targeted workplace and chemical laboratory issues. Some of the modules included in the new employee orientation were Disaster Preparedness, General First Aid, Water Industry Laboratory Safety and Personal Protective Equipment.

Three of the industry and Governmental Agency respondents stated that training in the areas of "Maintaining a safe and clean laboratory adhering to environmental/health and safety regulations" (LE5) was not essential because these businesses train their own employees in their specific industry. For insurance and loss prevention reasons, each facility/business is required to routinely train, and document that training in the areas of Safety and Health Regulations.

Regarding the questions on the Overview of the impact of Federal, State, Local and company regulations (LE5), industry respondents commented that, "These (health and safety) issues need to be taught and verified by the employer". They also commented that (health and safety) "Part of employee non-technical training. Records are kept by employer." With respect to health and safety training, the industrial respondents thought this knowledge would be beneficial but not required for an entry-level applicant.

Survey Results

At first glance, there was general agreement between the educators that teach the Laboratory Technician courses and the industrial respondents. However, there were a few areas where the industrial respondents responded stronger than the educators. And, there were several areas where educators felt stronger about teaching a skill than deemed necessary by potential employers. (The majority of these areas dealt with skills necessary for transferability to four-year schools.)

Below are the area/questions where educator and industry respondents showed the greatest disparity or difference in average scores. There were several skill areas where there was a noticeable difference in response ranking.

Areas Educators Thought Were More Important Than Industrial Employers

(The bolded number is the difference or GAP between the scores. A difference of 3.0 is the greatest possible GAP.)

LE4.03.10 Demonstrate the ability to access database information. **1.62**

LE5.05.01 Explain the importance of reporting even small fires that can be extinguished quickly. **1.5**

LE4.02.12 Demonstrate the ability to maintain a laboratory log. **1.38**

LE4.02.13 Demonstrate the ability to give oral presentations. **1.25**

LE4.02.02 Identify the components of a good oral report. **1.25**

LE5.04.05 Demonstrate the appropriate use of safety equipment including, but not limited to safety glasses, showers, respirators, eye washes, and blankets. **1.25**

Areas Industrial Employers Thought Were More Important Than Educators

(The bolded number is the difference or GAP between the scores. A difference of 3.0 is the greatest possible GAP.)

LE4.02.08 Demonstrate the ability to write clear and concise letters and memos. **1.38**

LE4.03.07 Identify technical manuals and journals that related to research. **0.75**

LE5.02.09 Demonstrate the ability to convert chemical concentrations to different units so that comparison can be made with MSDS safe levels. **0.62**

LE2.01.03 Demonstrate high ethical standards in all aspects of work. **0.5**

LE2.02.01 Demonstrate critical thinking skills. **0.5**

LE5.04.01 Demonstrate good housekeeping by maintaining a clean and safe workplace. **0.5**

Summary of Results

Overall, there was consistent agreement among all educator and industry responses on 90% of the survey questions. This result validated our Chemistry Program and our Laboratory Technician Program supporting the fact that our department is teaching the skills desired by industrial employers. In other words, industrial employers found the skill levels taught at Mt SAC were consistent with their specific entry-level employee expectations. However, the average educator scores were consistently, slightly, higher than industry employer ratings. This result suggested that Mt SAC chemistry faculty were teaching those skills to a slightly higher level. This observation was consistent with educators preparing students for transfer to four-year colleges and universities. Because all Laboratory Technician program students take most of the same transferable chemistry coursework, it should not be surprising that educators would teach to a higher level.

The following professional skill areas show the greatest difference between educators teaching to a higher level than industry needs. The following six areas are shown to have the greatest difference to the least difference in ability to:

1. Demonstrate the ability to access database information.
2. Explain the importance of reporting even small fires that can be extinguished quickly.
3. Demonstrate the ability to maintain a laboratory log.
4. Demonstrate the ability to give oral presentations.
5. Identify the components of a good oral report.

6. Demonstrate the appropriate use of safety equipment including, but not limited to safety glasses, showers, respirators, eye washes, and blankets.

Of the 109 questions, there were only seven question areas where industry skill levels requirements averaged higher than those taught by educators. There was one glaringly large difference between industry desires and educator emphasis. That was being able to write clearly. All other topic areas were closely matched with industry desiring slightly higher skill capability than educators taught.

The areas where industry expectations requested higher level skills levels than being educationally taught were skills which:

1. Demonstrate the ability to write clear and concise letters and memos.
2. Identify technical manuals and journals that related to research.
3. Demonstrate the ability to convert chemical concentrations to different units so that comparison can be made with MSDS safe levels.
4. Demonstrate high ethical standards in all aspects of work.
5. Demonstrate critical thinking skills.
6. Demonstrate good housekeeping by maintaining a clean and safe workplace.

When I proposed this sabbatical project my goal was to construct two, 2 to 3 hour learning modules that could be utilized in either a lecture or a laboratory setting. However, after the completion of two different laboratory assignments, surveys of our Advisory Committee and this professional skills survey, I came to believe that a short term learning module approach may not be the best approach to teach professional skills. Short training modules provide a brief introduction; not long enough to make and sustain professional skills into normal work habits.

From my own experiences, both industrially and as an educator, I believe longer duration project based learning modules would provide a better means for teaching, practicing and assimilating professional skills in students.

Section Four

Project Based Experiences

Project Based Experiences

From this sabbatical experience, I found that the eight point Professional Skills list offered by both our Advisor Committee and the American Chemical Society was by no means complete. If anything, the eight point list should be considered as a general overview for professional skills. As listed in the sample Daily Diary section, employers expect employees to have the skills from the eight point list and many more.

With unemployment rising, securing a professional entry-level position is difficult and will become even more competitive. For recent graduates, with little to no scientific laboratory experience, being familiar with Professional Skills is not sufficient to attract a potential employer's attention. Recent graduates that can demonstrate professional skills are more likely to land that first position. Graduates with Internship experience and project based experiences that put professional skills into practice, have the best chance at securing an entry-level position.

According to our Advisory Committee the most valued experience an entry-level candidate can have is internship experience. Internship experience (Work Experience CHMT 9) is required for graduation. However, the reality is that not all students, for one reason or another, are capable of securing or being successful in an internship position. Students that have internship experience but lack professional skills will still have difficulties getting hired and satisfying their employer expectations. I contend that project based laboratory activities that allow students

to take ownership, gain a clear understanding of their project and have an opportunity to practice professional skills will be better prepared to enter and succeed in the workforce.

Employers expect all employees, interns included, to be able to work safely and to demonstrate good laboratory practices. Project based learning modules offer an opportunity to practice laboratory safety, good laboratory practices and the professional skills employers expect. Projects also allow students more time to gain experience and to perfect the skills necessary to be successful in a working laboratory.

I believe two different "project based learning modules" can be constructed and incorporated into the existing Introduction to Chemical Laboratory Technology (CHMT 1) course. My professional and sabbatical experiences working at private and governmental laboratories have taught me that "project based learning modules" can be constructed with current equipment and instrumentation already available at the college. To accomplish this I propose the following two learning module activities. The first activity would be the weekly collecting physical data, sampling and analyzing for selected chemical compounds found in stream and pond waters within the Mt San Antonio College Wildlife Sanctuary. The second activity would be conducting ongoing studies of viscosity, the "thickness of a liquid", with commercially obtained samples or with fresh and spent motor oils collected from the Mt. San Antonio College Transportation Department.

In some respects the proposed "project based learning modules" are a hybrid of traditional chemical laboratory experiments and Chemistry 99, Special Projects in Chemistry. Traditional chemical laboratory experiments require 2 to 6 hours of actual lab time to complete. These traditional experiments are structured, controlled and with a specific goal or expected result. With very little practice time to perfect a technique; students would be graded on accuracy and precision. In the 2-unit Chemistry 99, "Special Projects in Chemistry", students invest six to eight hours per week for an entire semester, usually, on one project. If the project was technique based, students have the opportunity and time to develop their skills and to gain confidence as their project progresses. Often times in "Special Projects in Chemistry" the outcomes were unknown, the students and instructor would learn together. As instructors, the goal of any course would be to provide the opportunity for students to gain a deeper understanding of a specific learning activity. I believe a hybrid approach of the traditional and the Special Project courses could be created into a "project based learning module". It is my hope that these learning modules would provide students the opportunity to gain technical experience and to apply the professional skills necessary to be successful in the workplace.

The two proposed "project based learning modules" would incorporate the following opportunities to build professional skills. Each learning module would be designed to provide:

- scientific project based experiences that teach project ownership and pride in accomplishment
- sufficient time for students to understand their project
- sufficient practice for students to master a specific laboratory technique
- team based experiences with a set time duration goal
- repeated use of equipment that would provide confidence and experience
- data documentation and data archiving using Excel
- organization building and personal management skills through handling and analyzing multiple samples and results
- opportunities to practice communication skills by conducting an oral, seminar style, presentation.
- opportunities to work independently
- seeing a project form the beginning to completion
- working on a team to reach a common goal

Project Based Learning Module - Activity One

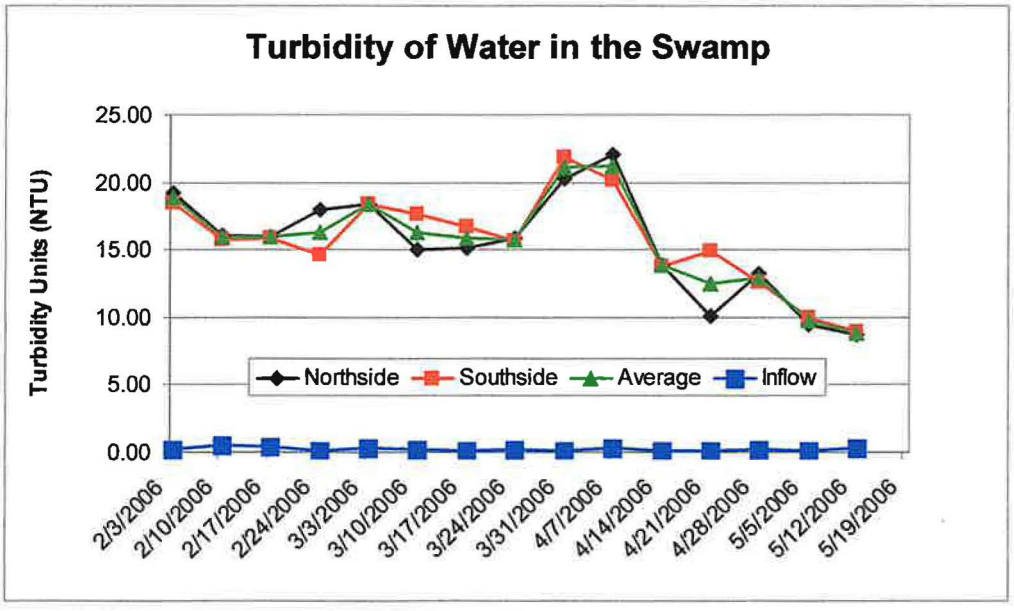
The campus has a wonderful Wildlife Sanctuary that contains three bodies of water, a pond, a lake and swamp, and a stream that is the head water for Snow Creek. With students interested in ecology, biology and the environment, the sanctuary offers an opportunity to monitor the physical and chemical properties of these bodies of water. Water analysis would include sampling these water sources in the Wildlife Sanctuary; it could, also, be expanded to other water sources on campus.

I propose that each team of students collect water samples from their respective sample sites (three to five sites per team) on a weekly basis. As with a government laboratory, students would be required to maintain a basic "Chain of Custody" and employ standard data collection and storage techniques. These techniques would include sample "log-in" with collection dates, times, sample conditions and any other observation that may affect the condition of the sample. Returning to the laboratory, teams of two or three students would be required to analyze their samples, complete a Results Log and enter their data onto a spreadsheet. These laboratory tests would include, but not be limited to, tests for water acidity, dissolved oxygen, turbidity, temperature and a few chemical and instrumental tests to determine concentrations of selected soluble ions. All sampling and testing would have no additional cost to the college because the Department of Chemistry already has both the equipment and instrumentation to conduct the tests described.

Before students would be allowed to analyze water samples, they would be trained and become competent in all the test methods used with this project. This would include training and practice with several pieces of laboratory instrumentation. Before collecting actual water samples, students would be required to calibrate each unit using known concentration of specific species dissolved in sample water. Once all the instruments had been calibrated and students had been trained on the proper use of each instrument, the actual test samples would be collected and analyzed.

Will this learning module work? Can this module be integrated into a classroom laboratory? The answer to both questions is, "Yes!" This specific project based learning module, in a different format has already been tested and many of the expected "bugs" have already been worked out. Beginning in spring 2006 through summer 2007 several students were involved in a Chemistry 99 Water Analysis project that closely modeled the proposed activity one[5-9].

For example, the chart below, Turbidity of Water in the Swamp, was completed by a student that worked on this project during spring 2006. The black diamonds and the red squares represent water turbidity results sampled from two different locations in the sanctuary swamp. The blue squares are turbidity results measured from the supply water feeding the swamp. This chart represents one of many different types of analysis that could be conducted from the proposed learning module.



The basic elements used in previous Chem 99 projects would be incorporated into this "project based learning module" - Activity One. Granted, working with three to five students is much different than working with 15 to 20 students. However, utilizing multiple sample sites and multiple testing instruments, all students could have their piece in this project.

As with both professional laboratories, all collected information would be entered onto data forms and tables specifically designed for that project. Utilizing standardized tables or log sheets adds uniformity to the data collection process and insures that all samples are analyzed at the same time. Filling in all the areas insures that all water samples are collected. Using data tables also reduces the possibility of random errors or forgetting something.

For the "project based learning module" I would propose that a log sheet, such as the one shown below, be used to assist students working on Learning Module - Activity One. A log sheet similar to the one below could be modified to whatever water testing site that was chosen. Each student team would have their own binder containing their specific log sheets specific to their project. Students would use their log sheet for the duration of their project. At the end of each project, all data log sheets and the final report would be collected archived.

		Wildlife Sanctuary Data Collection Table							
			Air Temp ©					Date:	
			Weather					Time:	
Sample Location	**H_2O Temp**	**DO (%)**	**Turb. (NTU)**	**Stds.**	**Cl- (ppm)**	**Stds.**	**Nitrate (ppm)**	**pH (acidity)**	**Stds.**
North Swamp									
South Swamp									
Ave. Swamp Cond.									
Supply Water									
Upper Stream									
Snow Creek									
Lake Supply Water									
North Lake									
East Lake									
South Lake									
Standards									
Comments									

I propose to conduct this Learning Module in the spring 09 CHMT 1, Introduction to Chemical Laboratory Technology Course. A smaller "trial version", about six weeks in duration, would be incorporated into the laboratory schedule. To assess the learning value of this module, a pre-quiz will be given to assess students understanding of professional skills necessary in working on team projects. At the conclusion of this module, a post-quiz, identical to the first, would assess what professional skills used and what were gained by working on this project. The differences between the two quizzes should correspond to the degree of learning each student gained from this learning module. Ranking the differences of the pre and post-quiz results should provide which specific professional skills saw the greatest change.

Project Based Learning Module - Activity Two

Viscosity is a physical property found in all liquids. In general terms viscosity is the resistance of a liquid to flow, or its "thickness". Viscosity can be thought of as a measure of the internal friction, between liquid molecules. Water would be considered "thin" with a viscosity of 0.894 cP at 25°C, whereas, maple syrup would be considered "thicker" with a higher viscosity of ~3200 cP at 25°C. (The unit "cP" is an abbreviation for centiPoise, the common unit used to describe viscosity.) Viscosity is one of those testing methods that is relatively unseen. But when a product of specific consistent viscosity suddenly shows large variability, product quality is called into question.

Viscosity measurements are routinely used in industries that deal with food (peanut butter, molasses and cooking oils), lubricating oils (machines, engine and others), personal care industry (hand creams, shampoo and liquid soaps) and many others. Testing viscosity is straight forward, reasonably reproducible and can be learned in as little as four hours.

The Chemistry Department has two Scientific Rotational Viscometers. Each of the units have 84 different range settings allowing versatility in testing a wide variety of liquids from motor oils to ice cream or yogurt. These units like the equipment for the water analysis, were

purchased with grant funds from the National Science Foundation, Advanced Technology Education, for the Chemical Laboratory Technician program.

Before students begin to collect viscosity data, each Viscometer unit must be calibrated versus manufacturer's standard viscosity solutions. The department already has two different standards that can be easily used and tested. If additional standards are desired, there are standard solutions that students can prepare. Since each viscometer is programmable, students will find them easy to operate and understand.

The time required to measure the viscosity of a typical fluid varies from three to six minutes per sample. The Viscometers are flexible and the pre-programmed setting ranges easy to change. With the two Viscometers at least four different student groups can use these two units efficiently with little wait time.

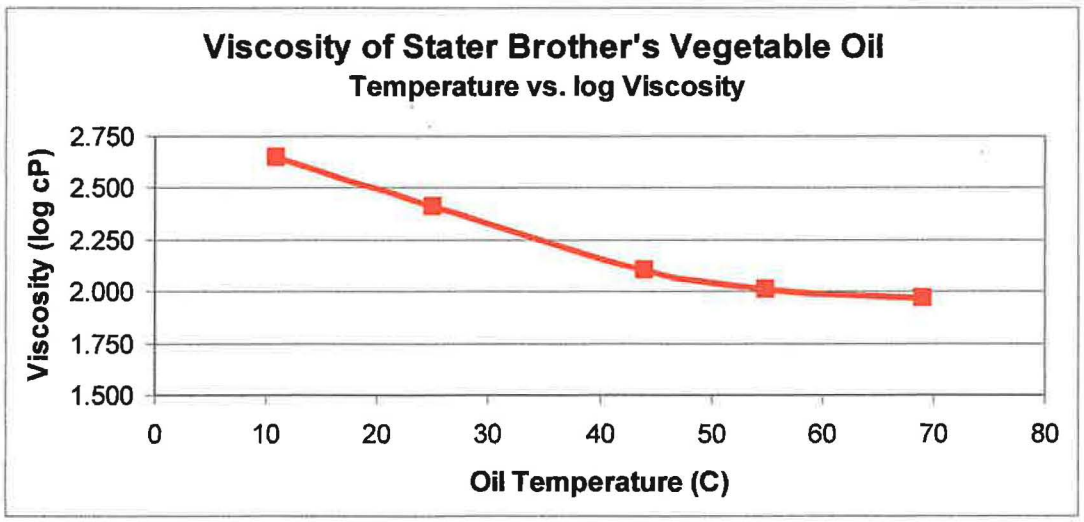
For specific projects, student groups could study the temperature effects on single grade and multi-grade motor oils[10]; solution viscosity versus percent polymer concentration dissolved in solutions, the viscosity of various cooking oils (corn, peanut, canola, etc.); or to measure the variability in viscosity within a product, as a function of different manufacturer lot numbers. Alternating between various oils one semester and personal care products the other semester should provide variety to the program.

Preliminary viscometry work has been completed by a previous Chem 99 student[11]. One of the possible Project Based Learning Modules may build upon and expand on this earlier work. This original work involved evaluating the viscosity behavior of Stater Brother's vegetable oil at different temperatures. The goal was to determine the change in vegetable oil viscosity as a function of increased temperature. The data, in the table below, clearly shows when the vegetable oil was colder, the viscosity (thickness) increases. The table, also, clearly shows that at elevated temperatures the oil viscosity decreases.

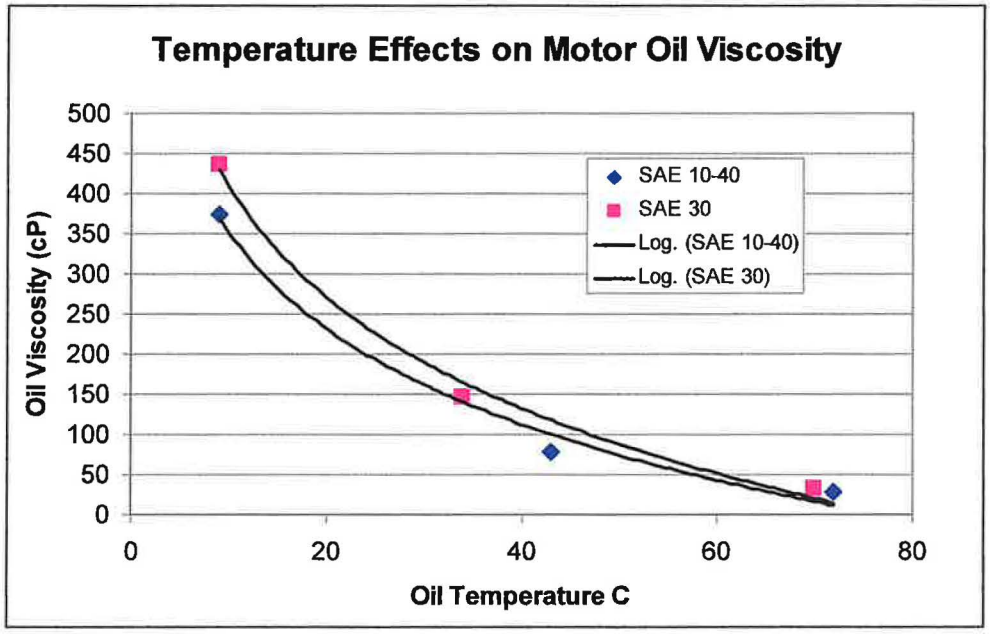
Stater Brothers Vegetable Oil

Temp(C')	cP(viscosity)	log cP	ln cP	Spindal Rpm
11	443	2.646	6.094	50
25	256	2.408	5.545	60
44	126	2.100	4.836	100
55	103	2.013	4.635	100
69	92	1.964	4.522	200

The following chart was prepared from the data in the table above. The "Y-axis" was represents the log base 10 viscosity while the "X-axis" represents the oil temperature in centigrade.



In a similar project, this same student[11] measured the viscosity of two different motor oils are various temperatures. His results are shown below. Note that the viscosity curve for the multi-grade oil (SAE 10-40) shows slightly less drop in viscosity at elevated temperatures. The multi-grade oil has a lower viscosity is slightly less viscous at low temperatures and similar to the single-weight (SAE 30) at higher temperatures.



Adapting this activity to a project based learning module, students could expand the temperature range and obtain a clearer picture of the viscosity change with respect to temperature. Measuring temperatures below freezing (0°C) and well above 100°C should accentuate the viscosity differences between both motor oils. The addition of several more multi-grade oils would provide a more complete picture of motor oil viscosity as a function of oil temperature.

Section Five

Conclusions

Conclusions

This sabbatical project, Learning Modules to Teach Professional Skills, was initiated partially in response to comments made by our Advisory Committee. This committee consists of professional educators, business persons and scientific laboratory personnel. Most of our committee members are cautiously optimistic, hard working, people that from years of experience have become pragmatic. All of them are easy to talk to and work with; however, I was disheartened to hear one industrial committee member state emphatically that if an employee wasn't taught these skills as a child at home, they would never learn them. In my heart, I believe if a person has a desire to learn, they will, and they will succeed. It would be a shame to conclude that the inadequacies of a family would professionally handicap a person, denying them the opportunity to strive toward their highest employment potential now and for the rest of their life.

To encourage students to learn professional skills would be very challenging. However, if professional skills were learned through Project Based Learning Modules the learning process becomes more palatable for both the student and the instructor. If the classroom atmosphere were built on a "role play" model of a professional laboratory, the learning professional skills may even become fun. The intent is to practice professional skills in a project based format, one that students would receive positive feedback in a safe environment.

The goal for both these Learning Modules was to build professional skills through working as a team member toward a common goal. The following list of professional skills are those emphasized by our Advisory Committee, the American Chemical Society and the actual working attributes learned on my sabbatical at Custom Building Products and Inland Empire Utility Agency.

Organizational skills

Collecting samples for analysis

Completing and maintaining the log sheets

Archiving historical data and records

Housekeeping around the student's lab work area

Integrity and Character

Grading based on correctly completing the process not the "right answer". (Offers an opportunity to address precision and accuracy)

Reporting "odd" results that were replicated and verified is valued above "fudging" numbers to fit a preconceived assumption

Dependability and Personal Responsibility

The team project involves and depends on student members

Arriving to class on-time

Follow through with projects and commitments

Follow all laboratory safety rules

Communication Skills: both Written, Verbal and Computer

Presentation, PowerPoint final oral report

Written final report

Excel would be used to store all data

Interpersonal communication within the team

Team decisions – consensus

A Positive Attitude – A "Can-Do" Spirit

A Productive Team Member – works well with others

Retain the same team members throughout the entire project

The overall quality of your work depends upon your team members

Problem Solving Abilities – not just from books

Practical problem solving

Open ended project

Initiative (Self Motivation – Self Starter) and show it

Each module would last several weeks

Minimal reminding students what they should do

Do your best at all times with everything you do

Benefit to the Community

Building positive relationships with our community businesses is exceedingly important. It is valuable to be a good neighbor but good community relations are essential when a college is requesting bond money. When an instructor wants to volunteer and work as a technician, the community gains in two ways. First the instructor provides free labor which is always a good thing. Secondly, I believe that businesses appreciate the college taking an interest and they appreciate the college teaching skills important to their business.

Benefit to the College and the Department of Chemistry

This sabbatical project was completed to fulfill several goals necessary to strengthen our Chemical Laboratory Technician program. This project has increased my understanding of a working scientific laboratory which should compliment the strengths and experiences of our chemistry faculty. This experience has also afforded me the opportunities to further strengthen Advisory Committee relationships and to build connections for students to begin Internship assignments.

Benefit to the Instructor

This sabbatical experience has been beneficial in that I have a clearer understanding of what types of professional skills employers expect from entry-level employees. Having volunteered/interned at two different businesses has provided me additional knowledge of a professional laboratory environment and credibility

with our students. This sabbatical project has also provided me the opportunity to further strengthen my relationships with two of our Advisory Committee members.

Benefit to the Students

I believe students that participate in these project based learning modules will learn professional skills, and those skills will be continually be reinforced through team based project activities. If students become fully engaged in the program, they will be able to implement these skills into their everyday work habits. Entry-level employees that understand the importance of professional skills and use those skills in the workplace will make a positive contribution to their organization. Being able to contribute to the organization is exceedingly important, especially in challenging economic times. Hopefully, employers will be so impressed with our graduates that they would want to contribute to our program, become an Advisory Committee member and seek to hire our graduates.

Appendix A

Workplace Skills GAP Analysis (Survey Results)

The information tables shown below are the Educators average responses and the Industry average responses to specific skills. The far right column is the absolute value difference between the two survey groups. The greater the difference, the more one group favors a skill over the other.

WORKPLACE SKILLS FOR SUCCESS

		Skill Level	Industry Average	Education Average	Difference
LE2.02.02	Demonstrate the use of problem-solving procedures.	Basic	2.00	2.75	0.75
LE2.02.03	Demonstrate skill in problem solving.	Basic	2.00	2.75	0.75
LE2.01.03	Demonstrate high ethical standards in all aspects of work	Basic	3.00	2.50	0.5
LE2.02.01	Demonstrate critical thinking skills.	Basic	3.00	2.50	0.5
LE2.02.06	Make decisions and plan actions based on data and observations.	Intermediate	3.00	2.50	0.5
LE2.02.04	Pay close attention to details and observe trends	Basic	3.00	2.62	0.38
LE2.02.05	Coordinate several tasks simultaneously.	Basic	2.00	2.12	0.12
LE2.01.01	Describe the teamwork concept and discuss how teams work together in planning, performing, analyzing, and reporting.	Basic	2.00	2.12	0.12
LE2.01.02	List reasons why opinions of all team members must be valued.	Basic	2.00	2.00	0

QUALITY IN THE CHEMICAL LABORATORY

		Skill Level	Industry Average	Education Average	Difference
LE3.01.01	Describe the concept of "continuous improvement."	Basic	1.00	1.50	0.5
LE3.01.03	Describe principles of total quality management (TQM).	Intermediate	1.00	1.38	0.38
LE3.01.05	Describe the role of the laboratory technician in implementing TQM.	Intermediate	1.00	1.38	0.38
LE3.01.09	Identify those TQM procedures, elements, and principles that contribute to defect prevention.	Advanced	1.00	1.38	0.38
LE3.01.08	Use statistical tools such as fish bone (cause and effect) diagrams, Pareto charts, histograms, and scatter diagrams; demonstrate the use of each and describe the value of each in planning and designing experiments.	Advanced	1.00	1.25	0.25
LE3.01.04	Describe elements of TQM as they relate to suppliers, producers, and customers.	Intermediate	1.00	1.25	0.25
LE3.01.02	Determine conformance specifications by comparison of inspection done with product specification.	Basic	1.00	1.25	0.25

COMMUNICATION FOR THE CHEMICAL TECHNICIAN

		Skill Level	Industry Average	Education Average	Difference
LE4.03.10	Demonstrate the ability to access database information.	Intermediate	0.00	1.62	1.62
LE4.02.12	Demonstrate the ability to maintain a laboratory log.	Basic	1.00	2.38	1.38
LE4.02.08	Demonstrate the ability to write clear and concise letters and memos.	Basic	3.00	1.62	1.38
LE4.02.13	Demonstrate the ability to give oral presentations	Intermediate	1.00	2.25	1.25
LE4.02.02	Identify the components of a good oral report.	Basic	1.00	2.25	1.25
LE4.02.06	Demonstrate the ability to use presentation software to give oral reports.	Basic	1.00	2.12	1.12
LE4.02.14	Demonstrate the ability to give clear and concise instructions to team members.	Intermediate	1.00	1.88	0.88
LE4.02.19	Demonstrate the ability to use graphics software.	Intermediate	1.00	1.75	0.75
LE4.03.07	Identify technical manuals and journals that related to research.	Basic	2.00	1.25	0.75
LE4.03.11	Demonstrate the ability to work with Laboratory Information Management Systems (LIMS).	Intermediate	1.00	1.50	0.5
LE4.03.12	Demonstrate the ability to develop and maintain a database.	Advanced	1.00	1.50	0.5

LE4.03.13	Demonstrate the ability to transfer data to and from remote databases.	Advanced	1.00	1.50	0.5
LE4.02.10	Demonstrate the ability to use word-processing software to create documents.	Basic	2.00	2.50	0.5
LE4.03.09	Demonstrate the ability to read and interpret laboratory procedures.	Basic	2.00	2.50	0.5
LE4.02.03	Demonstrate the ability to keep accurate notes on laboratory activities.	Basic	2.00	2.50	0.5
LE4.01.01	Describe the lawful protocol and measures for keeping a laboratory notebook and documenting laboratory observations and data.	Basic	2.00	2.50	0.5
LE4.01.04	Present an overview of the law regarding the protection of intellectual property as applicable to work done in the chemical laboratory.	Intermediate	2.00	1.50	0.5
LE4.01.03	Identify characteristics required for notebooks to meeting legal requirements.	Basic	2.00	2.38	0.38
LE4.02.07	Demonstrate the ability to use spreadsheets to organize data into a communicable form.	Basic	2.00	2.38	0.38
LE4.03.08	Demonstrate the ability to read and interpret graphs and diagrams.	Basic	2.00	2.38	0.38
LE4.03.06	Demonstrate the ability to conduct on-line searches	Basic	2.00	1.62	0.38
LE4.02.01	Identify the various mediums for communication available to technicians.	Basic	2.00	1.75	0.25

LE4.02.09	Demonstrate the ability to communicate through electronic media such as e-mail.	Basic	2.00	1.75	0.25
LE4.02.17	Demonstrate the ability to read and prepare diagrams and graphs to clearly and accurately present data.	Intermediate	2.00	2.25	0.25
LE4.02.18	Identify respective responsibilities in the patent process for the principal investigator, technician, witness, and attorney.	Intermediate	1.00	1.12	0.12
LE4.02.16	Demonstrate the ability to write and report on methods.	Intermediate	2.00	2.12	0.12
LE4.02.05	Demonstrate the ability to write technical reports.	Basic	2.00	2.12	0.12

MAINTAINING A SAFE AND CLEAN LABORATORY ADHERING TO ENVIRONMENTAL/HEALTH AND SAFETY REGULATIONS

		Skill Level	Industry Average	Education Average	Difference
LE5.05.01	Explain the importance of reporting even small fires that can be extinguished quickly.	Basic	1.00	2.50	1.5
LE5.04.05	Demonstrate the appropriate use of safety equipment including, but not limited to safety glasses, showers, respirators, eye washes, and blankets.	Basic	1.00	2.25	1.25
LE5.01.11	Describe procedures used to respond to a spill or release of different kinds of chemicals.	Intermediate	1.00	1.88	0.88
LE5.02.01	Categorize common hazardous materials as corrosive, flammable, etc.	Basic	1.00	1.88	0.88

LE5.03.04	List elements of a safety plan for general laboratory safety.	Intermediate	1.00	1.86	0.86
LE5.04.10	Participate in an evacuation procedure.	Intermediate	1.00	1.75	0.75
LE5.01.01	Use computers to access information about procedures for chemical safety, environmental protection, and health preservation.	Basic	1.00	1.75	0.75
LE5.05.02	Describe the characteristics of fires that occur in chemical laboratory environments, including electrical, hydrocarbon, wood/paper, and chemical fires.	Basic	1.00	1.75	0.75
LE5.05.04	Define the term "flash point" and explain the importance of knowing the flash point of a specific hydrocarbon.	Basic	1.00	1.75	0.75
LE5.05.05	Describe fire potential information in a material safety data sheet (MSDS).	Basic	1.00	1.75	0.75
LE5.03.01	Participate in an evacuation procedure.	Basic	1.00	1.71	0.71
LE5.02.06	Read and interpret hazard data associated with chemicals that are presented in material safety data sheets (MSDSs) and other chemical data reference documents. Explain TLVs, PEL.. ETC	Intermediate	1.00	1.62	0.62
LE5.02.09	Demonstrate ability to convert chemical concentrations to different units so that comparison can be made with MSDS safe levels.	Intermediate	3.00	2.38	0.62
LE5.04.06	Participate in a fire safety activity that includes an explanation of how to use different classes of	Basic	1.00	1.62	0.62

	extinguishers to extinguish a variety of fires.				
LE5.01.10	Read a variety of cleanup and emergency response procedures and determine how to implement the procedures.	Intermediate	1.00	1.62	0.62
LE5.05.06	Select the correct fire-fighting equipment to use based on the type, size, and conditions of a fire.	Intermediate	1.00	1.62	0.62
LE5.05.03	Describe the environmental conditions (fire triangle) required to support combustion.	Basic	1.00	1.62	0.62
LE5.03.07	Identify and describe components of an safety plan for emergencies, including fire, spills/gas release, bomb threats, and inclement weather.	Advanced	1.00	1.57	0.57
LE5.04.01	Demonstrate good housekeeping by maintaining a clean and safe workplace.	Basic	3.00	2.50	0.5
LE5.04.02	Demonstrate proper lifting techniques.	Basic	1.00	1.50	0.5
LE5.02.11	Identify the requirements for effective response teams and describe the role of such teams in handling emergencies.	Advanced	1.00	1.50	0.5
LE5.02.02	Identify the conventions and symbols used for labeling chemical materials; include Hazardous Material Identification Symbols (HMIS) and the National Fire Protection Association (NFPA) guidelines.	Basic	1.00	1.50	0.5
LE5.01.07	Recognize that companies have specific safety/health and environmental (S/H/E) rules and	Intermediate	1.00	1.50	0.5

	regulations; review several examples from local industry.				
LE5.03.03	Specify components of an effective chemical hygiene plan.	Intermediate	1.00	1.43	0.43
LE5.03.10	Conduct a safety review and audit of a school laboratory by identifying the regulations for the laboratory as if it were in industry, developing or participating in a review team, conducting an audit, identifying areas of noncompliance, and reporting to the group; work with the school staff to correct the items of noncompliance according to a timetable.	Advanced	1.00	1.43	0.43
LE5.04.08	Select and demonstrate the use of appropriate personal protective equipment (PPE) for a variety of situations involving hazardous chemicals, including but not limited to, corrosive, explosive, biological, and volatile materials.	Intermediate	1.00	1.38	0.38
LE5.04.09	Participate in a simulated emergency, both as a leader and as a victim.	Intermediate	1.00	1.38	0.38
LE5.04.03	Demonstrate proper use of hand tools.	Basic	2.00	1.62	0.38
LE5.04.04	Demonstrate the ability to perform basic first aid skills.	Basic	1.00	1.38	0.38
LE5.02.04	State the responsibilities and rights of the technician under the Hazardous Communication Standard of the Occupational Safety and Health Administration (OSHA). Explain right to know. Emphasize importance of PPEs.	Intermediate	1.00	1.38	0.38
LE5.01.02	Identify the agencies (federal, state, and local) that develop and enforce	Intermediate	1.00	1.38	0.38

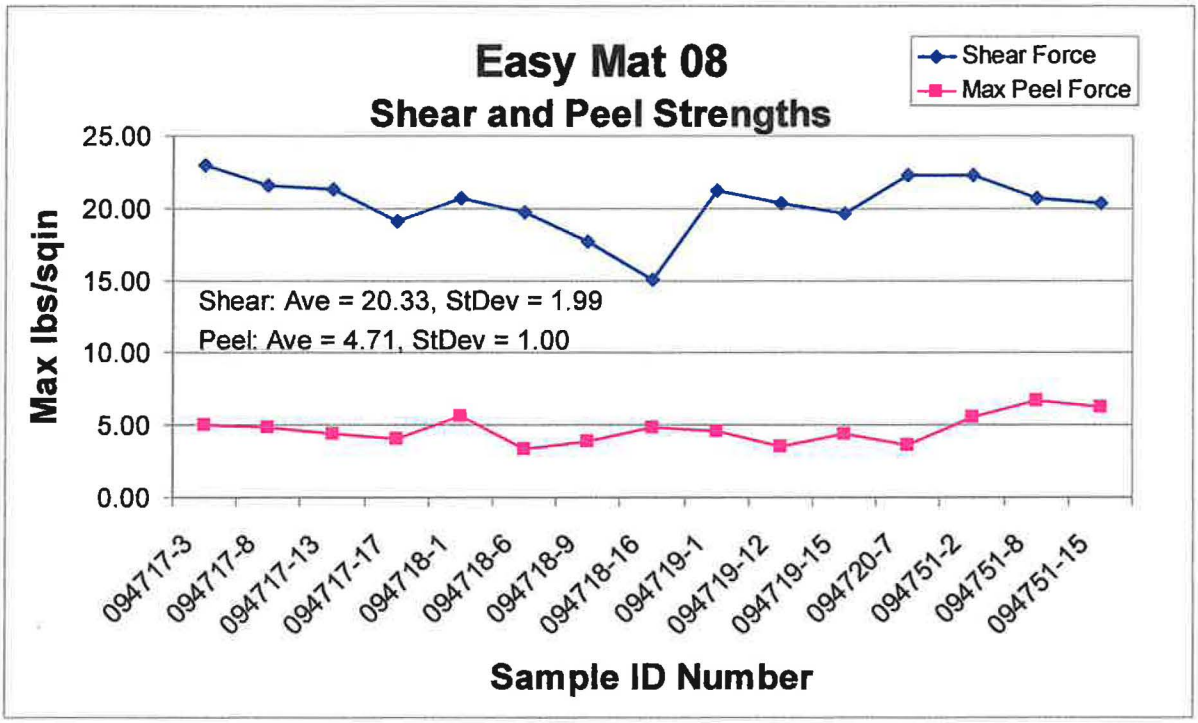
	regulations pertaining to chemical and related industries.				
LE5.03.02	Test safety equipment in laboratories and maintain a log.	Basic	1.00	1.29	0.29
LE5.01.08	Identify specific state and local regulations that affect operations at local industries.	Intermediate	1.00	1.25	0.25
LE5.01.09	Specify regulations that apply to consumer protection.	Intermediate	1.00	1.25	0.25
LE5.01.04	Specify three to five OSHA regulations that are directly applicable to the health and/or safety of the worker.	Intermediate	1.00	1.25	0.25
LE5.01.05	Specify three to five Environmental Protection Agency (EPA) regulations that directly affect the work of the laboratory technician; special attention should be paid to the regulations regarding the handling and disposal of hazardous wastes.	Intermediate	1.00	1.25	0.25
LE5.01.06	Describe the Department of Transportation (DOT) regulations for labeling and shipping hazardous wastes; include the possibility of personal liability and an explanation of the manifest system.	Intermediate	1.00	1.25	0.25
LE5.01.12	Categorize regulations according to those which impact each environmental area (air, water, and noise).	Advanced	1.00	1.25	0.25
LE5.04.11	Describe causes of sight and hearing loss in the laboratory environment and identify noise level thresholds requiring protection.	Intermediate	1.00	1.25	0.25
LE5.04.07	Prepare and lead a short safety meeting for classmates appropriate	Basic	1.00	1.25	0.25

to the school setting.

LE5.05.09	Define the terms "upper and lower explosive limits" and explain the importance of knowing the actual values in a potentially hazardous situations.	Intermediate	1.00	1.25	0.25
LE5.03.06	Develop and deliver a safety awareness session for fellow technicians.	Intermediate	1.00	1.14	0.14
LE5.01.13	Prepare and present to lay community members clear information about how the industry implements its responsibilities as a good neighbor in the area of S/H/E issues.	Advanced	1.00	1.12	0.12
LE5.01.14	Using library and on-line sources prepare a report for oral presentation on the impact of major regulations such as Occupational Safety and Health (OSHA), Food and Drug Administration (FDA), RCRA, CAA and CWA on the industry.	Advanced	1.00	1.12	0.12
LE5.01.03	Describe the purpose of the Responsible Care Code developed by the American Chemistry Council.	Intermediate	1.00	1.12	0.12

Appendix B

The graph below shows the shear and peel strengths for various production lot runs of the Custom Building Products (CBP) EasyMat® 08 product. Each data point on the graph represents an average of three individual tests.



Appendix C

Appendix C contains the experimental outlines for the experimental design spreadsheets for the project to increase the shear strength of the Prism® product. To preserve the privacy and trade secret nature of the Prism® formulation all proprietary information has been removed. In all cases letter designations have been substitutes for the actual reactant materials. One specific letter may have been used to represent several different raw materials.

Project	To meet A118.7 tensile strength in Prism				04.03.08
MATERIAL	**LP 43 A**	**LP 43 B**	**LP 43 C**	**LP 43 D**	**LP 43 E**
Base	2332				
A	145.15	145.15	0	0	0
B	0	0	145	261	365
C	0.38	0	0	0	0
D	3.02	3.02	0	0	0
E	0	0	0.75	0.75	0.75
F	18.85	18.85	28.25	28.25	28.25
G	0	0	2.75	2.75	2.75
H	0	0	0	0	0
Total	2499.4				
Water Ratio	26.5/100	26.5/100	26.5/100	26.5/100	26.5/100
7 Day Tensile Strength of Grout (psi)	299.5 (288.7-310.3)	223.5 (168.6-278.4)	381.9 (352.2-411.6)	403.85 (395.1-412.6)	293.5 (290.4-296.6)

Prism Standard

Base	2350.9	94.06%	2355	94.20%	2300	92.00%	2245	89.80%	2296.6	91.86%
A	145.15	5.81%	0	0.00%	0		0	0.00%	0	0.00%
B	0	0.00%	145	5.80%	200	8.00%	255	10.20%	200	8.00%
C	0.38	0.02%	0	0.00%	0	0.00%	0	0.00%	0.38	0.02%
D	3.02	0.12%	0	0.00%	0	0.00%	0	0.00%	3.02	0.12%
E	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
F	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
G	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
H	0	0.00%	0	0.00%	0		0	0.00%	0	0.00%
	2499.5	100.00%	2500	100.00%	2500	100.00%	2500	100.00%	2500	100.00%

Base	2296.6	91.86%	2291.9	91.68%	2241.6	89.66%	2295.85	91.83%	2351.6	94.06%
A	200	8.00%	200	8.00%	255	10.20%	200	8.00%	0	0.00%
B	0	0.00%	0	0.00%	0	0.00%	0	0.00%	145	5.80%
C	0.38	0.02%	0.38	0.02%	0.38	0.02%	0.38	0.02%	0.38	0.02%
D	3.02	0.12%	3.02	0.12%	3.02	0.12%	3.02	0.12%	3.02	0.12%
E	0	0.00%	0	0.00%	0	0.00%	0.75	0.03%	0	0.00%
F	0	0.00%	4.7	0.19%	0	0.00%	0	0.00%	0	0.00%
G	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
H	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
	2500	100.00%	2500	100.00%	2500	100.00%	2500	100.00%	2500	100.00%

	A 2X 1 & 1A Prism Standard		B		C		D		E	
Base	2350.9	94.057%	2355	94.200%	2300	92.000%	2245	89.800%	2296.6	91.864%
A	145.15	5.807%	0	0.000%	0		0	0.000%	0	0.000%
B	0	0.000%	145	5.800%	200	8.000%	255	10.200%	200	8.000%
C	0.38	0.015%	0	0.000%	0	0.000%	0	0.000%	0.38	0.015%
D	3.02	0.121%	0	0.000%	0	0.000%	0	0.000%	3.02	0.121%
E	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
F	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
G	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
H	0	0.000%	0	0.000%	0		0	0.000%	0	0.000%
	2499.45	100.000%	2500	100.000%	2500	100.000%	2500	100.000%	2500	100.000%

	F		G		H		I		J	
Base	2296.6	91.864%	2291.9	91.676%	2241.6	89.664%	2295.85	91.834%	2351.6	94.064%
A	200	8.000%	200	8.000%	255	10.200%	200	8.000%	0	0.000%
B	0	0.000%	0	0.000%	0	0.000%	0	0.000%	145	5.800%
C	0.38	0.015%	0.38	0.015%	0.38	0.015%	0.38	0.015%	0.38	0.015%
D	3.02	0.121%	3.02	0.121%	3.02	0.121%	3.02	0.121%	3.02	0.121%
E	0	0.000%	0	0.000%	0	0.000%	0.75	0.030%	0	0.000%
F	0	0.000%	4.7	0.188%	0	0.000%	0	0.000%	0	0.000%
G	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
H	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
	2500	100.000%	2500	100.000%	2500	100.000%	2500	100.000%	2500	100.000%

	1	2	3	4	5	6	7	8	9	10
Base	470.28	471.00	460.00	449.00	459.32	459.32	458.38	448.32	459.17	470.32
A	29.04	0.00	0.00	0.00	0.00	40.00	40.00	51.00	40.00	0.00
B	0.00	29.00	40.00	51.00	40.00	0.00	0.00	0.00	0.00	29.00
C	0.08	0.00	0.00	0.00	0.08	0.08	0.08	0.08	0.08	0.08
D	0.60	0.00	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60
E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
F	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.00	0.00
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total mass (grams)	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00

Prism Controls

PA	PB	PC
470.28	**470.28**	**470.28**
29.036	**29.036**	**29.036**
0.000	**0.000**	**0.000**
0.076	**0.076**	**0.076**
0.604	**0.604**	**0.604**
0.000	**0.000**	**0.000**
500.00	**500.00**	**500.00**
132.5g	26.5g/100g	142.5g

	I	M	F	G	H
BASE	459.17	459.17	459.32	458.38	448.38
A	40.000	40.000	40.000	40.000	51.000
B	0.000	0.000	0.000	0.000	0.000
C	0.000	0.000	0.000	0.000	0.000
D	0.604	0.000	0.604	0.604	0.604
F	0.000	0.940	0.000	0.940	0.000
Total mass (grams)	500.00	500.11	500.00	500.00	500.00
Water	132.5g	26.5g/100g	26.5g/100g	26.5g/100g	26.5g/100

	C	K	E	L	B	D
BASE	460.00	458.38	459.32	458.38	471.00	449.00
A	0.000	0.000	0.000	0.000	0.000	0.000
B	40.000	40.000	40.000	40.000	29.000	51.000
C	0.000	0.000	0.000	0.000	0.000	0.000
D	0.000	0.000	0.604	0.604	0.000	0.000
F	0.000	0.940	0.000	0.940	0.000	0.000
Total mass (grams)	500.00	499.32	500.00	499.92	500.00	500.00

		Previous Standards	
		39E	PD
Base		459.32	470.28
A		0.00	29.04
B		40.00	0.00
C		0.00	0.08
D		0.60	0.60
F		0.00	0.00
		500.00	500.00
		26.5g/100g	26.5g/100g

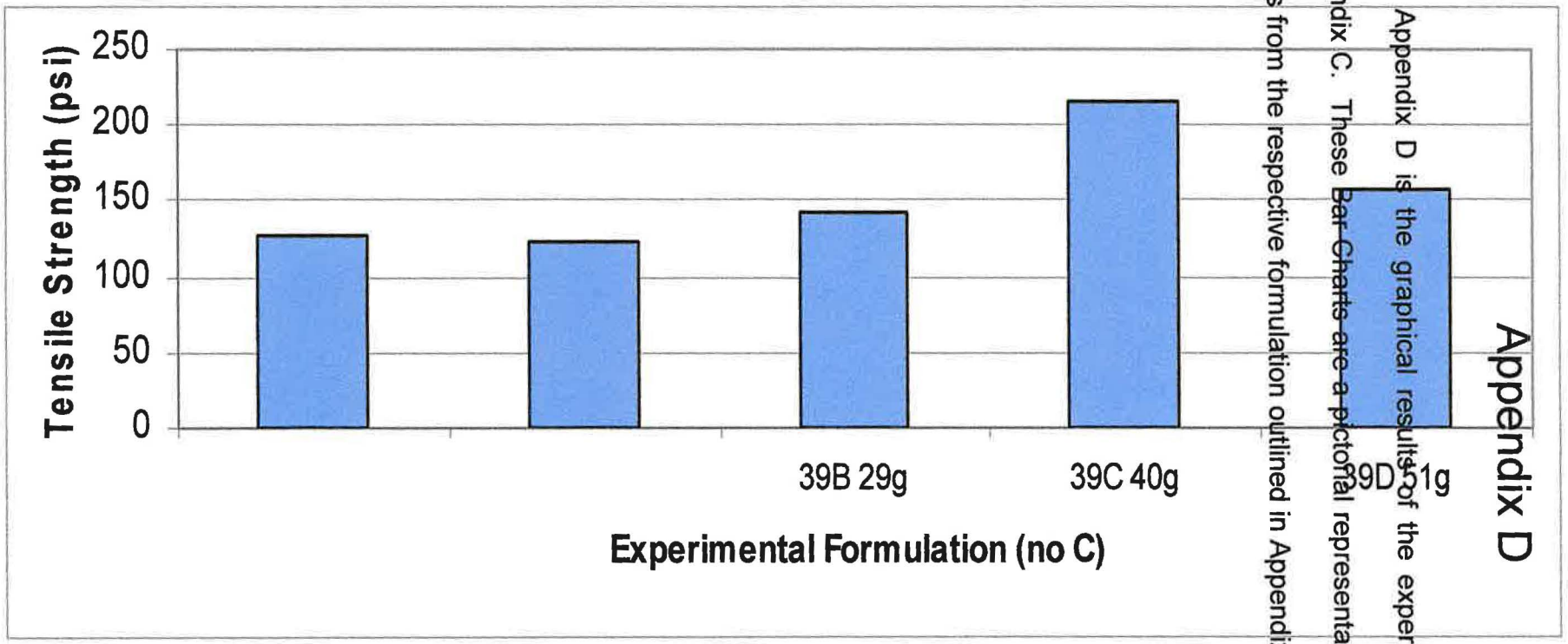
Base
A
B
C
D
F

	Vary D	
39E	A	B
459.32	459.32	459.32
0.00	0.00	0.00
40.00	40.00	40.00
0.00	0.00	0.00
0.60	0.20	1.00
0.00	0.00	0.00
500.00	500.00	500.00
26.5g/100g	26.5g/100g	26.5g/100g

			Vary F		
	39L	39G	39E	C	D
Base	458.46	458.46	459.40	457.96	458.96
A	0.00	40.00	0.00	0.00	0.00
B	40.00	0.00	40.00	40.00	40.00
C	0.00	0.00	0.00	0.00	0.00
D	0.60	0.60	0.60	0.60	0.60
F	0.94	0.94	0.00	1.44	0.44
	500.00	500.00	500.00	500.00	500.00
	26.5g/100g	26.5g/100g	26.5g/100g	26.5g/100g	26.5g/100g

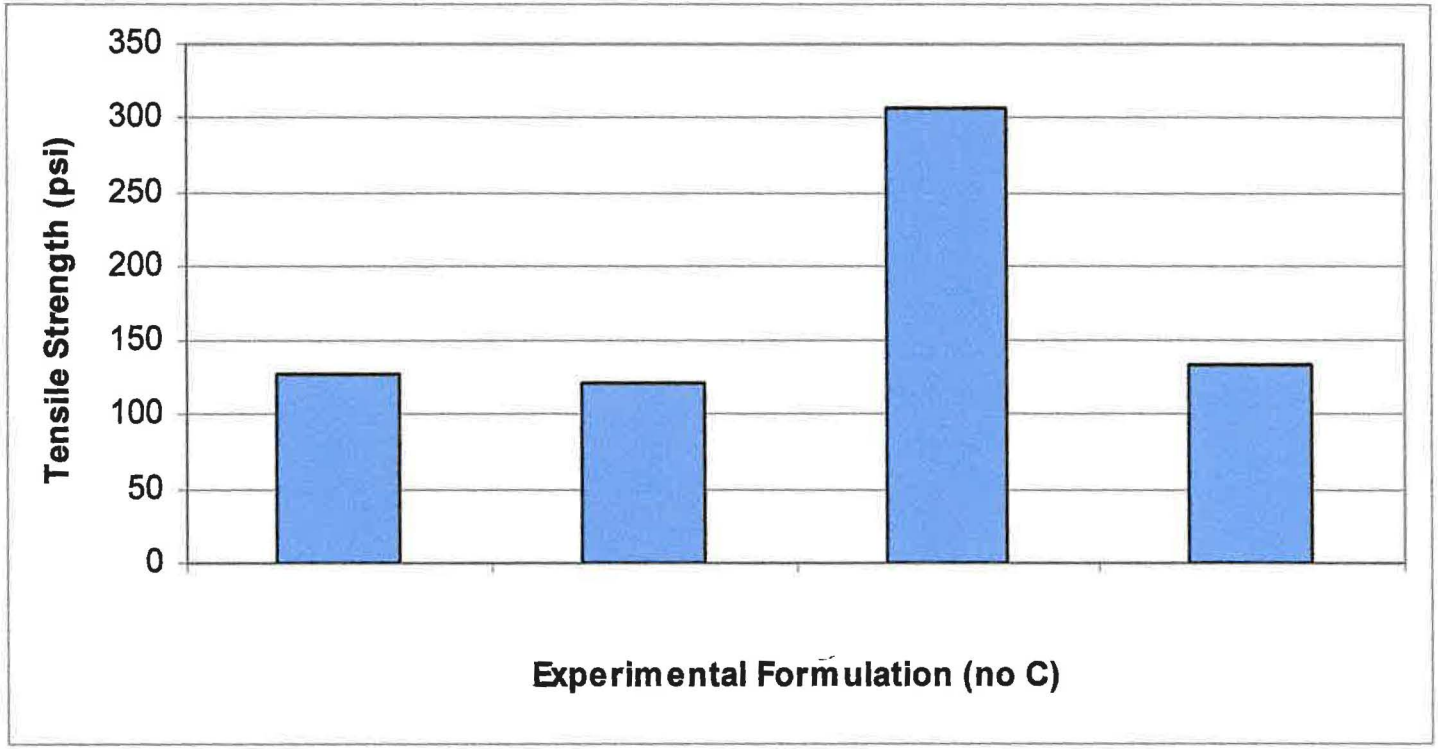
Appendix D

Appendix D is the graphical results of the experimental design shown in Appendix C. These Bar Charts are a pictorial representation of the these strengths results from the respective formulation outlined in Appendix C.



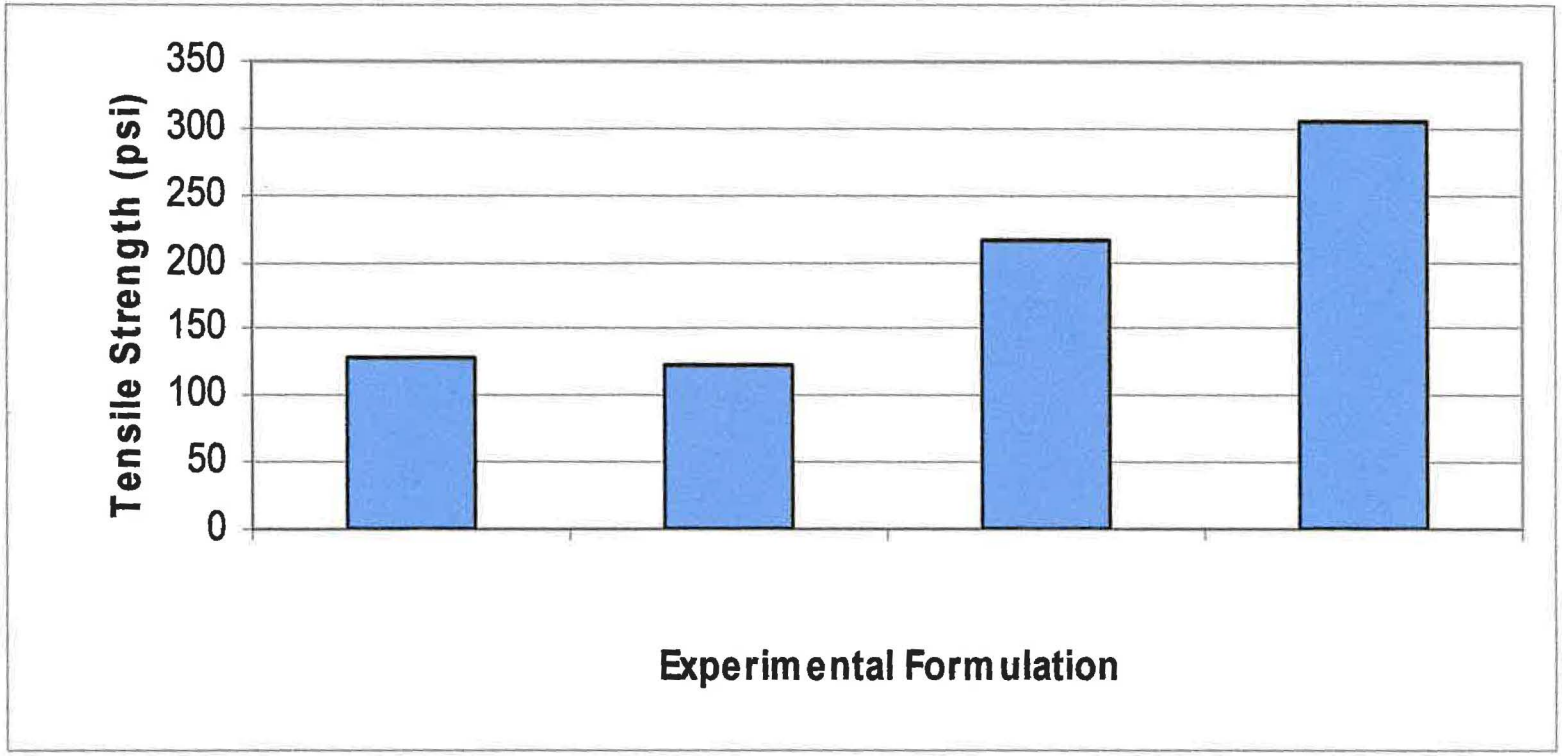
	39 Crtl A	39 Crtl B	39B	39C	39D
BASE	470.28	470.28	471.00	460.00	449.00
A	29.04	29.04	0.00	0.00	0.00
B	0.00	0.00	29.00	40.00	51.00
C	0.08	0.08	0.00	0.00	0.00
D	0.60	0.60	0.00	0.00	0.00
Tensile (psi)	128	122	143	215	157

Comparison of B vs. A



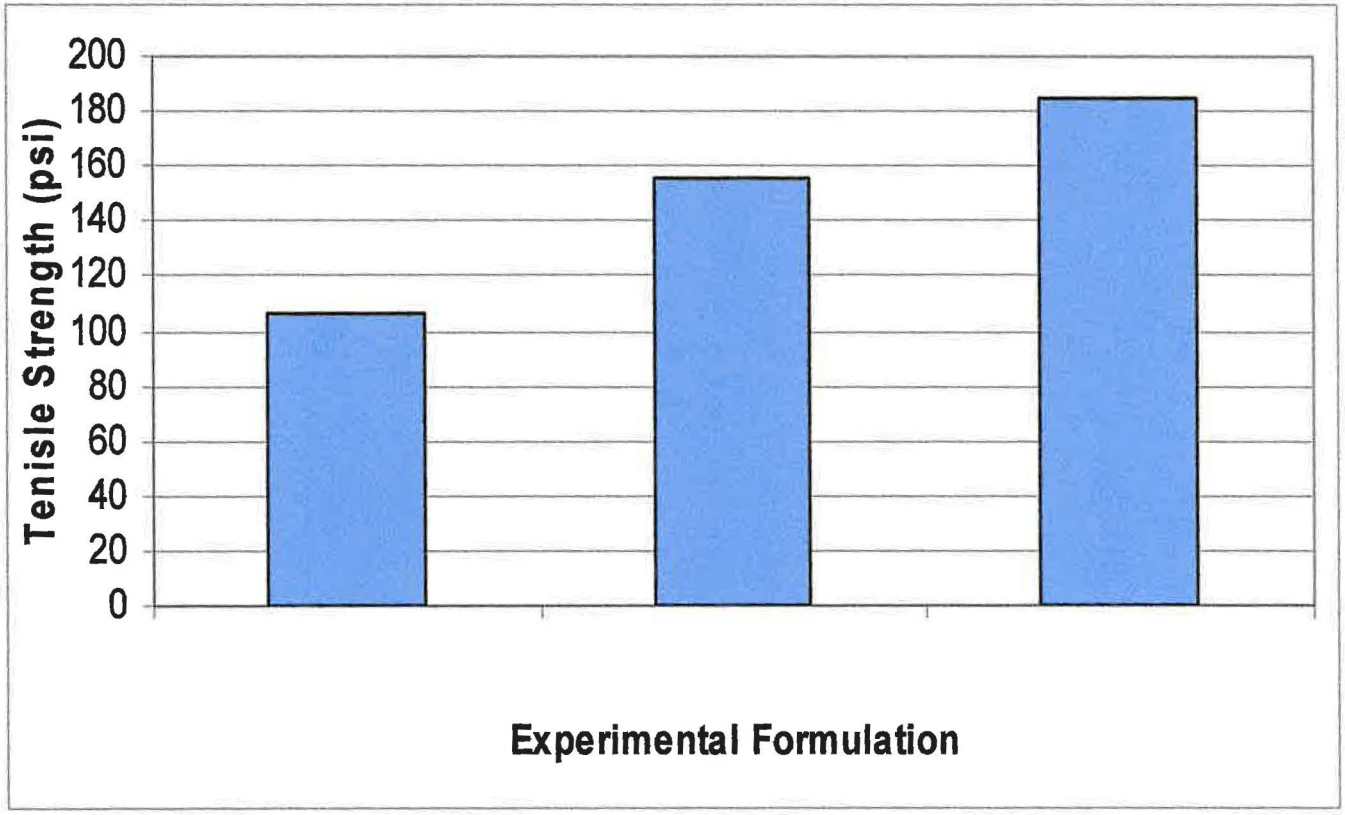
	39 Crtl A	39 Crtl B	39E	39F
A	470.28	470.28	459.32	459.32
B	29.04	29.04	0.00	40.00
C	0.00	0.00	40.00	0.00
D	0.08	0.08	0.00	0.00
E	0.60	0.60	0.60	0.60
Tensile (psi)	128	122	306	134

Addition of 0.60g Additional D



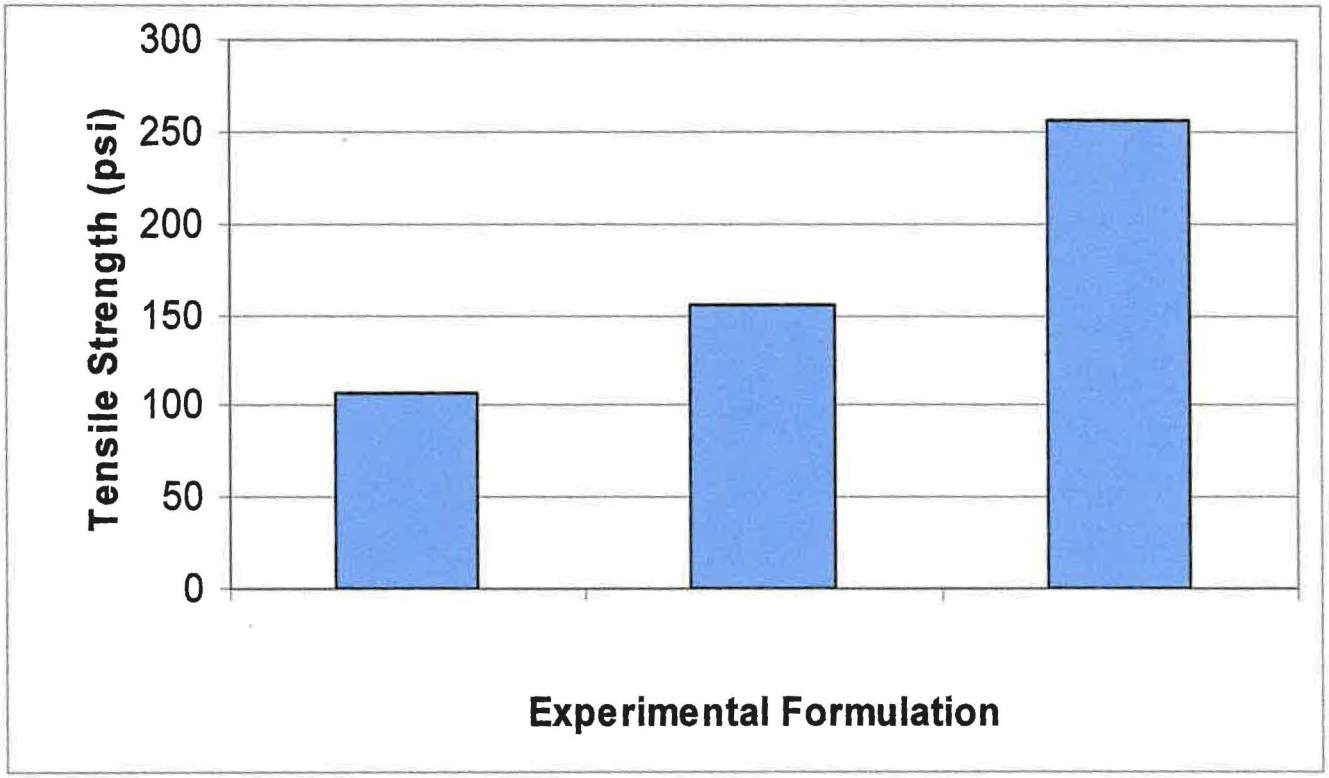
	39 Crtl A	39 Crtl B	39C	39E
A	470.28	470.28	460.00	459.32
B	29.04	29.04	0.00	0.00
C	0.00	0.00	40.00	40.00
D	0.08	0.08	0.00	0.00
E	0.60	0.60	0.00	0.60
Tensile (psi)	128	122	215	306

Vary Levels of B



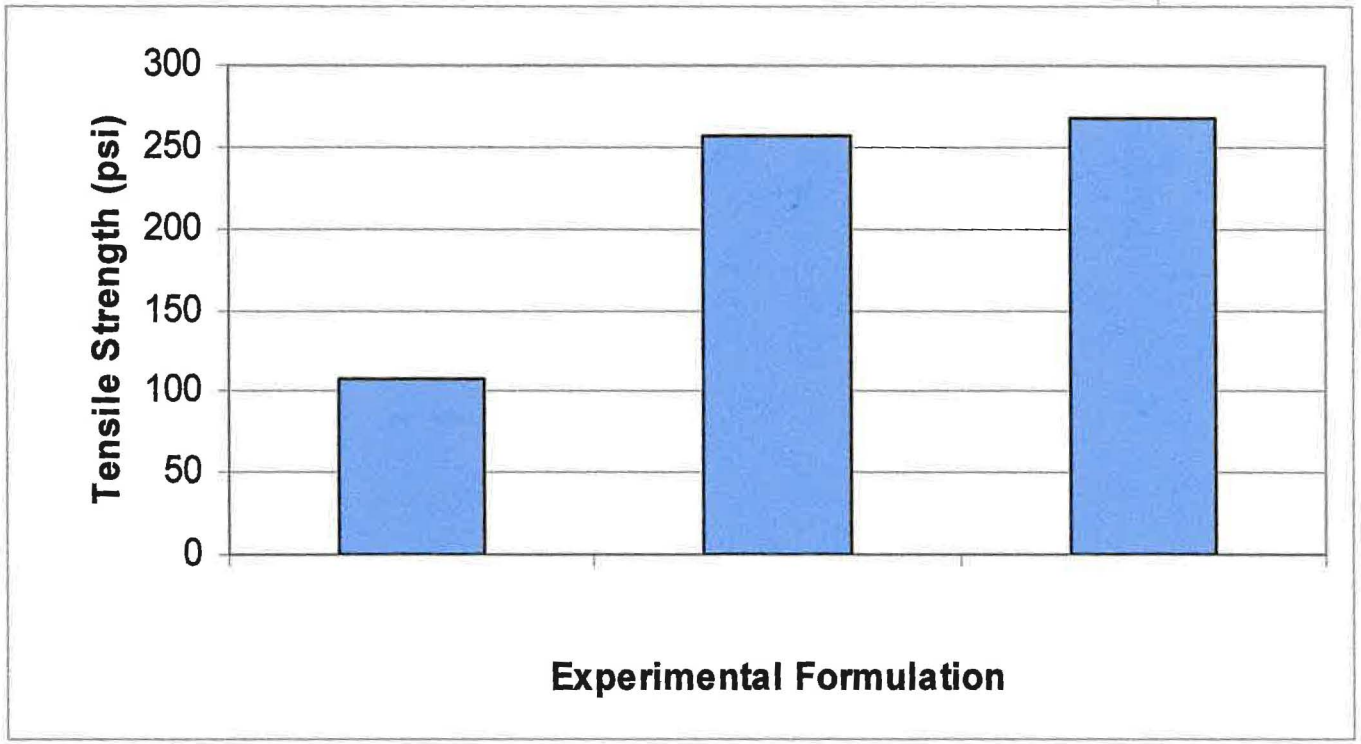
	39 Crtl A	39 I	39 H
A	470.28	459.17	448.38
B	29.04	40.00	51.00
C	0.08	0.00	0.00
D	0.60	0.60	0.60
Tensile (psi)	128	155	185

Addition of a Substance



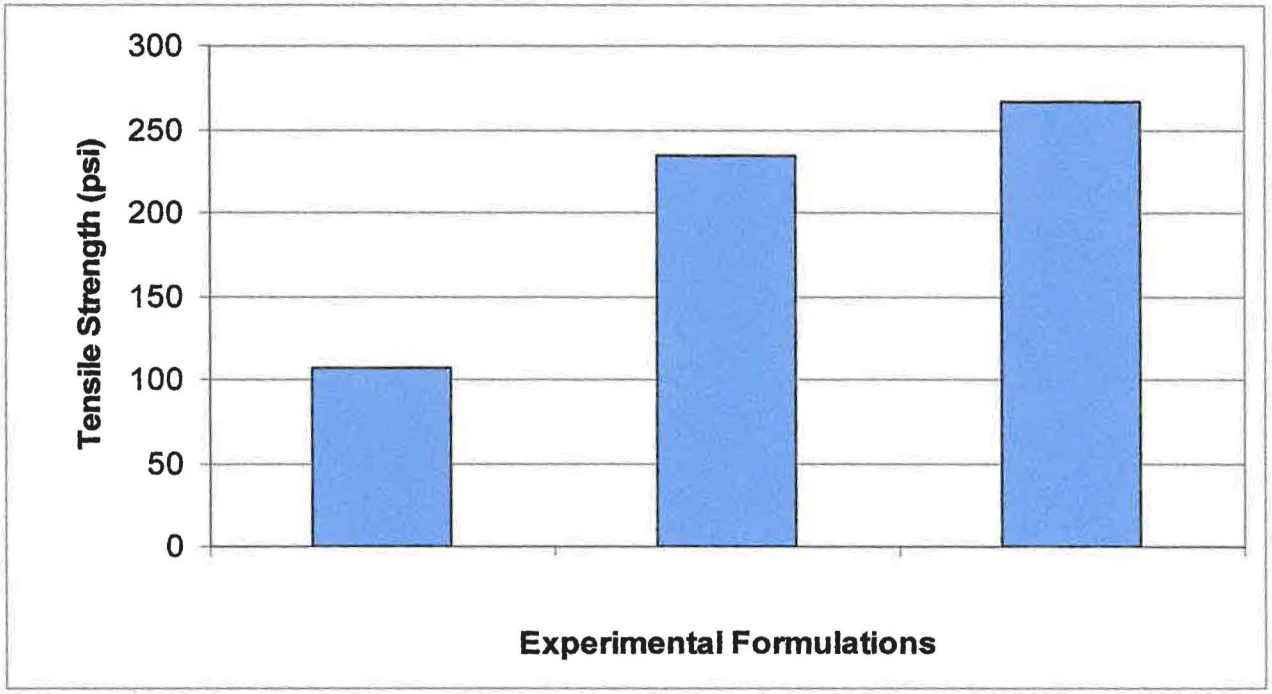
	39 Crtl A	39 I	39 G
A	470.28	459.17	458.38
B	29.04	40.00	40.00
C	0.08	0.00	0.00
D	0.60	0.60	0.60
E	0.00	0.00	0.94
Tensile (psi)	128	155	256

40g B vs. 40g B'



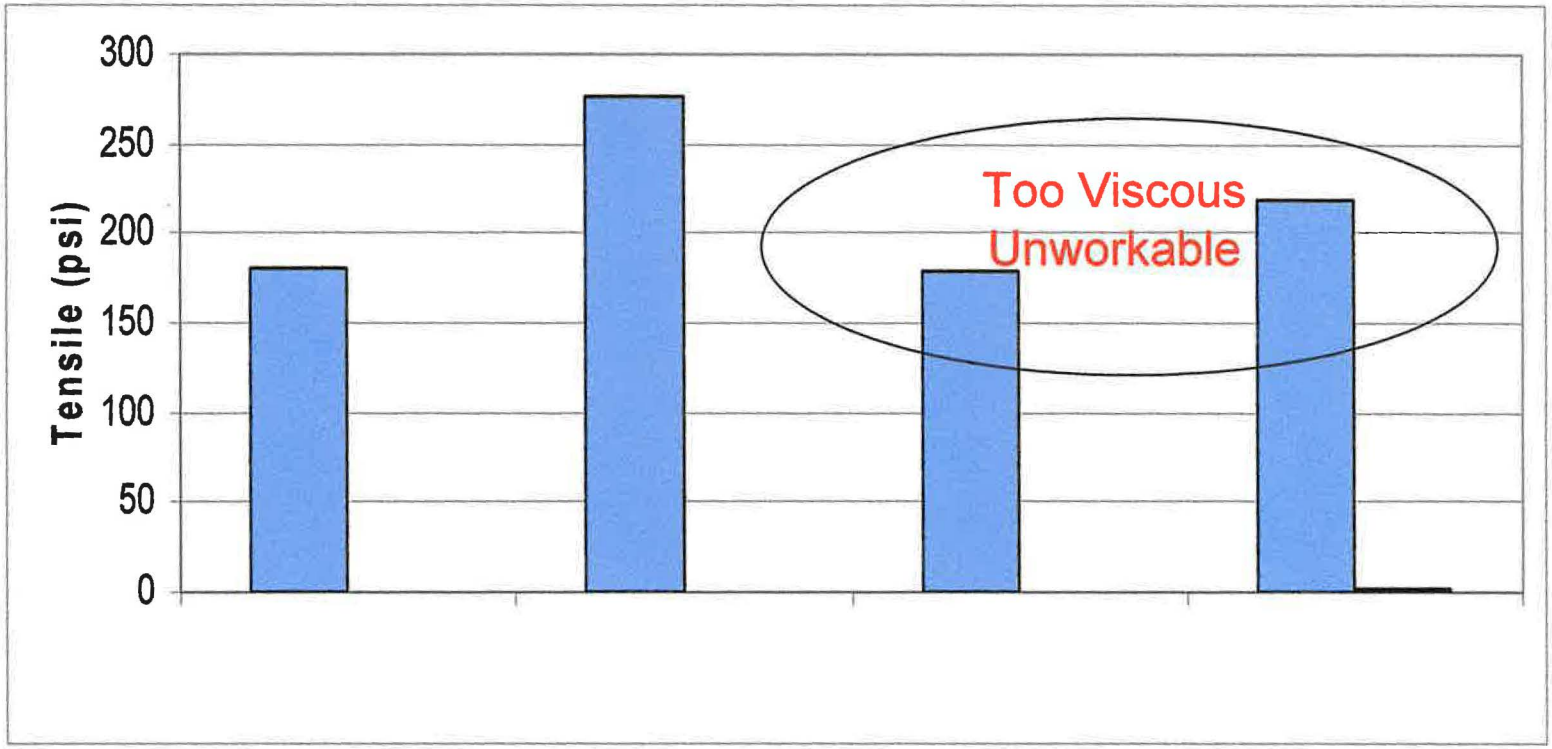
	39 Crtl A	39 G	39 L
A	470.28	458.38	458.38
B	29.04	40.00	0.00
C	0.00	0.00	40.00
D	0.08	0.00	0.00
E	0.60	0.60	0.60
F	0.00	0.94	0.94
Tensile (psi)	128	256	267

Additions of D



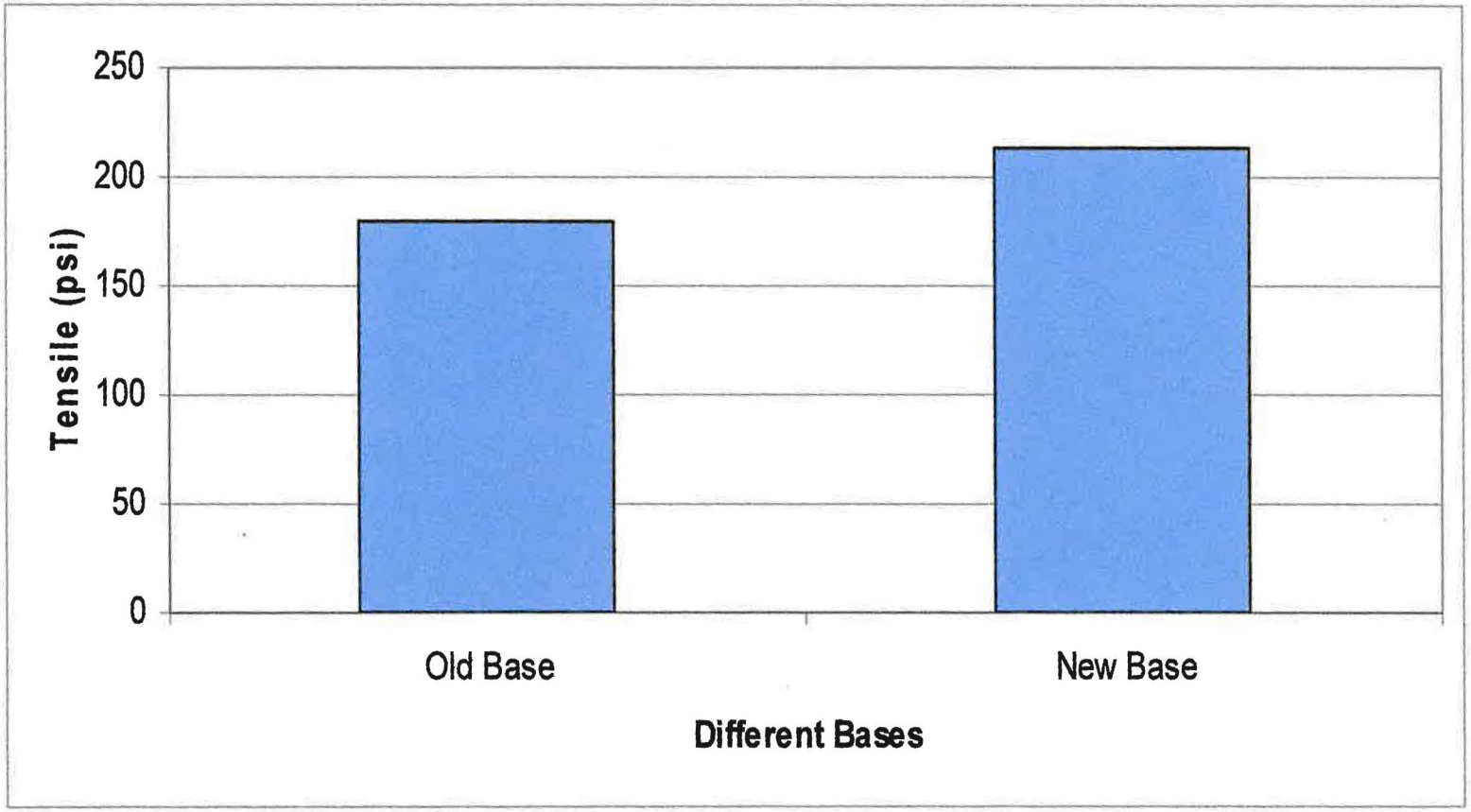
	39 Crtl A	39 K	39 L
A	470.28	458.38	458.38
B	29.04	0.00	0.00
C	0.00	40.00	40.00
D	0.08	0.00	0.00
E	0.60	0.00	0.60
F	0.00	0.94	0.94
Tensile (psi)	128	235	267

Various Levels of G



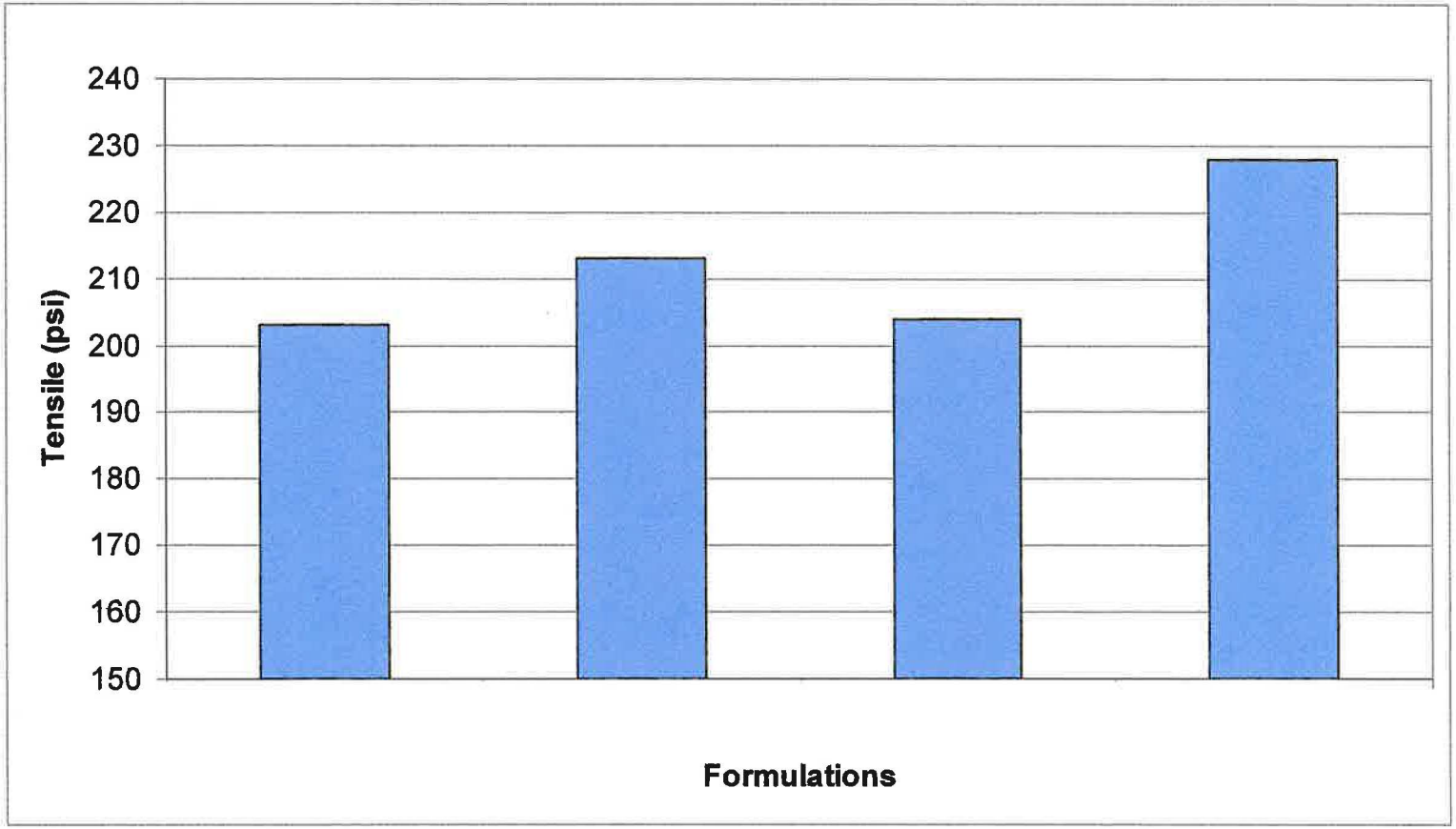
	39 N	39 O	39 Q	39 P
A	459.40	459.12	458.85	458.30
B	40.00	40.00	40.00	40.00
C	0.60	0.60	0.60	0.60
D	0.00	0.28	0.55	1.10
Tensile (psi)	180.00	276.00	180.00	219.00

Comparisons of Base Materials



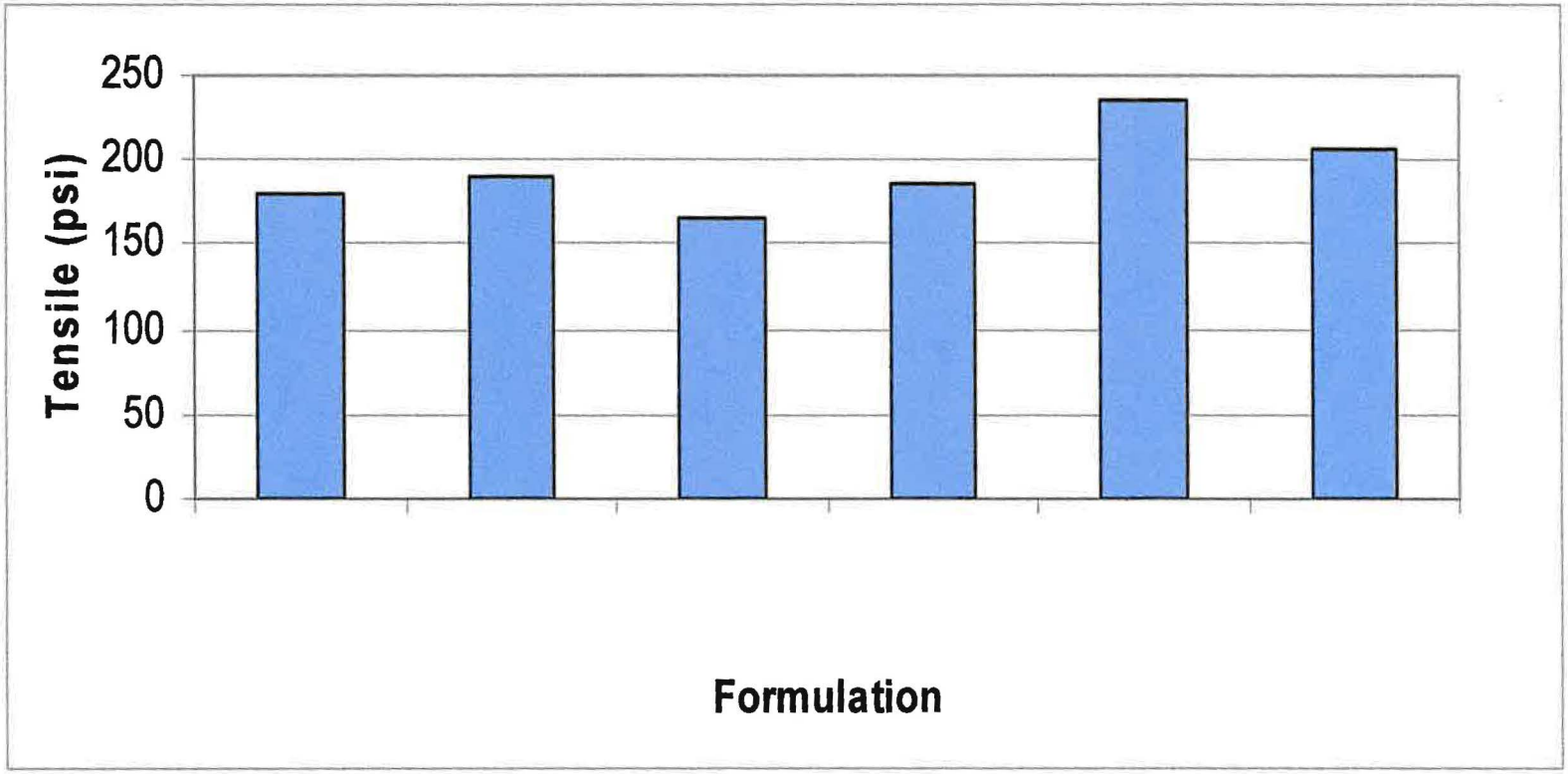
	Q (old base)	QA (new base)
BASE	458.85	458.85
B	40.00	40.00
D	0.60	0.60
(psi)	180.00	213.00

Varying Levels of G



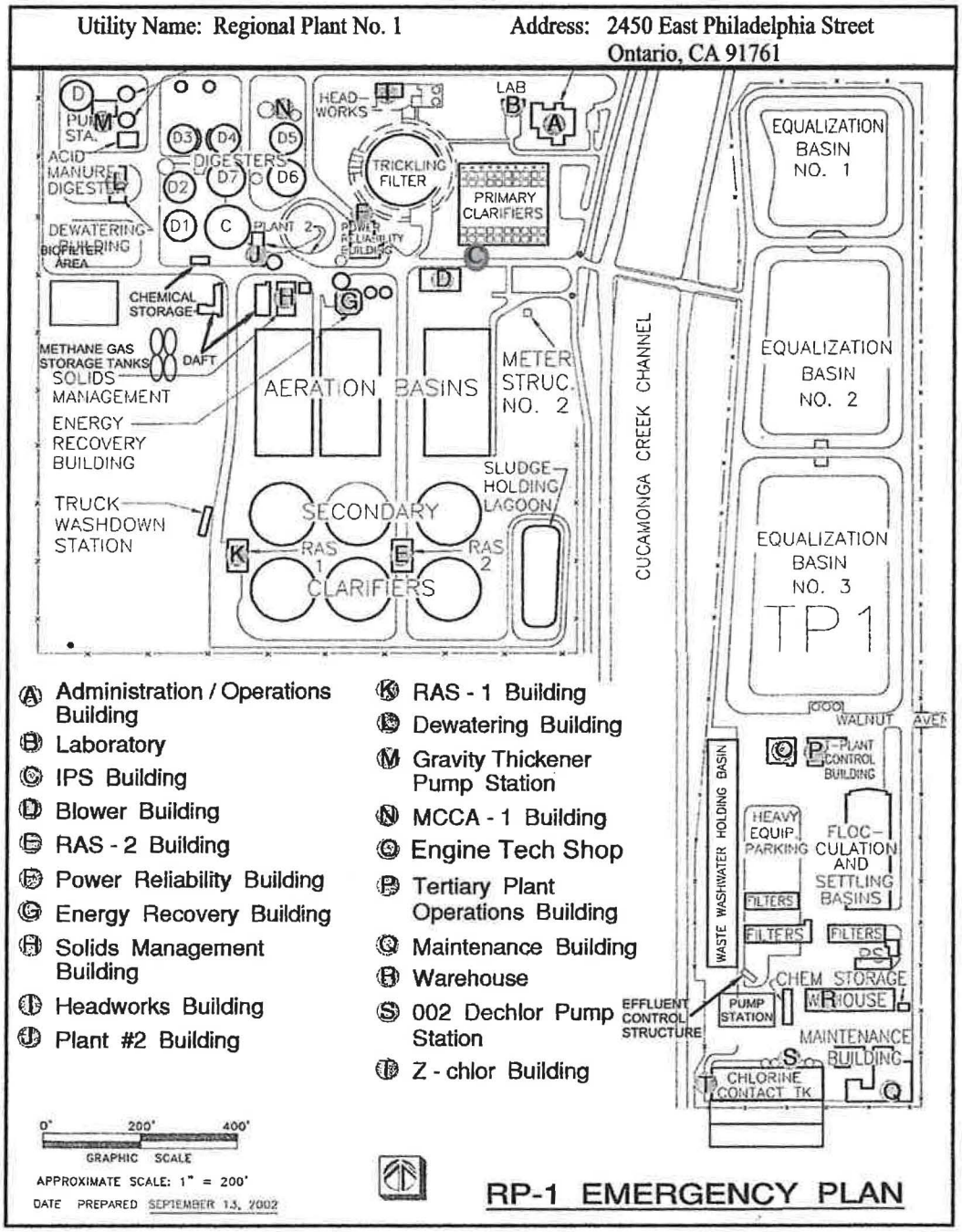
	39R	39N	39S	39T
A	459.60	459.40	459.20	459.00
B	40.00	40.00	40.00	40.00
C	0.40	0.60	0.80	1.00
Tensile	203	180	204	228

Variations in Substance Concentration



	39N	39U	39V	39W	39L	39X
A	459.40	459.15	458.90	458.65	458.46	458.18
B	0.00	0.00	0.00	0.00	0.00	0.00
C	40.00	40.00	40.00	40.00	40.00	40.00
D	0.60	0.60	0.60	0.60	0.60	40.00
E	0.00	0.25	0.50	0.75	0.94	0.94
F	0.00	0.00	0.00	0.00	0.00	0.28
Tensile	180	190	165	184	235	207

Appendix E
Site Plan for Regional Plant One



Appendix F

Dissemination of Professional Skills Survey

As per my sabbatical requirement, the note below will be sent, via email, to my colleagues in chemistry, the Director of Histotechnology and the Directors of other Mt SAC technical programs.

My sabbatical proposal included an educational and industrial survey component. I have compiled the findings of my Professional Skills survey given to Mt SAC chemistry faculty (educators) and local industrial employers. Focus was placed on the response differences between of the educators and employers to the same questions. The only difference was that the educators ranked the professional skill to the level they taught, while the industrial employers answer to what level they desire for new employees. The results presented here will highlight the differences between the educator responses and the responses of the industrial employers.

The American Chemical Society permitted me to modify an existing survey specifically for the purpose of evaluating desired professional skills taught by educators and desired by industrial employers. This survey was given to seven chemistry faculty and ten industrial employers. Of those, six faculty and four industrial employers responded. The question topic areas and the results are to follow.

This survey was conducted to gain information that could be identify employer desired professional skills necessary in an industrial work environment. The four professional skill areas surveyed were: 1.) Workplace Skills for Success 2.) Quality in the Chemical Laboratory 3.) Communications for the Chemical Technician

and 4.) Maintaining a Safe and Clean Laboratory Adhering to Environmental, Health and Safety Regulations. These specific survey topic areas were chosen based previous survey responses from our Advisory Committee for the Scientific Laboratory Technician program. The survey was composed of 109 questions.

Overall, there was consistent agreement among all educator and industry responses on 90% of the survey questions. These results showed the level which Mt SAC Chemistry Faculty taught specific professional skills was consistent with the level desired by industrial employers. In other words, industrial employers found the skill levels taught were consistent with their entry-level employee expectations.

In most cases the survey responses from industry closely agreed with the level taught by the educators. However, educator scores were consistently higher than industry employer ratings suggesting that Mt SAC chemistry faculty were teaching those skills to a slightly higher level. This observation was consistent with the expectations that educators are preparing students for transfer to four-year colleges and universities. Because Technician program students take most of the same transferable chemistry coursework, it should not be surprising that educators would teach to a higher level.

The following are the professional skill areas with the greatest difference between educators teaching higher than industry needs. The following six areas are shown to have the greatest difference to the least difference in ability to:

7. Demonstrate the ability to access database information.
8. Explain the importance of reporting even small fires that can be extinguished quickly.
9. Demonstrate the ability to maintain a laboratory log.
10. Demonstrate the ability to give oral presentations.
11. Identify the components of a good oral report.

12. Demonstrate the appropriate use of safety equipment including, but not limited to safety glasses, showers, respirators, eye washes, and blankets.

Of the 109 questions, there were only seven areas industry requested higher skill levels than that taught by educators. There was one glaringly large difference between industry desires and educator emphasis. That area was being able to write clearly. All other topic areas were closely matched with industry desiring slightly more skill capability than educators taught.

The areas where industry expectations requested higher level skills levels than being educationally taught were skills which:

7. Demonstrate the ability to write clear and concise letters and memos.
8. Identify technical manuals and journals that related to research.
9. Demonstrate the ability to convert chemical concentrations to different units so that comparison can be made with MSDS safe levels.
10. Demonstrate high ethical standards in all aspects of work.
11. Demonstrate critical thinking skills.
12. Demonstrate good housekeeping by maintaining a clean and safe workplace.

When I began this sabbatical project my goal was to construct two, 2 to 3 hour learning modules that could be utilized in either a lecture or a laboratory setting. However, after the completion of two different laboratory work assignments, surveys of our Advisory Committee and this sabbatical Educator Industrial Employer survey, I came to believe a short term learning module approach may not be the best method to teach professional skills. From my own experiences, both industrially and as an educator, I believe longer duration project based learning modules would be a better means of teaching, practicing and engraining professional skills into students.

I would suggest that within your own specific technical discipline, the instructor construct a six to eight week learning module, or series of learning modules, where students are provided the opportunity to learn, practice and adopt specific skills into their working style. This module is best employed in a laboratory setting. These skills can be introduced, adopted and practiced within different activities, if students are expected that those professional skills will be expected to be used throughout the duration of the course.

To be consistent with this most recent educator industrial survey and earlier employer surveys, I would suggest incorporating the following professional skills into your specific learning activity modules.

Organizational skills

Collecting samples for analysis

Completing and maintaining the log sheets

Archiving historical data and records

Housekeeping around the student's lab work area

Integrity and Character

Grading will be based on correctly completing the process, not the "right answer" (This addresses precision and accuracy related issues.)

Reporting "odd" results that were replicated and verified is valued above "fudging" numbers to fit a preconceived assumption.

Dependability and Personal Responsibility

Depending on all student as a team members on projects

Arriving to class on-time

Following through with projects and commitments

Following all laboratory safety rules

Communication Skills: both Written, Verbal and Computer

Presenting oral reports using PowerPoint final

Writing periodic smaller reports

Using Excel to store all data

Interpersonal Communication within a team – arriving at consensus

A Productive Team Member – works well with others

Retaining team members throughout the entire project

The overall quality of your work depends upon your team members

Problem Solving Abilities – not just from books

Practical problem solving

Open ended project

Initiative (Self Motivation – Self Starter) and show it

Each module would last several weeks

Minimal reminding students what they should do

Do your best at all times with everything you do

One of my sabbatical goals was to conduct a survey of educators and industrial employers. The goal was to learn what specific professional skills were necessary or essential to be successful in a technical laboratory environmental. Hopefully we, as educators, can integrate essential skills into our specific programs.

As educators, it should be our goal to educate and train students, not only in the technical disciplines, but also allow them the opportunity to learn and practice the professional skills that industrial employers perceive as necessary for success in a professional environment.

Reference Citations

1.) Advisory Committee Meeting. *Chemical Laboratory Technology*, Meeting Minutes, Aug. 2003.

2.) American Chemical Society. "Futures Through Chemistry-Charting a Course". ACS Division of Education and International Activities. Washington DC, 1999.

3.) American Chemical Society " Focus on Analytical Careers". *Chemical and Engineering News*. Jan. 22, 2007: 62.

4.) Inland Empire Utility Agency <http://www.ieua.org/index.html>

5.) Del Rio, Roxanne. "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report. Spring 2006.

6. Dayrit, Jeremy and Nidhi Gandi. "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report, Summer 2006.

7. Kang, Peggy and Janice Gatsky "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report. Fall 2007

8. Hong, Connie, Heather Pace and Diwyacitta Nandini. "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report. Winter 2007.

9.) LaCuran, Alec, and Michael Olague. "Analysis of Chemical and Physical Compositions of Three Natural Streams", Chemistry 99 Report. Winter and Spring 2007.

10.) Ravanbakhsh, R. "The Viscosity of Motor Oil", California State Science Fair. 2003. <http://www.usc.edu/CSSF/History/2003/Projects/J1531.pdf >

11.) Arceo, Salvador. "Viscosities of Various Oils at Temperatures of 0 to 100°C", Chemistry 99 Report. Summer 2007.

Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC
01/30/2009 01:42 PM

To Linda Potter/InstructionOffice/MtSAC@MtSAC
cc vburley@mtsac.edu, lredinger@mtsac.edu
bcc
Subject Re: Your request for an extension on your Sabbatical Report

History: This message has been forwarded.

Dear Linda,

Thank you for your response to my request for an additional extension to complete my sabbatical report. The college has been more than gracious with previous extensions. The patience you have extended toward me has been appreciated. The college will receive my revised sabbatical report on 20 February.

To deliver my revised sabbatical report on time I will be making several adjustments to my schedule. As of today, I have been keeping up with my responsibilities as Department Chairperson and the other responsibilities that instructors maintain between semesters as well as my jury obligations. Since my jury service is not adjustable nor negotiable, I will rearrange other areas of responsibility. I have spoken to my Division Dean and he was willing to allow me the time needed to complete my Sabbatical responsibility on time.

Respectfully,

Charles G. Newman, Ph.D.
Chairperson, Department of Chemistry
Mt San Antonio College
1100 North Grand Ave.
Walnut, CA 91789-1399
(909) 594-5611 ext. 4014
Linda Potter/InstructionOffice/MtSAC

Linda Potter/InstructionOffice/MtSAC
01/29/2009 04:23 PM

To Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC@MtSAC
cc
Subject Your request for an extension on your Sabbatical Report

Please refer to the response to your request for an extension

Newman Sabbatical Report Extension Request Response.doc

Linda Potter
Executive Assistant - Vice President of Instruction
Mt. San Antonio College
909.594.5611 ext. 5414

Return Receipt

Your message:	Your request for an extension on your Sabbatical Report
was received by:	Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC
at:	01/30/2009 10:13:04 AM

Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC
01/29/2009 10:03 PM

To Linda Potter/InstructionOffice/MtSAC@MtSAC
cc
bcc
Subject Charles Newman is out of the office on Jury Duty.

I will be out of the office starting 01/26/2009 and will not return until 03/13/2009.

Linda Potter/InstructionOffice/MtSAC

01/29/2009 04:23 PM

To Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC

cc

bcc

Subject Your request for an extension on your Sabbatical Report

Please refer to the response to your request for an extension

Newman Sabbatical Report Extension Request Response.doc

Linda Potter
Executive Assistant - Vice President of Instruction
Mt. San Antonio College
909.594.5611 ext. 5414

MT. SAC
Mt. San Antonio College

Mt. San Antonio College
1100 North Grand Ave. ▪ Walnut, CA 91789 ▪ 909.594.5611

VIRGINIA R. BURLEY, PH.D.
Vice President of Instruction
vburley@mtsac.edu ext. 5414

January 29, 2009

Charles G. Newman
17292 Coralwood Circle
Yorba Linda, CA 92886

Dear Charlie:

I have taken your request to the Salary and Leaves Committee for an extension of the February 20, 2009 deadline for submission of a revised and completed sabbatical leave report. The Committee is not willing to extend the deadline.

Instead, I have been asked to remind you that the Committee has already granted a generous extension from September 2, 2008 until February 20, 2009, for your submission of a satisfactory report. Your email request for extension includes a brief status report on your progress in distributing the survey to which you had committed in your sabbatical leave proposal. Given the central place of the survey in the development of information that would establish real benefit to the College from your sabbatical activities, the Committee is seriously concerned about the lack of progress you describe.

I must remind you that at this point you have not submitted a satisfactory sabbatical report to the College, as is required in the Faculty Agreement. You are still welcome to submit a complete report to the S&L Committee by the February 20 deadline, but at that point if you have not completed a satisfactory report of your work, the S&L Committee must report that. Failure to submit a satisfactory report will result in the requirement that you reimburse the District for compensation you earned while on sabbatical leave, as we documented clearly in the packet of materials distributed to the applicants for sabbaticals.

I hope that you will find a way to complete your work and submit a report within the timeline. You are a highly valued faculty member, and we surely do not want to create difficulties for you.

Sincerely,

Ginny

Virginia R. Burley, Ph.D.
Chair, Salary & Leaves Committee
Vice President, Instruction

Newman

1. Proposal indicates survey of faculty and employers re: essential skills. To develop with RIE – no indication that surveys were done
2. These were supposed to be used to identify required/highly desired skills, categorize, rank by importance
3. A comparison of faculty vs. employer responses was to be the basis to identify discrepancies and the magnitude of difference; this would then drive what was to be incorporated into new learning modules.
4. Need to strengthen how the modules intentionally develop the intended skills; point out which skills/where in the module, and relate these to on-the-job from his internship. There seems to be little relationship between the on-the-job list (p.23) and the intended skills for the modules (p. 58-59)?
5. Supposed to disseminate results to other departments – no info on how this will happen, and not sure what would be useful to distribute? Benefit to the college/department?

12/10/08 met w/ Charlie Newman to convey the above points + recommendations. Confirmed deadline for him to submit acceptable revisions is Feb 20, 2009

D Bouck

MT. SAC
Mt. San Antonio College

SALARY AND LEAVES COMMITTEE 2008-09

COMMITTEE MEMBERS CHECKLIST FOR REVIEWING SABBATICAL LEAVE REPORTS

Sabbatical Recipient Charles Newman Received 10-17-08

1.		Comprehensiveness	11.	✓	Statement of purpose
2.	✓	Examples of pertinent materials	12.	✓	Table of contents (headings, listings, data, illustrations, etc.)
3.	✓	Clear description of research design and methods of investigation (if applicable)	13.	✓	Summary statement includes value to college
4.		Verification of course work units completed	14.	✓	Contains pertinent appendices
5.	✓	Substantiates conclusions, cites research or other sources of data	15.	✓	Footnotes (if applicable)
6.	✓	Distinguishes between personal opinion, empirical results, research results, theory	16.	✓	Quality typed or professional hand calligraphy
7.	✓	Uses scholarly approach with attention to detail	17.	no	Submitted by deadline date
8.		Pages numbered consecutively	18.	✓	Two copies received/3-hole punched no
9.	✓	Title page	19.	✓	Abstract of Report for Board Agenda
10.	✓	Copy of sabbatical application proposal			

Comments by Committee Member: As far as I can tell, there are no survey results from either faculty or local employers. On page 2 of 5 statement of purpose he says findings will be disseminated to other departments/staff - I see no indication that this is going to happen nor do I see any information that would be particularly helpful - this study results in only (2) learning modules. On page 8 of his Sabbatical report he indicates that he will conduct Research + Satisfaction Effectiveness to get help on his survey/questionnaire

Recommendations by Committee Member:

☐ Accept as submitted ☐ Accept with modifications noted ✓ Not acceptable (Needs full Committee review)

He even talks about discriminating the survey in his 1st line too much data about his daily assignments outside [illegible]

Signature of Committee Member

11/3/08
Date

MT. SAC
Mt. San Antonio College

SALARY AND LEAVES COMMITTEE 2008-09

COMMITTEE MEMBERS CHECKLIST FOR REVIEWING SABBATICAL LEAVE REPORTS

Sabbatical Recipient Charles Newman Received 10-17-08

1.	?	Comprehensiveness	11.	✓	Statement of purpose
2.		Examples of pertinent materials	12.	✓	Table of contents (headings, listings, data, illustrations, etc.)
3.		Clear description of research design and methods of investigation (if applicable)	13.	✓	Summary statement includes value to college
4.	NA	Verification of course work units completed	14.	✓	Contains pertinent appendices
5.		Substantiates conclusions, cites research or other sources of data	15.		Footnotes (if applicable)
6.		Distinguishes between personal opinion, empirical results, research results, theory	16.	✓	Quality typed or professional hand calligraphy
7.		Uses scholarly approach with attention to detail	17.	no	Submitted by deadline date
8.	✓	Pages numbered consecutively	18.	✓	Two copies received / 3-hole punched no
9.	✓	Title page	19.	✓	Abstract of Report for Board Agenda
10.	✓	Copy of sabbatical application proposal			

Comments by Committee Member: application
Part 2 of sabbatical states a survey will be given to Chem Dept faculty and local employers (p.8). Sabbatical report does not confirm that this survey was issued (p.40).

Recommendations by Committee Member:

☐ Accept as submitted ☐ Accept with modifications noted ☐ Not acceptable (Needs full Committee review)

Emily Winters
Signature of Committee Member

11/1/08
Date

Sabbatical Report

Spring 2008

Learning Modules

to

Teach Professional Skills

Charles G. Newman

Department of Chemistry

Table of Contents

Acknowledgements

I would like to acknowledge the following persons for their assistance on this sabbatical project. Without their help, this project would not have been possible. My thanks go out to George Marcina Director of Quality of Custom Building Products, Terry Catlin, Vice President, Board of Directors and Nel Groenvelt, Laboratory Director, of Inland Empire Utility Agency for allowing me the opportunity to work as a technician in their laboratories and to better understand the skills necessary to be a solid contributing employee. I only wish more college faculty would volunteer or work as an intern in a business or industrial environment and gain the wealth of knowledge I was allotted.

I would also like to acknowledge my laboratory supervisors; they were Juan Flores, Carlos Martinez and Periaswamy Arjunan from Custom Building Products and Kevin Tang and Jennifer Huber from Inland Empire Utility Agency. Thank you for treating as you would any entry-level employee. I greatly appreciated the opportunity and the experience.

I would like to thank the faculty and staff in the Department of Chemistry and the Natural Science Division for their support and encouragement.

I would also like to express my gratitude to the administration at Mt San Antonio College for their insight and wisdom recognizing that there is more to a solid entry-level employee that just a technical education.

Statement of Purpose

A few precious minutes are all a candidate has in a job interview to demonstrate technical competence, professional skills, and how he/she intends to contribute to an organization. According to our Chemical Laboratory Technician Program Advisory Committee, representing about fourteen local businesses, employers want candidates that have solid fundamental technical skills and excellent professional skills. Many of the professional skills employers look for in potential candidates are: organization, integrity (character), dependability, personal responsibility, good communication skills (written, verbal and computer), problem solving ability and a positive attitude. These skills all add up to a productive team member that works well with others and shows initiative.

Consistent with the aim of the Advisory Committee, this sabbatical sought to identify and quantify, first hand, the professional skills that employers desire in their employees and, to build learning modules that cultivate professional skills into a laboratory based curriculum. The goal was to construct scientific laboratory activities where students could learn and practice professional skills in a teamwork environment. According to Advisory Committee recommendations, if students could learn and integrate professional skills into their everyday work habits, they would be better equipped to enter the work force.

Adapting applied project based learning modules into a classroom setting would provide students the opportunity to integrate professional skills into a scientific laboratory environment. Conducting these project based learning modules as a professional laboratory, would offer students the opportunity to put these professional skills into practice. Integrating traditional laboratory activities with project based learning modules would allow students to gain the necessary technical, professional and interpersonal skills that employers insist upon in entry-level applicants.

The results of this sabbatical project are intended to offer students vision into a laboratory workplace environment and to equip them for immediate success in their new entry-level position. Project findings will be disseminated to other departments, divisions and the college. In addition sharing results with our Advisory Committee and community would build relationships with local employers who could hire our graduates and become more involved with this program.

To accomplish this goal, I volunteered, or interned, at two different laboratories in two different industries. The first was the Research and Development laboratory at Custom Building Products, Inc. in Santa Fe Springs, CA. The second was the Analytical Laboratory for Inland Empire Utility Agency in Ontario, CA. To gain the maximum experience and gather the most information on professional skills, the two laboratories were chosen from entirely different industries. Custom Building Products is a for-profit Corporation whose products

are sold around the world, mostly through Home Depot stores. Inland Empire Utility Agency is a public Agency that treats and processes waste water for over 400 square miles in the Ontario area. It was believed that job assignments in both a private corporation and a public agency would provide a wider background and a better overall understanding of professional skill expectations in very different laboratory workplace environments.

This sabbatical project intended to construct two different project based learning modules that could be integrated into a class offered in spring 2009 (Introduction to Chemical Laboratory Technology, (CHMT 1). Each learning module, as part of the class, would be designed to be 15 to 20 hours in length. Students would be treated as laboratory employees and be subject to similar rules and expectations as a laboratory workplace. A focus on communication skills and teamwork skills would be highlighted. As a final project, students would be required to present their learning module project findings in both written report format and as a presentation seminar to the entire class.

Section One

Sabbatical Request

Sabbatical Request

Spring 2008

Learning Modules to Teach Professional Skills

Charles G. Newman

Department of Chemistry

Sabbatical Request

March to June 2008

Summary

This sabbatical project will concentrate on understanding the professional and technical roles of Chemical Laboratory Technicians. During spring semester, 2008, considerable effort will be placed on identifying critical areas where professional skills are required to be successful in the work place. This project will combine first-hand knowledge working as a laboratory technician, and surveys collected from both faculty and local employers. Sabbatical findings will be utilized to build Learning Modules expected to improve professional skills for those students within the Chemical Laboratory Technician program and to other degree programs within the college.

Justification

Academic intuitions stress technical knowledge based skills and do little to stress professional working or interpersonal skills. Although workplace technical competency is critical, non-technical skills may be equally or more important in a business environment. To confirm this, data will be collected and measured against the metric of employer expectations.

Plan

I intend to volunteer as a Chemical Laboratory Technician at two different businesses, in two different industries, and learn as much as I can what employers expect from entry-level employees. Required and highly desired skills will be identified, documented, categorized and ranked by importance. The information gained during this sabbatical project will be distilled into Learning Modules and taught to our Chemical Laboratory Technology students so they are aware of employer expectations. This first hand knowledge will be supplemented with surveys from industrial employers and chemistry faculty. If these Learning Modules are shown to be beneficial, they will be shared with other degree programs on campus.

The Proposed Sabbatical Project

Objectives:

Part 1: Acquire Technical and Non-technical Skill Set Information through Work Experience.

1. I've offered to volunteer as a Laboratory Technician at several local businesses.
2. Two facilities have responded (See emails attached to the original proposal.)
    a. Inland Empire Utility Agency – Waste Water Treatment Facility in Ontario, CA

b. Custom Building Products – Manufacturer of cements, grouts, tile adhesives and ceramic material cleaners in Santa Fe Springs, CA

3. With prior written consent from each employer, collect information on desired working skills.
4. Document essential technical, non-technical skills and competency levels.
5. Gain first-hand information on all skill set requirements for entry-level lab technicians.
6. Using an "Activity Journal" (diary format), document the activities performed and the necessary skills required for success.
7. Rank essential and desired skill set requirements by each employer.

Part 2: Verify Required and Highly Desired Skill Competencies by Survey.

1. With assistance from Research and Institutional Effectiveness (RIE), construct a survey to be given to Chemistry Department faculty and local employers.
2. Compare the responses from faculty and employers, identify the specific skill areas where discrepancies exist and determine the magnitude of the discrepancy.
3. The results from survey respondents will define the specific areas that may be included as Learning Module topics.

Part 3: Construct Learning Modules for the Chemical Laboratory Technician Program

1. Based on first-hand observations and survey respondent results, build Learning Modules that illustrate the skill sets necessary for success in a working environment.
    a. Construct hands-on laboratory based technical skill set activities.
    b. Construct Learning Modules that illustrate Professional skills.
    c. Construct Learning Modules that illustrate Interpersonal skills.
2. Test Learning Modules during fall 2008.
3. Based on employer and student responses validate Learning Module importance.
4. Plan to make the Learning Modules available to other disciplines at the college.

Project Goals:

The overriding goal of this sabbatical project is to:

- better equip our students for a professional career,
    - provide real world examples, through Learning Modules, that illustrate typical workplace situations,
    - provide credible, verifiable and essential skill sets requirements for the workplace,
    - teach students the necessary technical, professional and interpersonal skills that employers desire,

- disseminate project findings to the department, division and college,
- disseminate findings to the educational community at large,
- build stakeholder commitment with the community and local employers

Project Timeline:

Sabbatical Project Timeline is found on page 6.

Final Report and Findings:

The final report will be submitted on-time for review and presentation. The following information will be available for dissemination:

- Survey Results from Chemistry Faculty, Employers and Supervisors
- Professional skill Learning Modules - both lecture and hands-on laboratory activities

Benefit to the Community

Along with the goal to better equip our students to enter the workforce comes the opportunity of grow our industrial contact base, to gain increased stakeholder involvement by local industries and to further identify industrial sectors that seek to hire our Chemical Laboratory Technician graduates.

Benefit to the College and the Department of Chemistry

This proposed sabbatical project complements the existing department and division goals with respect to supporting the Chemical Laboratory Technician

program. The completion of this project will provide an increased understanding into the technical and professional skill set competencies necessary to becoming a successful Chemical Laboratory Technician. These findings will be integrated into the existing Chemical Laboratory Technician curriculum so our program graduates are sought after by local employers.

Having a tenured faculty gain first hand experience working as a technician underscores our dedication and commitment for all program stakeholders. From an employer's perspective, this sabbatical project is a statement of assurance to maintain a current and relevant program content in a changing professional environment. By working in their facilities, employers will feel more connected to the college. They will feel their voices are being heard where specific professional skill needs are being addressed and integrates into our program. The results of this sabbatical project would increase stakeholder involvement between the community and the college.

Since most chemistry faculty have little industrial experience, sharing this sabbatical experience would benefit the entire department. Since the overwhelming majority of our students will work in some sort of a for-profit business, the industrial experience gained by this sabbatical project would be valuable to all our students as well. Again, these sabbatical project findings would be available to everyone to use or integrate into their specific programs throughout the college.

Benefit to the Instructor

Ever since I began graduate school, I questioned the standard education model used in the sciences to equip graduates for a career. It became painfully obvious that the State University and University of California systems educate students to become academic researchers. In a sense, University professors were propagating themselves. Since most academicians have never worked in an industrial environment, it is reasonable that they would teach what they know, basic research from an academic perspective. However, more that 80% of science majors begin their careers in a business environment. Therefore, we as educators should realize this fact and make provisions to address this disconnect.

This sabbatical would benefit me by increasing my understanding of the businesses that surround our community. This experience would also add confidence and authority to my presentations to industrial members and to potential employers of our graduates. Even though I have 21 years of industrial experience and have supervised numerous technicians, a current fresh experience could only refresh, compliment and validate my lecture presentations.

Benefit to the Students

The overriding goal of this sabbatical project is to provide students with the best educational experience possible so program graduates not only become successful entry-level employees, but that employers would request to hire our graduates.

Comment:

Prior to the submission of this proposal, project goals, objectives and outcomes were shared with two consultants from College Chemistry Consultants, (an advisory group that works closely with the American Chemical Society). (One of these consultants, was a former laboratory technician and now a Ph.D. in Chemical Engineering who was a key participant in the formation of the Technician branch of the American Chemical Society. The other consultant initiated and was a Program Director of the Chemical Technician program and later became the Dean of Sciences and Letters at City College of New York.) Both consultants believed this sabbatical project would benefit our program and our students.

Projected Timeline

The following is a projected timeline for the proposed sabbatical project scheduled for spring 2008.

Month	Proposed Projects				
	Industrial Site	Observations	Surveys	Findings	Learning Modules
March	Custom Building Products	Document skills necessary	Construct Survey with RIE Complete and test Survey with RIE		
April	Custom Building Products	Draft summary findings	Disseminate Survey	Data Collection	Build Modules
May	Inland Empire Utility Agency	Document skills necessary	Disseminate Survey	Data Collection	
June	Inland Empire Utility Agency	Document skills necessary Draft summary findings		Data Reduction Draft Formal Report of Findings	Build Modules

This Sabbatical Project final report will include the all observations made on-site at the industrial facilities previously mentioned.

Section Two

Work Activities

Work Activities

To validate the importance the Professional Skills I volunteered/interned as a laboratory technician at two different facilities. Working in a professional laboratory provided me the opportunity to observe and to practice the skills required to be a professional technician. The following portions of this report are my experiences.

Observations That Validate the Statements Above: Custom Building Products

Volunteering as a Laboratory Technician at Custom Building Products (CBP), I found that most instructions were verbal. I had to pay close attention and quickly ask questions when I was unclear about my assignment. Typically, I was shown how to do something once, then asked to demonstrate it. If I did well, I was allowed to complete the task on my own. My supervisors, other professional laboratory technicians, would check-up on me to insure I was performing up to their expectations.

Certain aspects of my first assignment I completed to the expectations of CBP. On other occasions, I needed assistance. On tasks where I needed more explanation, my supervisors became visibly frustrated. As long as I tried my best, and remained engaged in explanations, I was able to diffuse the frustration. After the first four hours, I was turned loose to continue on my own.

My first week was spent preparing samples and measuring both peel strengths and shear strengths of a product called EasyMat®. My supervisor was satisfied with the quality and quantity of work I completed. After a few days of data collection, I assisted

with the construction of a graph that served as a pictorial reference as to EasyMat® product consistency. I was able to build Excel charts easier than my supervisor, so I helped him, so he could impress his boss. After a bit of teaching him about graphing spreadsheet data, he was on his own. See **Appendix A**.

During my second assignment, color matching of tile grouts, I was asked to prepare several formulations and make batches of product using approved and unqualified raw materials. My supervisor on this project wanted me to be exact in all my measurements and work fast. Even though I was familiar with the equipment and the techniques, I found I was not as fast as I had hoped. I tried to work as fast as possible without making mistakes. The next day I had a bit more confidence and began to work faster but ultimately made a mistake. My supervisor caught my mistake and reworked that formulation to arrive at the answer he expected.

This second assignment proved challenging. Part of requirements for this task was to see subtle color differences between the grouts that contained the

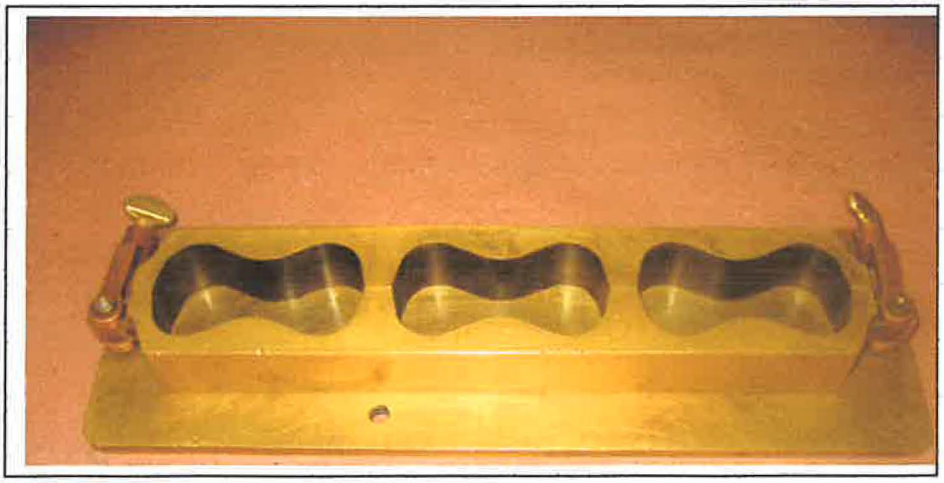
different raw materials. This was something that was challenging. I struggled to discern very subtle color differences. CBP wisely changed my assignment to a different project.

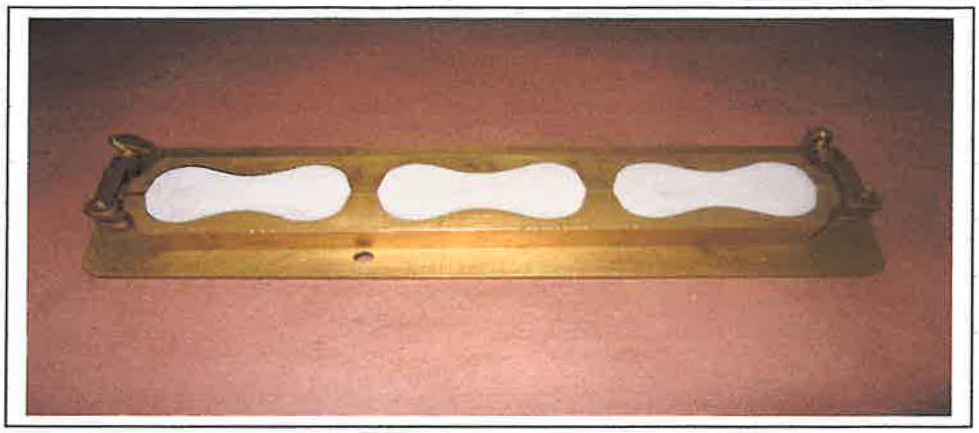
The third assignment was to work with a different technician and a Research and Development Manager to modify an existing standard cement grout product. After discussions with the technician and the R&D manager they designed a set of experiments to test various formulations with the goal of improving the strength of standard cement grout.

Willard Hotel, Washington D.C.

The experimental matrix involved over 38 different formulations. See **Appendix B** and the functional testing of the standard cement grout product is found in **Appendix C**.

The goal was to increase the durability of this experimental grout product so it would resist breakage. To test for improvement, different formulations were prepared, mixed with water and cast into molds to achieve a specific shape and dimensions. (Shown below) These shapes were affectionately known as "dog bones."





With each trial several standard cement grout-like formulation duplicate castings were made. Once the dog bones had dried for 12+ hours, the dried grout-like products were removed from their molds and labeled with a specific laboratory code number. To test for strength, the dog bones were allowed to cure for seven and 28 days. At both the seven and 28 day times, the dog bones were evaluated for strength using a destructive testing technique. To produce the most reproducible controlled testing method, the destructive technique was computer controlled. (Shown Below)

The image on the left is the dog bone sample before testing. The sample is mounted in a set of steel jaws and stretched until the dog bone breaks. The image on the right is the broken dog bone after the test was complete. During the test, as the dog bones are stretched, electronic strain gages are continuously measuring and recording the force on the sample. At the breaking point, the computer records the maximum force placed on the sample and that is considered to be the breaking or tensile strength. By June this project had not yet been completed. Indications of follow on work suggested that even with 40 or so formulation variations the tensile strength showed no appreciable increase.

At CBP, the technicians arrive and "clock-in" to work between 6:30 and 7:00 AM. They were allowed one 15 minute morning break and another in the afternoon. Lunch was 30 minutes and employees took their lunch break at a time that was convenient with their project. Most employees brought their lunches and ate in the lunch room. The technicians "clocked-out" when their tasks were complete which could be anywhere from 3:30 to 5:00 PM. This type of work is time sensitive and once begun, it had to be completed. Therefore, breaks and lunch were fit into the workday, not vice versa.

Sample Daily Log at Custom Building Products

Day 1 – Product Testing (EasyMat® shear and peel strengths)

- Adhesion Testing (Shear and Peel strengths)
    - Received anywhere from 12 to 20 samples of coated material for adhesion testing
    - Cut 3-1"x6" and 3-1"x12" samples from each product sample.
    - Label the paper back with the appropriate lot number and test piece
    - Pre-clean the steel and copper testing panels. (to bake off all residual organic, asphalt and other contamination)

Day 2 – I recommended making a tool holder to increase panel throughput. The method of heat treating and cleaning test panels was to heat two panels to 600°C for 8 minutes. The Director of Quality and the Laboratory Manager drew a picture and had it made. Present throughput is now 10 to 12 panels to 600°C for 24 minutes.

Day 7 – Summarize data from the EasyMat® evaluation

- Two suppliers – one East Coast and the other West Coast
- The West Coast Supplier delivers good material, whereas, the peel strengths from the East Coast Supplier is lower and erratic.
- Entered data onto an Excel spread sheet and constructed a run chart of the average shear and peel strength values.

While at Custom Building Products I began to record specific "Professional Skills" that were necessary to be successful at this job. These observations were to:

- Follow verbal instruction
- Pay attention at ALL times to the best of your ability
- Pay attention to detail – even the smallest detail may have an effect on the outcome.
- Follow ALL safety rules –written or unwritten (specifically safety glasses and don't eat or drink in the lab or manufacturing areas)
- Be precise – consistent with each sample to be tested or measured. The method must be consistent and followed exactly each time. Erratic testing procedures will result in confusion and may cost the company money, time and reputation.
- Multitask when possible and if no project would be in jeopardy. Make the best use of your time at all times.
- Do what you're asked and do it well. Someone is always watching even if you don't realize it.
- Be flexible – situations in business are fluid. Your goal is to satisfy (meeting and exceeding) your internal (supervisor) or external customer's needs while maximizing profits so the company can grow.
- Pay attention to detail – how others view the quality of your work and your capability and value to the company.

- Always stay busy – don't have others see you goofing off or taking long breaks.
- Always look for ways to improve what YOU are doing. Tell your supervisor when you have a good idea. Get your supervisor's approval before you act on your idea. (This may require additional work. Conduct both processes concurrently. Collect data from both ways and then compare.)
- Have pride in your work. The quality of your work is a reflection on you.
- Get your supervisor's opinion and find out for certain if you are meeting their expectations.
- Always strive to be better, more accurate and more efficient at your job.
- Look for ways to better express or more clearly show your data and results.
- Learn to be computer literate. (Microsoft Office suite of products) Stay current or you'll be left behind.
- Always continue to learn. (Continuing education such as cross-training, seminars, workshops, college courses and teaching yourself.)
- Be thorough and check your work.
- Keep your work and work area neat and organized
- Complete all tasks
- Be dependable because people are depending on you and your work results.
- Stress accuracy and precision
- Become an expert at your job no matter how routine or repetitive that job is.

My volunteer experience at Custom Building Products R&D Laboratories was great. The staff was dedicated, optimistic and committed to doing their best. The laboratory environment was professional, supportive and organized. My supervisors (Juan, Carlos and Arjun) were patient, congenial and clearly communicated their expectations. One of the more impressive aspects about CBP was that questions were answered immediately. The staff really valued time. From Laboratory Assistants to Research Managers, everyone participated and was willing to do whatever was necessary to achieve the desired project outcome. This was a valuable experience, one that I will share with my students.

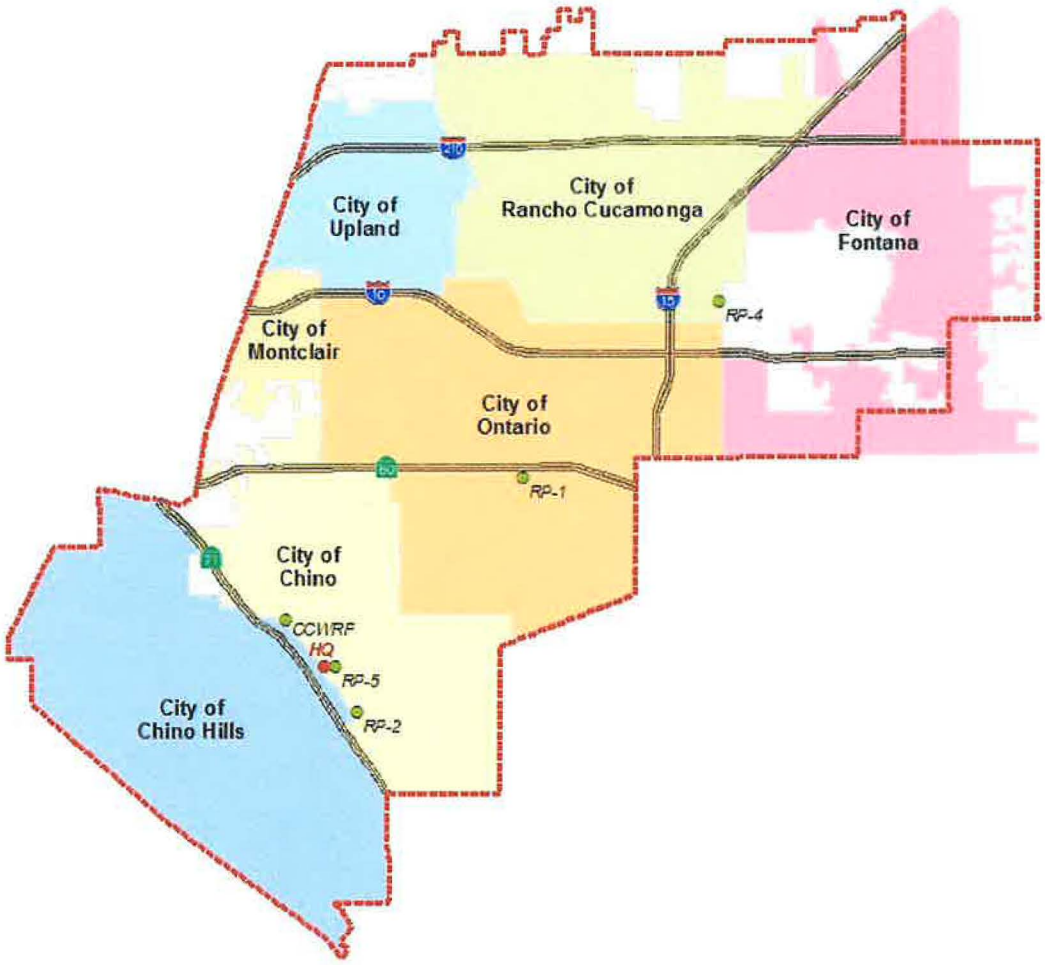
Observations that validate the statements above: Inland Empire Utility Agency

As with volunteering at CBP, being an Intern at Inland Empire Utility Agency proved to be challenging and hard work.

Many people take for granted the treatment and recycling of waste water. In general, people are unaware that many groups of highly trained professionals are processing and cleaning waste water so it can be recycled and used again. (Federal laws, Title 22, California Code and Regulations for Drinking Water, clearly states pollutant concentration levels for drinking water and treated water) IEUA is regulated by the National Pollution Discharge Elimination System (NPDES) permitting program as authorized by the clean water act.

Inland Empire Utility Agency is responsible for the collection and treatment of waste water from a 242 square mile area of southwestern San Bernardino County. (See Map below) All of the waste water is brought into the agency's five treatment

plants. Employed at each treatment facility are experienced technical, operational and scientific personal to insure public health in compliance with Federal and State Regulations.



The process of treating waste water is complicated and employs many sophisticated chemical and engineering operations. A detailed outline of waste water processing can be found on the Inland Empire Utility Agency website[4]. For brevity sake, I have summarized some of that information.

Raw sewage, from surrounding waste systems, is received by the treatment plant and passed through screens to removal grit that could damage downstream equipment. These collected materials are then transported to a local landfill for disposal. The waste water stream then flows through a biological environment for nitrification and de-nitrification. In this process, the waste water flows through a series of tanks that contain moderate and low levels of dissolved oxygen where biological microorganisms reduce nitrogen concentrations.

The waste water then flows through different clarifying processes to further separate suspended solids from the treated water. From this point the waste water proceeds to a tertiary treatment facility where additional chemical agents and processing steps further cleanse the water. As part of the final process, the treated water is chlorinated, then de-chlorinated and then flows through a sand filter to remove suspended particulates. After filtering, the treated water from Regional Plant No.1 enters the Cucamonga Flood Control Channel. This flood control channel is a tributary to the Santa Ana River.

The solids removed from the treatment process are concentrated then processed in a "digester" to stabilize the solid materials. Once stabilized, the solids are dried and the dried materials are trucked to an agency composting site. This digestion process produces several byproduct gases that are contained (reducing odors) and collected. Some of the collected gas is methane, natural gas, which is used to produce electricity. About half of the facility's electricity requirements are produced from these gases.

Regional Plant No.1 (RP-1) is highly dependent upon computer controlled processing equipment. A state-of-the-art computer system provides control for various plant equipment and operations, such as the oxygen reduction potential system. Plant operations must be tightly controlled in order to effectively treat and discharge several million gallons of treated water per day.

Appendix E contains a detailed outline of the Water Treatment and Recycle Process[4].

Samples from various locations within RP-1 and the other treatment plants were collected by trained process technicians and delivered to the Ontario facility. At the start of the day the samples from RP-1 were already in the lab. Samples from the other facilities arrived at about 9:00 AM. All of the samples delivered required a variety of chemical and physical tests. To satisfy "chain of custody" requirements and all governmental agency requirements, the results from each analysis were logged into a central computer at the end of each day.

Laboratory test results are a clear indicator of how efficiently the waste water treatment process is operating at each specific location within the facility. Plant operators depend upon timely and accurate laboratory results as a guide or measure to confirm plant treatment operations and efficiencies of each treatment unit. Since the materials contained in the waste water streams vary on a daily

basis, continuous monitoring, accurate and timely analysis are required to make the appropriate adjustments that are essential to discharge treated water that meets Federal Standards.

My first laboratory assignment was to prepare water samples for two different automatic computer controlled Total Organic Carbon (TOC) analyzers. Six or more half to one-gallon samples were delivered each morning from multiple sites within the facility. Generally, the samples consisted of an Inflow (incoming water), Primary Effluent (water after primary separation), three samples from the Aeration Basins (secondary treatment), Secondary Effluent and two or more additional samples. Often additional industrial based samples were sampled, analyzed and reported.

Most of the liquid samples were obtained from the same location on different days. However, Monday and Wednesdays there were more samples to analyze than Tuesday and Thursdays. Once all the samples had been prepared for TOC analysis, somewhere between thirty and sixty samples, the analyzers began the computer controlled analysis process. At the end of each analysis set, the computer stored results were down loaded to the central computer.

Often specific samples required grinding with an industrial strength kitchen blender to homogenize the water solution before testing. To protect the small piping and tubing in the TOC analyzers from becoming plugged up, larger particles were physically removed. For me, sample set up time ranged from three to seven hours

depending upon how many samples were to be analyzed and which of the two instruments were being operated.

My second and last assignment, an essential laboratory test, was solids analysis. Solids analysis is an important metric used to access the efficiency of plant operations. It determines the quantity of suspended solids at each location within the plant. At certain locations concentrations of suspended solids should be low. If this value were high, it is possible the lab made an error or the treatment process was not operating at peak efficiency. Solids analysis includes total suspended solids and inorganic solids, the material that does not burn.

To do a good job in solids analysis the technician must be fast, accurate and save time by multitasking. Multitasking requires that the technician pay attention at all times. (On a few occasions my mind wondered causing me to be unsure of exactly what I did. Rather than taking the risk of producing bad data, I would repeat the entire test.) Mixing up samples or sample locations could cause different solids value results that could mislead plant operators that were controlling plant operations. On the surface this assignment appeared easy, but it was not.

Part of solids analysis was the analysis of sludge. As I began my first sludge analysis, my supervisor reminded me that sludge was not the solid material that goes down the toilet. Sludge was the result of bubbling air through partially

treated waste water. Even so, it didn't smell pleasant. Determining the amount of solids and water contained in the sludge was important to efficient plant operations.

Occasionally, other samples would arrive for solids analysis. Some samples originated from food processing plants and other industrial sites. Either way, the same tests routinely done on sludge was done on these samples.

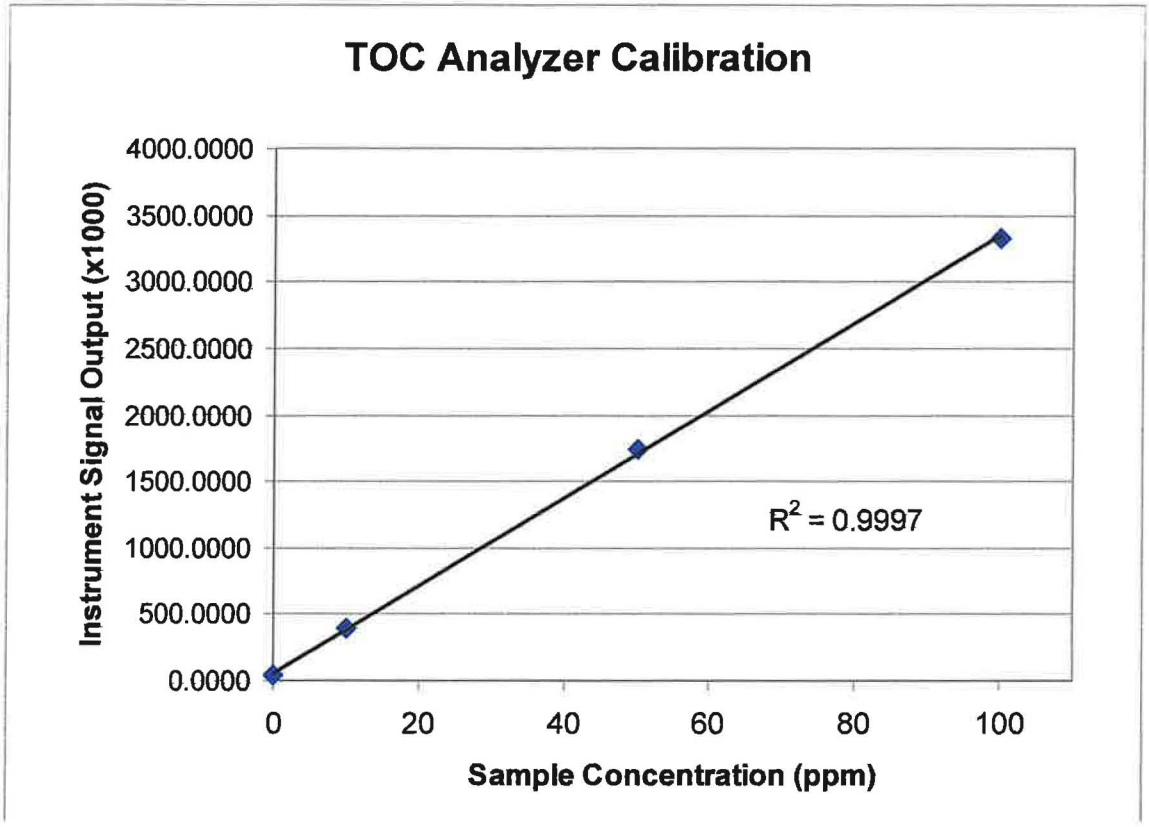
Both of my IEUA assignments required me to stand the entire day. Other than using the bathroom and lunch, I usually did not take breaks. However, when someone would bring in a homemade dessert, I made sure to take a break.

Both assignments required adhering to all safety procedures, attention to detail, and following sample protocol, exactly. I had to pay attention all the time. I tried not to chit chat so I would not be distracted.

To decrease the repetitive nature of these analyses, technicians were rotated to a different assignment stations about every three months. This allowed each technician to stay focused. Rotation, also, insured that all technicians were trained in all the analysis procedures in the laboratory. This cross training provided technical back-up if someone were out ill or on vacation. Since waste water treatment is a seven day operation, technicians rotated on weekends.

The IEUA laboratories began operation at 6:00 AM. Most laboratory staff arrived ready to work between 6:30 and 7:00. Depending on the schedule, quitting times were between 3:00 and 4:30. The laboratory staff was allowed to take breaks when time permitted. Lunch was between 30 and 45 minutes and on the honor system.

Near the end of my assignment, I had the opportunity to set-up an instrumentation calibration test on one of the total organic carbon (TOC) analyzers. In the lab, the technicians had a cardboard Burger King crown with the number 0.9999 written on the front. This 0.9999 represents the correlation coefficient received when an instrument calibration is done exceptionally well. (The closer to 1.0000 the better) Technicians that calibrate instruments to 0.9999 get to wear the crown. I really wanted to wear the crown. I tried my best to calibrate the instrument and received a correlation coefficient of 0.9997. Even though I did not get to wear the crown I was pleased with my accuracy. (The results of my calibration test are shown below.)



Sample Daily Log at Inland Empire Utility Agency, RP-1

Day 1: New Employee Orientation

Computer learning and training modules on various workplace issues.

Computer guided Study Lessons

- Disaster Preparedness
- Water Industry Driving Safety
- General Ergonomics
- General First Aid
- Water Industry Lab Safety

- Office Safety
- Water Industry Personal Protective Equipment
- Sexual Harassment

A short quiz was given at the end of each section. (Passing was 70% on each quiz)

Day 2: Observed Kevin Tang prepare (simpler) samples for Total Organic Carbon (TOC) analysis. (High and low level instruments)

- Transferred samples to a TOC auto sampler for analysis at a later time.
- Assisted with data input of TOC results into the Laboratory Information Management (computer) System (LIMS).
- Observed final testing of samples for Biological Oxygen Demand (BOD) using a dissolved oxygen meter.

Day 3: With Kevin Tang and Jen Huber as my supervisors, continued preparing sample for Total Organic Carbon (TOC) analysis.

Samples were prepared for two different methods, (high and low TOC concentrations) from samples at various locations within the plant and from different plant facilities within the Agency.

Observed, for a second time, Dissolved Oxygen probe calibration for Biological Oxygen Demand (BOD)

Day 4: The low level total organic carbon (Phoenix) samples were neat (straight) (visibly inspect and remove any particles)

Spiked RP-1 Samples were prepared by diluting 25.0mL of sample with 250µL of the Laboratory Control Standard (LCS) then fill to the 50.0mL mark with "Nanopure" water.

A Laboratory made Control Standard was also run. To prepare control samples use an Eppendorf, pipet to transfer 250µL of LCS into a 50mL dilution tube and dilute to 50.0mL

For further calibration check purposes, another standard is run using 500µL (2X250µL) of a purchased Quality Control Standard (QCS) and is prepared by using fill to the 50.0mL mark with "Nano" water.

My overall impression of the Inland Empire Utility Agency laboratory at RP-1 was fantastic. The people were bright, optimistic, serious about their work, and they understood the consequences for poor analysis. The laboratory environment was professional, supportive and organized in an efficient design. My direct supervisors (Kevin and Jen) were patient, clearly share their expectations and would jump in if I got into a jam. All of the lab workers that I worked with were organized, dependable and dedicated to doing their best to meet or beat the standards of their particular job function. All the lab workers showed excellent lab technique and worked safely in all their dealings with sample materials.

As an instructor, I teach students about precision and accuracy. At the RP-1 laboratory they live by precision and accuracy. I felt fortunate to have worked with the laboratory staff at Inland Empire Utility Agency. I will never forget this experience and the first hand knowledge I gained.

Section Three

Professional Skills

Professional Skills

Part One – Background, Advisory Committee

About three years ago, at our Chemical Laboratory Technology Advisory Committee Meeting, one of our Industrial members stated that if they found a candidate that had good professional skills and lacked some of the required technical skills; they would hire that person and train them in the technical areas. This statement was quite telling. As educators we train students in the technical areas with little emphasis on the "softer" professional skills. If educators were requested to teach students professional skills, most educators would feel unqualified to teach in areas outside their discipline.

At a different Advisory Committee Meeting, another member stated that more employees are terminated for unprofessional behavior than for lack of technical expertise. Usually employees with extreme cases of unprofessional behavior are terminated, fired, whereas, minor cases are recommended for further training. American business moves fast, requires employees that are flexible, have good communications skills and work well in a team environment under pressure.

By the time employees have passed their probationary periods, companies prefer to retrain their employees than to terminate them. During the employee's annual performance reviews, both technical and professional skill deficiencies are discussed and documented. (More serious deficiencies are usually discussed on

an as-needed basis.) For professional areas that require minor improvement, managers will outline improvement plans that include specific measureable goals and milestones dates for progress reviews.

Many business continuing education programs are available that teach Time Management, Professional Organization, Interpersonal Communications, Teamwork and Teambuilding, Conflict Resolution. Interestingly, these are the very areas that employers say their employees need additional education and training. These are the foundational characteristics that form most professional skills.

Part Two – Essential Professional Skills

Results from our Industrial members of the Chemical Laboratory Technician Advisory Committee listed the following Professional Skills as essential to successful workplace performance[1]. Employers were looking for candidates that have:

- Organizational Skills
- Integrity and Character
- Dependability and Personal Responsibility
- Communication Skills: both Written, Verbal and Computer
- A Positive Attitude – A "Can-Do" Spirit
- A Productive Team Member – works well with others
- Problem Solving Abilities – not just from books
- Initiative (Self Motivation – Self Starter) and show it

Chemical and Engineering News, a weekly magazine by The American Chemical Society[2,3] lists the more important professional skills for laboratory professionals as follows:

- Communication Skills
- Leadership and Teamwork Skills
- Problem Solving Abilities
- Flexibility and Creativity
- Initiative and Follow-through
- Interpersonal Skills
- Computer Literacy
- Business Orientation

Surprisingly the professional skills list from our Advisory Committee and that of the American Chemical Society are quite similar. The importance of professional skills can not be emphasized enough. Shortcomings in any of the above skill areas may jeopardize, or at the least limit, an employee's future. Employees lacking professional skills run the risk of limited future earning potential, future promotions and if sever enough become detrimental to job security.

Section Four

Project Based Experiences

Project Based Experiences

From this sabbatical experience, I found that the eight point Professional Skills list offered by both our Advisor Committee and the American Chemical Society was by no means complete. If anything, the eight point list should be considered as a general overview for professional skills. As listed in the sample Daily Diary section, employers expect employees to have the skills from the eight point list and many more.

With unemployment rising, securing a professional entry-level position is difficult and will become even more competitive. For recent graduates, with little to no scientific laboratory experience, being familiar with Professional Skills is not sufficient to attract a potential employer's attention. Recent graduates that can demonstrate professional skills are more likely to land that first position. Graduates with Internship experience and project based experiences that put professional skills into practice, have the best chance at securing an entry-level position.

According to our Advisory Committee the most valued experience an entry-level candidate can have is internship experience. Internship experience (Work Experience CHMT 9) is required for graduation. However, the reality is that not all students, for one reason or another, are capable of securing or being successful in an internship position. Students that have internship experience but lack professional skills will still have difficulties getting hired and satisfying their employer expectations. I contend that project based laboratory activities that allow students

to take ownership, gain a clear understanding of their project and have an opportunity to practice professional skills will be better prepared to enter and succeed in the workforce.

Employers expect all employees, interns included, to be able to work safely and to demonstrate good laboratory practices. Project based learning modules offer an opportunity to practice laboratory safety, good laboratory practices and the professional skills employers expect. Projects also allow students more time to gain experience and to perfect the skills necessary to be successful in a working laboratory.

I believe two different "project based learning modules" can be constructed and incorporated into the existing Introduction to Chemical Laboratory Technology (CHMT 1) course. My professional and sabbatical experiences working at private and governmental laboratories have taught me that "project based learning modules" can be constructed with current equipment and instrumentation already available at the college. To accomplish this I propose the following two learning module activities. The first activity would be the weekly collecting physical data, sampling and analyzing for selected chemical compounds found in stream and pond waters within the Mt San Antonio College Wildlife Sanctuary. The second activity would be conducting ongoing studies of viscosity, the "thickness of a liquid", with commercially obtained samples or with fresh and spent motor oils collected from the Mt. San Antonio College Transportation Department.

In some respects the proposed "project based learning modules" are a hybrid of traditional chemical laboratory experiments and Chemistry 99, Special Projects in Chemistry. Traditional chemical laboratory experiments require 2 to 6 hours of actual lab time to complete. These traditional experiments are structured, controlled and with a specific goal or expected result. With very little practice time to perfect a technique; students would be graded on accuracy and precision. In the 2-unit Chemistry 99, "Special Projects in Chemistry", students invest six to eight hours per week for an entire semester, usually, on one project. If the project was technique based, students have the opportunity and time to develop their skills and to gain confidence as their project progresses. Often times in "Special Projects in Chemistry" the outcomes were unknown, the students and instructor would learn together. As instructors, the goal of any course would be to provide the opportunity for students to gain a deeper understanding of a specific learning activity. I believe a hybrid approach of the traditional and the Special Project courses could be created into a "project based learning module". It is my hope that these learning modules would provide students the opportunity to gain technical experience and to apply the professional skills necessary to be successful in the workplace.

The two proposed "project based learning modules" would incorporate the following opportunities to build professional skills. Each learning module would be designed to provide:

- Scientific project based experiences that teach project ownership and pride in accomplishment
- Sufficient time for students to understand their project
- Sufficient practice for students to master a specific laboratory technique
- Team based experiences with a set time duration goal
- Repeated use of equipment that would provide confidence and experience
- Data documentation and data archiving using Excel
- Organization building and personal management skills through handling and analyzing multiple samples and results
- Opportunities to practice communication skills by conducting an oral, seminar style, presentation.
- Opportunities to work independently
- Seeing a project form the beginning to completion
- Working on a team to reach a common goal

Project Based Learning Module - Activity One

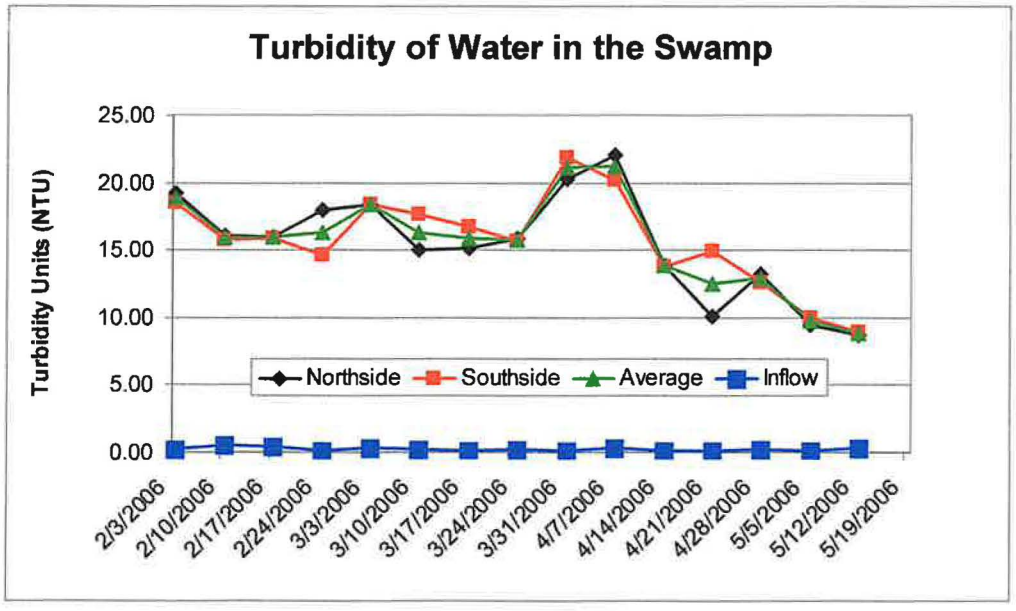
The campus has a wonderful Wildlife Sanctuary that contains three bodies of water, a pond, a lake and swamp, and a stream that is the head water for Snow Creek. With students interested in ecology, biology and the environment, the sanctuary offers an opportunity to monitor the physical and chemical properties of these bodies of water. Water analysis would include sampling these water sources in the Wildlife Sanctuary; it could, also, be expanded to other water sources on campus.

I propose that each team of students collect water samples from their respective sample sites (three to five sites per team) on a weekly basis. As with a government laboratory, students would be required to maintain a basic "Chain of Custody" and employ standard data collection and storage techniques. These techniques would include sample "log-in" with collection dates, times, sample conditions and any other observation that may affect the condition of the sample. Returning to the laboratory, teams of two or three students would be required to analyze their samples, complete a Results Log and enter their data onto a spreadsheet. These laboratory tests would include, but not be limited to, tests for water acidity, dissolved oxygen, turbidity, temperature and a few chemical and instrumental tests to determine concentrations of selected soluble ions. All sampling and testing would have no additional cost to the college because the Department of Chemistry already has both the equipment and instrumentation to conduct the tests described.

Before students would be allowed to analyze water samples, they would be trained and become competent in all the test methods used with this project. This would include training and practice with several pieces of laboratory instrumentation. Before collecting actual water samples, students would be required to calibrate each unit using known concentration of specific species dissolved in sample water. Once all the instruments had been calibrated and students had been trained on the proper use of each instrument, the actual test samples would be collected and analyzed.

Will this learning module work? Can this module be integrated into a classroom laboratory? The answer to both questions is, "Yes!" This specific project based learning module, in a different format has already been tested and many of the expected "bugs" have already been worked out. Beginning in spring 2006 through summer 2007 several students were involved in a Chemistry 99 Water Analysis project that closely modeled the proposed activity one[5-9].

For example, the chart below, Turbidity of Water in the Swamp, was completed by a student that worked on this project during spring 2006. The black diamonds and the red squares represent water turbidity results sampled from two different locations in the sanctuary swamp. The blue squares are turbidity results measured from the supply water feeding the swamp. This chart represents one of many different types of analysis that could be conducted from the proposed learning module.



The basic elements used in previous Chem 99 projects would be incorporated into this "project based learning module" - Activity One. Granted, working with three to five students is much different than working with 15 to 20 students. However, utilizing multiple sample sites and multiple testing instruments, all students could have their piece in this project.

As with both professional laboratories, all collected information would be entered onto data forms and tables specifically designed for that project. Utilizing standardized tables or log sheets adds uniformity to the data collection process and insures that all samples are analyzed at the same time. Filling in all the areas insures that all water samples are collected. Using data tables also reduces the possibility of random errors or forgetting something.

For the "project based learning module" I would propose that a log sheet, such as the one shown below, be used to assist students working on Learning Module - Activity One. A log sheet similar to the one below could be modified to whatever water testing site that was chosen. Each student team would have their own binder containing their specific log sheets specific to their project. Students would use their log sheet for the duration of their project. At the end of each project, all data log sheets and the final report would be collected archived.

		Wildlife Sanctuary Data Collection Table							
			Air Temp ©					Date:	
			Weather					Time:	
Sample Location	**H_2O Temp**	**DO (%)**	**Turb. (NTU)**	**Stds.**	**Cl- (ppm)**	**Stds.**	**Nitrate (ppm)**	**pH (acidity)**	**Stds.**
North Swamp									
South Swamp									
Ave. Swamp Cond.									
Supply Water									
Upper Stream									
Snow Creek									
Lake Supply Water									
North Lake									
East Lake									
South Lake									
Standards									
Comments									

I propose to conduct this Learning Module in the spring 09 CHMT 1, Introduction to Chemical Laboratory Technology Course. A smaller "trial version", about six weeks in duration, would be incorporated into the laboratory schedule. To assess the learning value of this module, a pre-quiz will be given to assess students understanding of professional skills necessary in working on team projects. At the conclusion of this module, a post-quiz, identical to the first, would assess what professional skills used and what were gained by working on this project. The differences between the two quizzes should correspond to the degree of learning each student gained from this learning module. Ranking the differences of the pre and post-quiz results should provide which specific professional skills saw the greatest change.

Project Based Learning Module - Activity Two

Viscosity is a physical property found in all liquids. In general terms viscosity is the resistance of a liquid to flow, or its "thickness". Viscosity can be thought of as a measure of the internal friction, between liquid molecules. Water would be considered "thin" with a viscosity of 0.894 cP at 25°C, whereas, maple syrup would be considered "thicker" with a higher viscosity of ~3200 cP at 25°C. (The unit "cP" is an abbreviation for centiPoise, the common unit used to describe viscosity.) Viscosity testing is one of those methods that is relatively unseen. But when a product of specific consistent viscosity suddenly shows large variability, product quality is called into question.

Viscosity measurements are routinely used in industries that deal with food (peanut butter, molasses and cooking oils), lubricating oils (machines, engine and others), personal care industry (hand creams, shampoo and liquid soaps) and many others. Testing viscosity is straight forward, reasonably reproducible and can be learned in as little as four hours.

The Chemistry Department has two Scientific Rotational Viscometers. Each of the Units have 84 different range settings allowing Versatility in testing a wide variety of liquids from motor oils to ice cream or yogurt. These units like the equipment for the water analysis, were

purchased with grant funds from the National Science Foundation, Advanced Technology Education, for the Chemical Laboratory Technician program.

Before students begin to collect viscosity data, each Viscometer unit must be calibrated versus manufacturer's standard viscosity solutions. The department already has two different standards that can be easily used and tested. If additional standards are desired, there are standard solutions that students can prepare. Since each viscometer is programmable, students will find them easy to operate and understand.

The time required to measure the viscosity of a typical fluid varies from three to six minutes per sample. The Viscometers are flexible and the pre-programmed setting ranges easy to change. With the two Viscometers at least four different student groups can use these two units efficiently with little wait time.

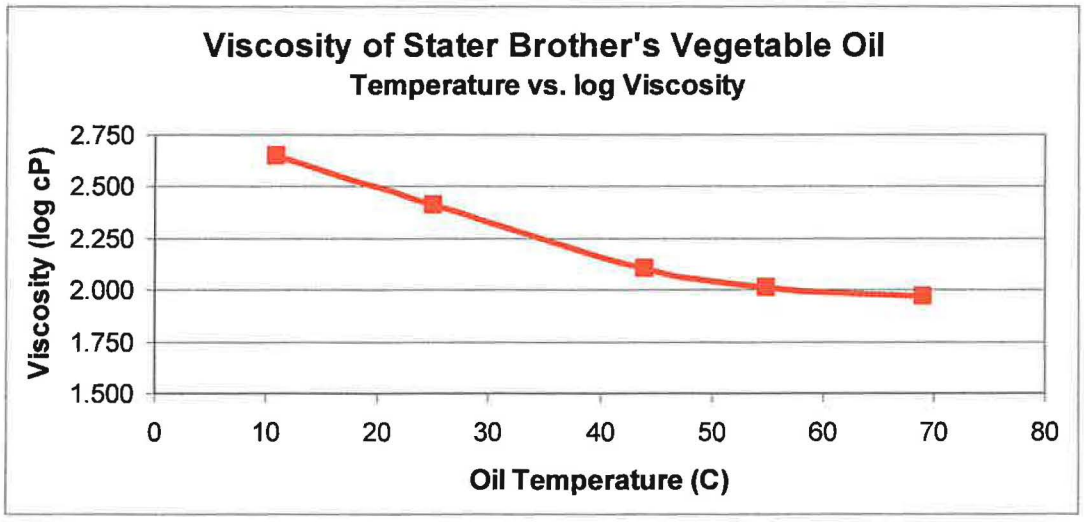
For specific projects, student groups could study the temperature effects on single grade and multi-grade motor oils[10]; solution viscosity versus percent polymer concentration dissolved in solutions, the viscosity of various cooking oils (corn, peanut, canola, etc.); or to measure the variability in viscosity within a product, as a function of different manufacturer lot numbers. Alternating between various oils one semester and personal care products the other semester should provide variety to the program.

Preliminary viscometry work has been completed by a previous Chem 99 student[11]. One of the possible Project Based Learning Modules may build upon and expand on this earlier work. This original work involved evaluating the viscosity behavior of Stater Brother's vegetable oil at different temperatures. The goal was to determine the change in vegetable oil viscosity as a function of increased temperature. The data, in the table below, clearly shows when the vegetable oil was colder, the viscosity (thickness) increases. The table, also, clearly shows that at elevated temperatures the oil viscosity decreases.

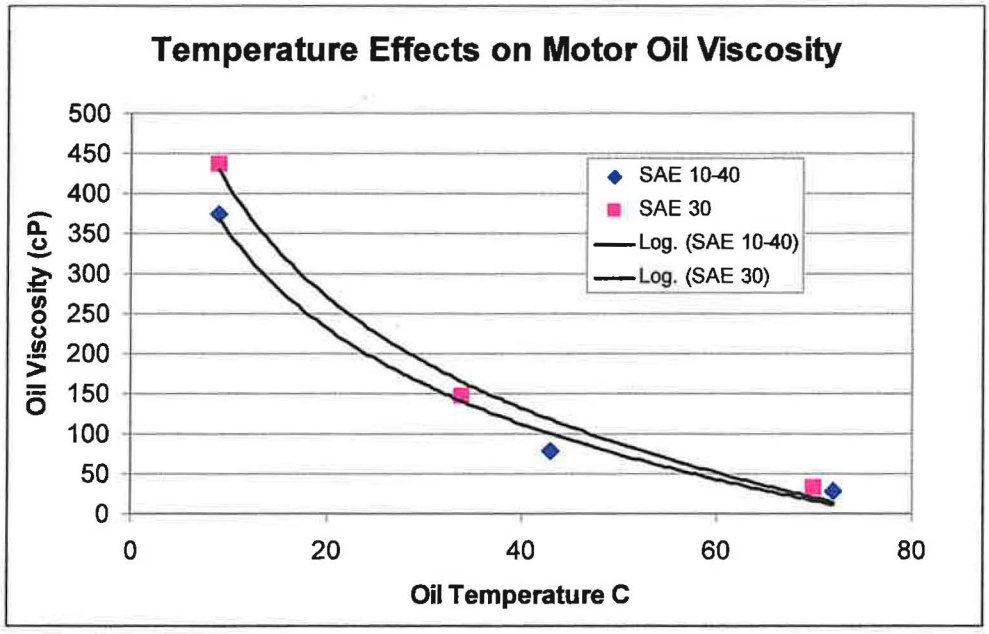
Stater Brothers Vegetable Oil

Temp(C')	cP(viscosity)	log cP	ln cP	Spindal Rpm
11	443	2.646	6.094	50
25	256	2.408	5.545	60
44	126	2.100	4.836	100
55	103	2.013	4.635	100
69	92	1.964	4.522	200

The following chart was prepared from the data in the table above. The "Y-axis" was represents the log base 10 viscosity while the "X-axis" represents the oil temperature in centigrade.



In a similar project, this same student[11] measured the viscosity of two different motor oils are various temperatures. His results are shown below. Note that the viscosity curve for the multi-grade oil (SAE 10-40) shows slightly less drop in viscosity at elevated temperatures. The multi-grade oil has a lower viscosity is slightly less viscous at low temperatures and similar to the single-weight (SAE 30) at higher temperatures.



Adapting this activity to a project based learning module, students could expand the temperature range and obtain a clearer picture of the viscosity change with respect to temperature. Measuring temperatures below freezing (0°C) and well above 100°C should accentuate the viscosity differences between both motor oils. The addition of several more multi-grade oils would provide a more complete picture of motor oil viscosity as a function of oil temperature.

Section Five

Conclusions

Conclusions

This sabbatical project, Learning Modules to Teach Professional Skills, was initiated partially in response to comments made by our Advisory Committee. This committee consists of professional educators, business persons and scientific laboratory personnel. Most of our committee members are cautiously optimistic, hard working, people that from years of experience have become pragmatic. All of them are easy to talk to and work with; however, I was disheartened to hear one industrial committee member state emphatically that if an employee wasn't taught these skills as a child at home, they would never learn them. In my heart, I believe if a person has a desire to learn, they will, and they will succeed. It would be a shame to conclude that the inadequacies of a family would professionally handicap a person, denying them the opportunity to strive toward their highest employment potential now and for the rest of their life.

To encourage students to learn professional skills would be very challenging. However, if professional skills were learned through Project Based Learning Modules the learning process becomes more palatable for both the student and the instructor. If the classroom atmosphere were built on a "role play" model of a professional laboratory, the learning professional skills may even become fun. The intent is to practice professional skills in a project based format, one that students would receive positive feedback in a safe environment.

The goal for both these Learning Modules was to build professional skills through working as a team member toward a common goal. The following list of professional skills are those emphasized by our Advisory Committee, the American Chemical Society and the actual working attributes learned on my sabbatical at Custom Building Products and Inland Empire Utility Agency.

Organizational skills

Collecting samples for analysis

Completing and maintaining the log sheets

Archiving historical data and records

Housekeeping around the student's lab work area

Integrity and Character

Grading will be based on correctly completing the process not the "right answer"

Reporting "odd" results that were replicated and verified is valued above "fudging" numbers to fit a preconceived assumption

Dependability and Personal Responsibility

The team project involves and depends on student members

Arriving to class on-time

Follow through with projects and commitments

Follow all laboratory safety rules

Communication Skills: both Written, Verbal and Computer

Presentation, PowerPoint final oral report

Written final report

Excel would be used to store all data

Interpersonal communication within the team

Team decisions – consensus

A Positive Attitude – A "Can-Do" Spirit

A Productive Team Member – works well with others

Retain the same team members throughout the entire project

The overall quality of your work depends upon your team members

Problem Solving Abilities – not just from books

Practical problem solving

Open ended project

Initiative (Self Motivation – Self Starter) and show it

Each module would last several weeks

Minimal reminding students what they should do

Do your best at all times with everything you do

Benefit to the Community

Building positive relationships with our community businesses is exceedingly important. It is valuable to be a good neighbor but good community relations are essential when a college is requesting bond money. When an instructor wants to volunteer and work as a technician, the community gains in two ways. First the instructor provides free labor which is always helpful. Secondly, I believe that businesses appreciate the college, taking an interest as well as the college teaching skills important to their businesses.

Benefit to the College and the Department of Chemistry

This sabbatical project was completed to fulfill several goals necessary to strengthen our Chemical Laboratory Technician program. This project has increased my understanding of a working scientific laboratory, which should compliment the strengths and experiences of our chemistry faculty. This experience has also afforded me the opportunities to further strengthen Advisory Committee relationships and to build connections for students to begin Internship assignments.

Benefit to the Instructor

This sabbatical experience has been beneficial, in that, I have a clearer understanding of what types of professional skills employers expect from entry-level employees. Having volunteered/interned at two different businesses has provided me additional knowledge of a professional laboratory environment and credibility

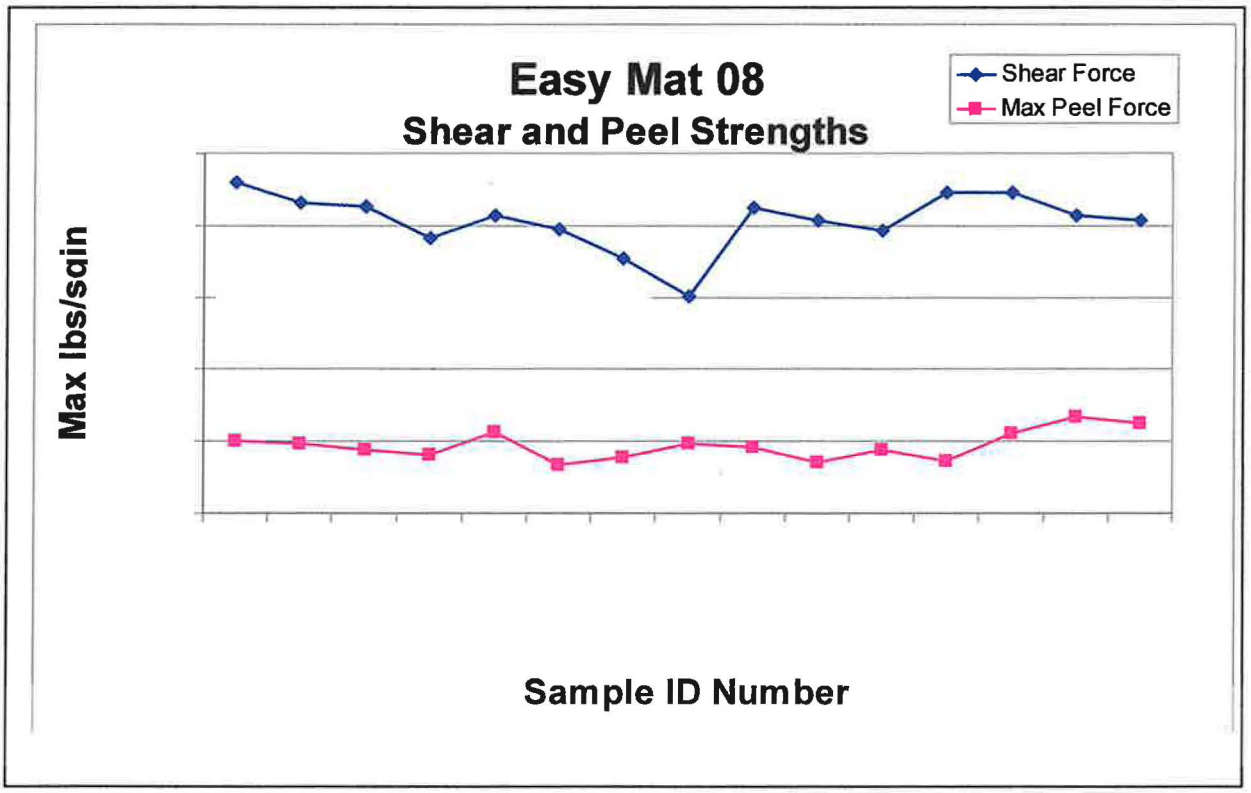
with our students. In addition, this sabbatical project has provided me the opportunity to further strengthen my relationships with two of our Advisory Committee members.

Benefit to the Students

Students that participate in these "project based learning modules" will learn professional skills, and those skills will be continually be reinforced through team based project activities. If students become fully engaged in the program, they will be able to implement these skills into their future everyday work habits. Entry-level employees that understand the importance of professional skills and use those skills in the workplace will make a positive contribution to their organization. Being able to contribute to the organization is exceedingly important, especially in challenging economic times. Hopefully, employers will be so impressed with our graduates that they will want to contribute to our program, become an Advisory Committee member, and seek to hire our graduates.

Appendix A

The graph below shows the shear and peel strengths for various production lot runs of the Custom Building Products (CBP) EasyMat® 08 product. Each data point on the graph represents an average of three individual tests. Actual test values were removed at the request of Custom Building Products



Appendix B

Appendix B contains the experimental outlines for the experimental design spreadsheets for the project to increase the tensile strength of the experimental grout product. To preserve the privacy and trade secret nature of these experimental formulations, all proprietary information has been removed. In all cases letter designations have been substitutes for the actual reactant materials. One specific letter may have been used to represent several different raw materials.

Project					04.03.08
MATERIAL	**LP 43 A**	**LP 43 B**	**LP 43 C**	**LP 43 D**	**LP 43 E**
Base	2332				
A	145.15	145.15	0	0	0
B	0	0	145	261	365
C	0.38	0	0	0	0
D	3.02	3.02	0	0	0
E	0	0	0.75	0.75	0.75
F	18.85	18.85	28.25	28.25	28.25
G	0	0	2.75	2.75	2.75
H	0	0	0	0	0
Total	2499.4				
Water Ratio	26.5/100	26.5/100	26.5/100	26.5/100	26.5/100
[redacted]	299.5 (288.7-310.3)	223.5 (168.6-278.4)	381.9 (352.2-411.6)	403.85 (395.1-412.6)	293.5 (290.4-296.6)

standard cement grout

Base	2350.9	94.06%	2355	94.20%	2300	92.00%	2245	89.80%	2296.6	91.86%
A	145.15	5.81%	0	0.00%	0		0	0.00%	0	0.00%
B	0	0.00%	145	5.80%	200	8.00%	255	10.20%	200	8.00%
C	0.38	0.02%	0	0.00%	0	0.00%	0	0.00%	0.38	0.02%
D	3.02	0.12%	0	0.00%	0	0.00%	0	0.00%	3.02	0.12%
E	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
F	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
G	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
H	0	0.00%	0	0.00%	0		0	0.00%	0	0.00%
	2499.5	100.00%	2500	100.00%	2500	100.00%	2500	100.00%	2500	100.00%

Base	2296.6	91.86%	2291.9	91.68%	2241.6	89.66%	2295.85	91.83%	2351.6	94.06%
A	200	8.00%	200	8.00%	255	10.20%	200	8.00%	0	0.00%
B	0	0.00%	0	0.00%	0	0.00%	0	0.00%	145	5.80%
C	0.38	0.02%	0.38	0.02%	0.38	0.02%	0.38	0.02%	0.38	0.02%
D	3.02	0.12%	3.02	0.12%	3.02	0.12%	3.02	0.12%	3.02	0.12%
E	0	0.00%	0	0.00%	0	0.00%	0.75	0.03%	0	0.00%
F	0	0.00%	4.7	0.19%	0	0.00%	0	0.00%	0	0.00%
G	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
H	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
	2500	100.00%	2500	100.00%	2500	100.00%	2500	100.00%	2500	100.00%

	A 2X 1 & 1A standard cement grout		B		C		D		E	
Base	2350.9	94.057%	2355	94.200%	2300	92.000%	2245	89.800%	2296.6	91.864%
A	145.15	5.807%	0	0.000%	0		0	0.000%	0	0.000%
B	0	0.000%	145	5.800%	200	8.000%	255	10.200%	200	8.000%
C	0.38	0.015%	0	0.000%	0	0.000%	0	0.000%	0.38	0.015%
D	3.02	0.121%	0	0.000%	0	0.000%	0	0.000%	3.02	0.121%
E	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
F	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
G	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
H	0	0.000%	0	0.000%	0		0	0.000%	0	0.000%
	2499.45	100.000%	2500	100.000%	2500	100.000%	2500	100.000%	2500	100.000%

	F		G		H		I		J	
Base	2296.6	91.864%	2291.9	91.676%	2241.6	89.664%	2295.85	91.834%	2351.6	94.064%
A	200	8.000%	200	8.000%	255	10.200%	200	8.000%	0	0.000%
B	0	0.000%	0	0.000%	0	0.000%	0	0.000%	145	5.800%
C	0.38	0.015%	0.38	0.015%	0.38	0.015%	0.38	0.015%	0.38	0.015%
D	3.02	0.121%	3.02	0.121%	3.02	0.121%	3.02	0.121%	3.02	0.121%
E	0	0.000%	0	0.000%	0	0.000%	0.75	0.030%	0	0.000%
F	0	0.000%	4.7	0.188%	0	0.000%	0	0.000%	0	0.000%
G	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%
H	0	0.000%	0	0.000%	0	0.000%	0	0.000%	0	0.000%

	2500	100.000%	2500	100.000%	2500	100.000%	2500	100.000%	2500	100.000%

	1	2	3	4	5	6	7	8	9	10
Base	470.28	471.00	460.00	449.00	459.32	459.32	458.38	448.32	459.17	470.32
A	29.04	0.00	0.00	0.00	0.00	40.00	40.00	51.00	40.00	0.00
B	0.00	29.00	40.00	51.00	40.00	0.00	0.00	0.00	0.00	29.00
C	0.08	0.00	0.00	0.00	0.08	0.08	0.08	0.08	0.08	0.08
D	0.60	0.00	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60
E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
F	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.00	0.00
G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total mass (grams)	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00

Standard cement grout Controls

x	y	z
470.28	**470.28**	**470.28**
29.036	**29.036**	**29.036**
0.000	**0.000**	**0.000**
0.076	**0.076**	**0.076**
0.604	**0.604**	**0.604**
0.000	**0.000**	**0.000**
500.00	**500.00**	**500.00**
132.5g	26.5g/100g	142.5g

	I	M	F	G	H
BASE	**459.17**	**459.17**	**459.32**	**458.38**	**448.38**
A	**40.000**	**40.000**	**40.000**	**40.000**	**51.000**
B	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
C	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
D	**0.604**	**0.000**	**0.604**	**0.604**	**0.604**
F	**0.000**	**0.940**	**0.000**	**0.940**	**0.000**
Total mass (grams)	**500.00**	**500.11**	**500.00**	**500.00**	**500.00**
Water	132.5g	26.5g/100g	26.5g/100g	26.5g/100g	26.5g/100

	C	K	E	L	B	D
BASE	**460.00**	**458.38**	**459.32**	**458.38**	**471.00**	**449.00**
A	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
B	**40.000**	**40.000**	**40.000**	**40.000**	**29.000**	**51.000**
C	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
D	**0.000**	**0.000**	**0.604**	**0.604**	**0.000**	**0.000**
F	**0.000**	**0.940**	**0.000**	**0.940**	**0.000**	**0.000**
Total mass (grams)	**500.00**	**499.32**	**500.00**	**499.92**	**500.00**	**500.00**

		Previous Standards	
		39E	**PD**
Base		**459.32**	**470.28**
A		**0.00**	**29.04**
B		**40.00**	**0.00**
C		**0.00**	**0.08**
D		**0.60**	**0.60**
F		**0.00**	**0.00**
		500.00	**500.00**
		26.5g/100g	**26.5g/100g**

Base
A
B
C
D
F

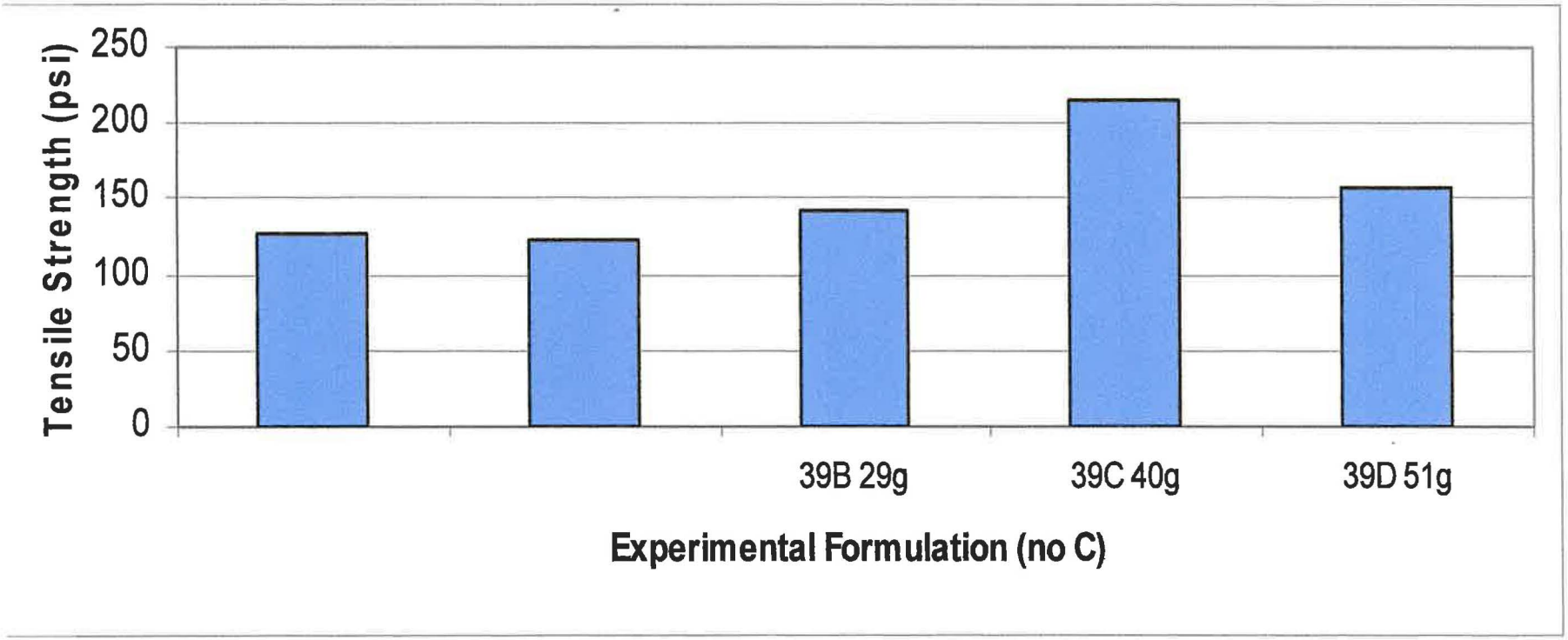
	Vary D	
39E	A	B
459.32	459.32	459.32
0.00	0.00	0.00
40.00	40.00	40.00
0.00	0.00	0.00
0.60	0.20	1.00
0.00	0.00	0.00
500.00	500.00	500.00
26.5g/100g	26.5g/100g	26.5g/100g

			Vary F		
	39L	39G	39E	C	D
Base	458.46	458.46	459.40	457.96	458.96
A	0.00	40.00	0.00	0.00	0.00
B	40.00	0.00	40.00	40.00	40.00
C	0.00	0.00	0.00	0.00	0.00
D	0.60	0.60	0.60	0.60	0.60
F	0.94	0.94	0.00	1.44	0.44
	500.00	500.00	500.00	500.00	500.00
	26.5g/100g	26.5g/100g	26.5g/100g	26.5g/100g	26.5g/100g

Appendix C

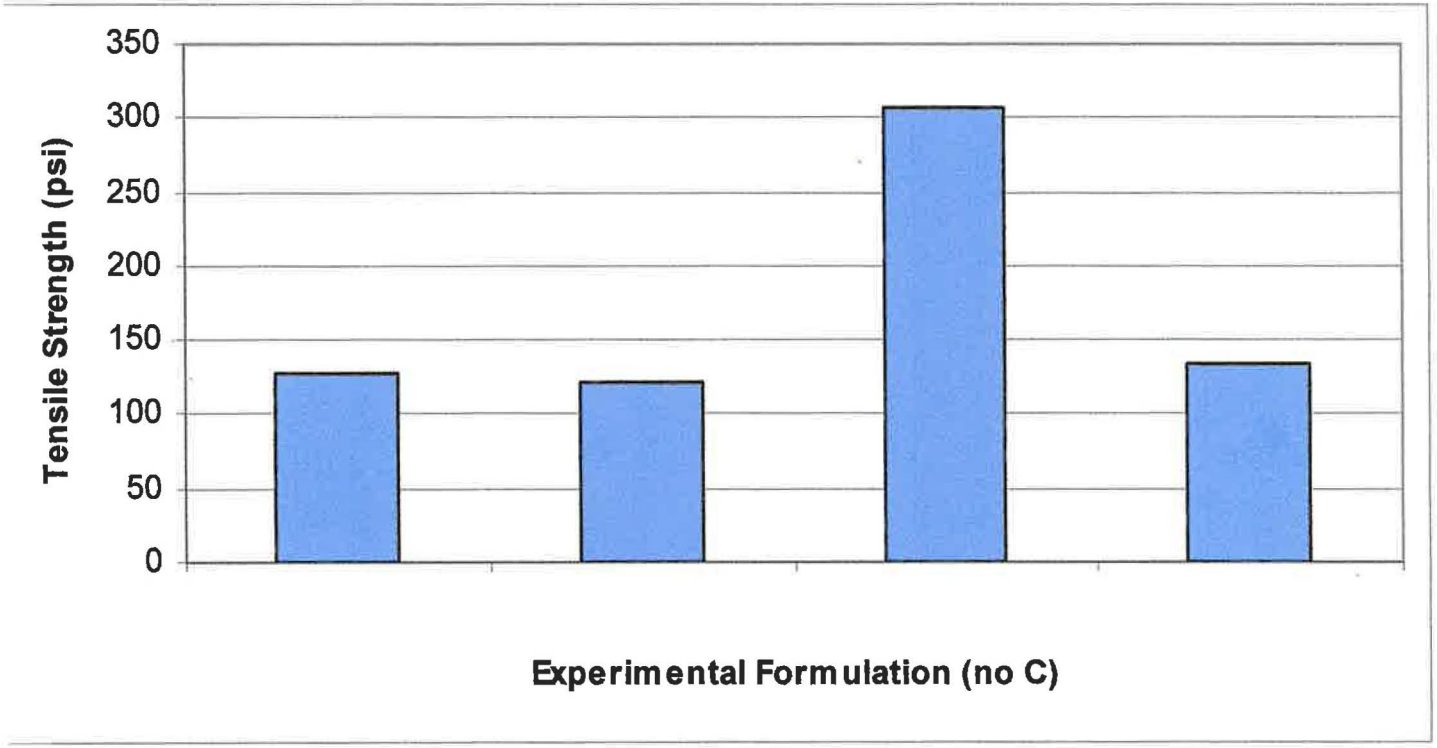
Appendix C is the graphical results of the experimental design shown in Appendix B. These Bar Charts are a "relative" pictorial representation of the tensile strength results from the respective experimental formulation outlined in Appendix B. Per Custom Building Products, all mention of raw materials and teat results have been eliminated.

Comparison of D vs. A



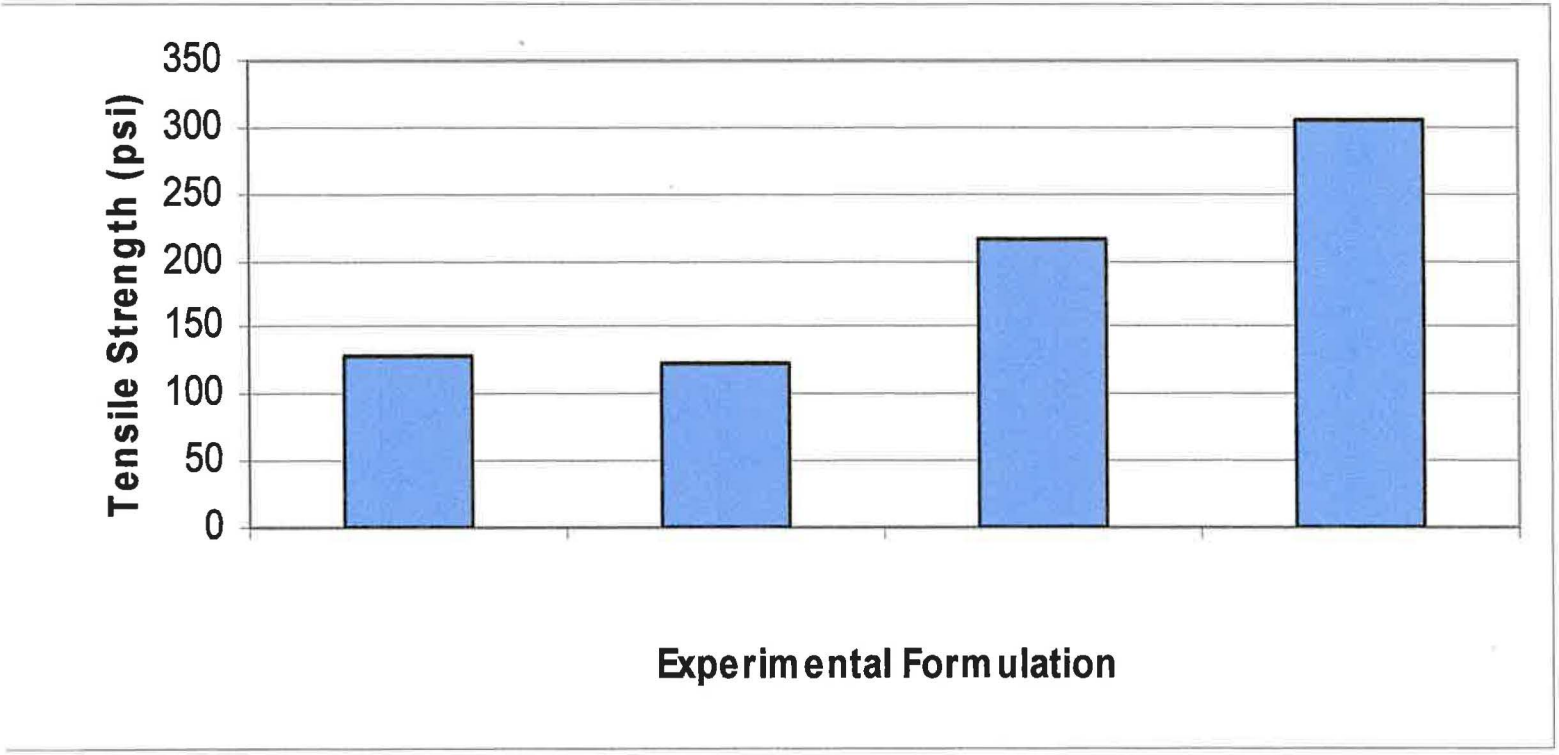
	39 Crtl A	39 Crtl B	39B	39C	39D
BASE	470.28	470.28	471.00	460.00	449.00
A	29.04	29.04	0.00	0.00	0.00
B	0.00	0.00	29.00	40.00	51.00
C	0.08	0.08	0.00	0.00	0.00
D	0.60	0.60	0.00	0.00	0.00
Tensile (psi)	128	122	143	215	157

Comparison of B vs. A



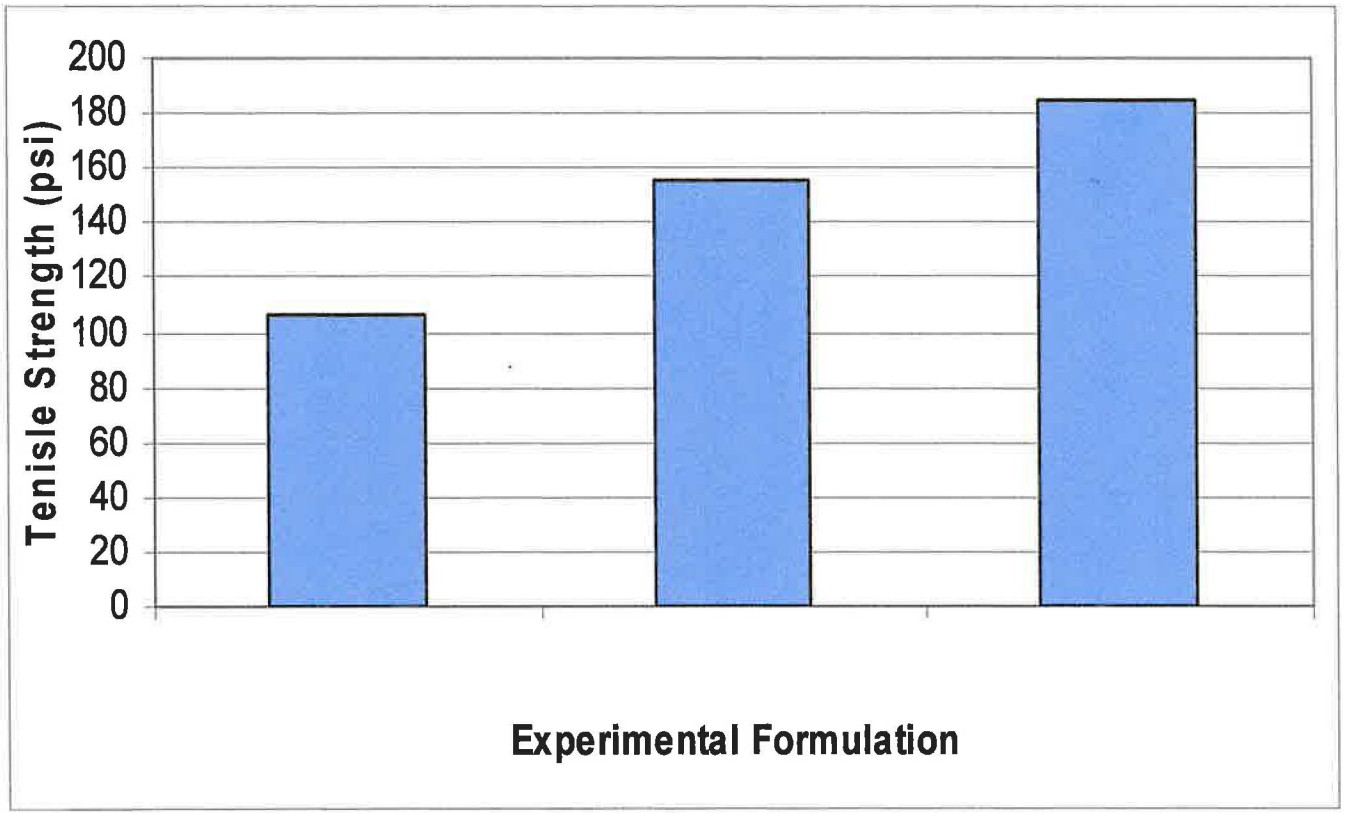
	39 Crtl A	39 Crtl B	39E	39F
A	470.28	470.28	459.32	459.32
B	29.04	29.04	0.00	40.00
C	0.00	0.00	40.00	0.00
D	0.08	0.08	0.00	0.00
E	0.60	0.60	0.60	0.60
Tensile (psi)	128	122	306	134

Addition of 0.60g Additional D



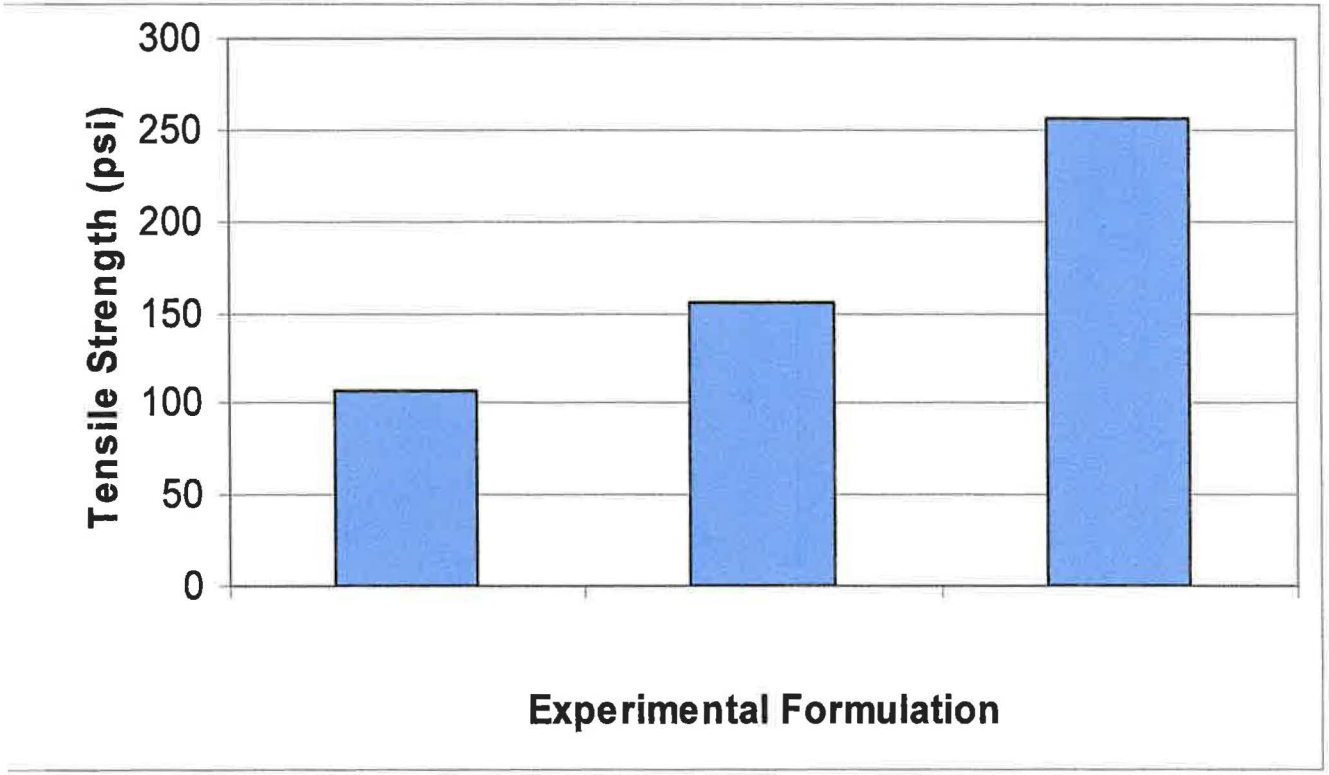
	39 Crtl A	39 Crtl B	39C	39E
A	470.28	470.28	460.00	459.32
B	29.04	29.04	0.00	0.00
C	0.00	0.00	40.00	40.00
D	0.08	0.08	0.00	0.00
E	0.60	0.60	0.00	0.60
Tensile (psi)	128	122	215	306

Vary Levels of B



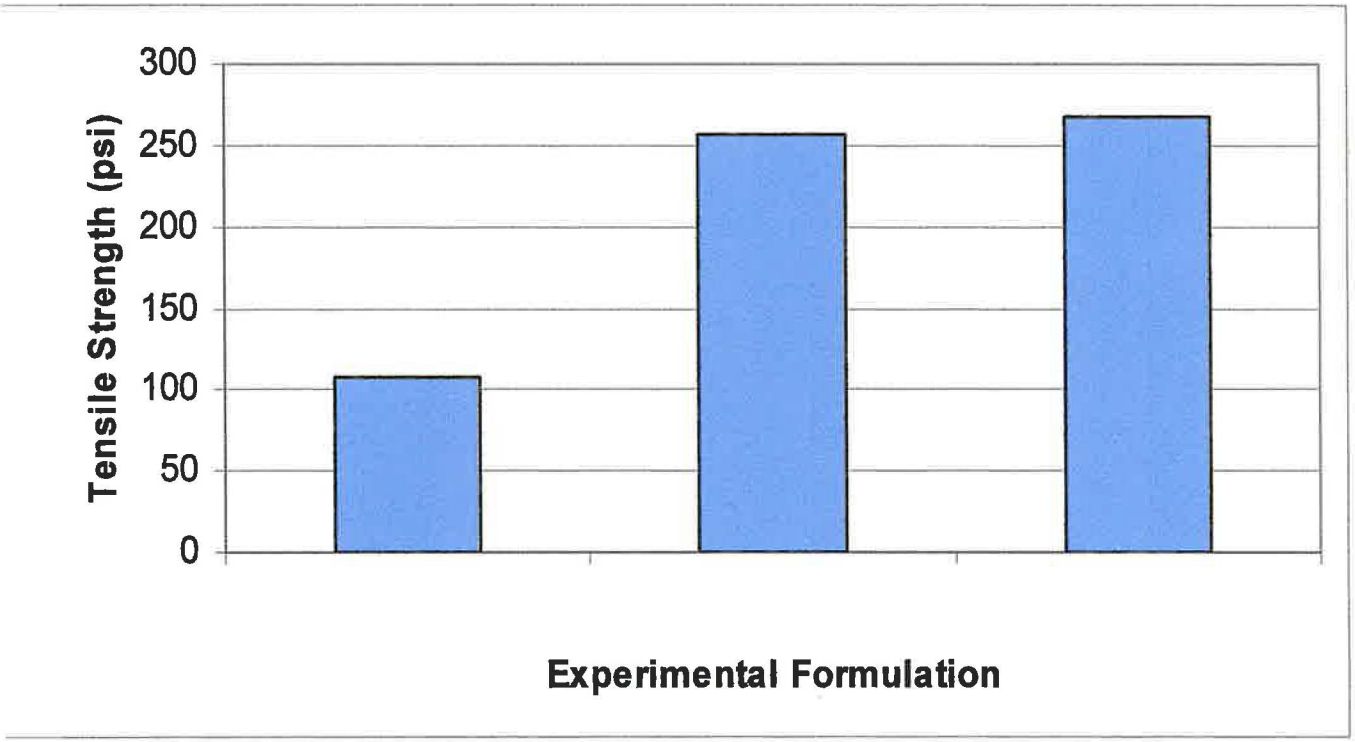
	39 Crtl A	39 I	39 H
A	470.28	459.17	448.38
B	29.04	40.00	51.00
C	0.08	0.00	0.00
D	0.60	0.60	0.60
Tensile (psi)	128	155	185

Addition of a Substance



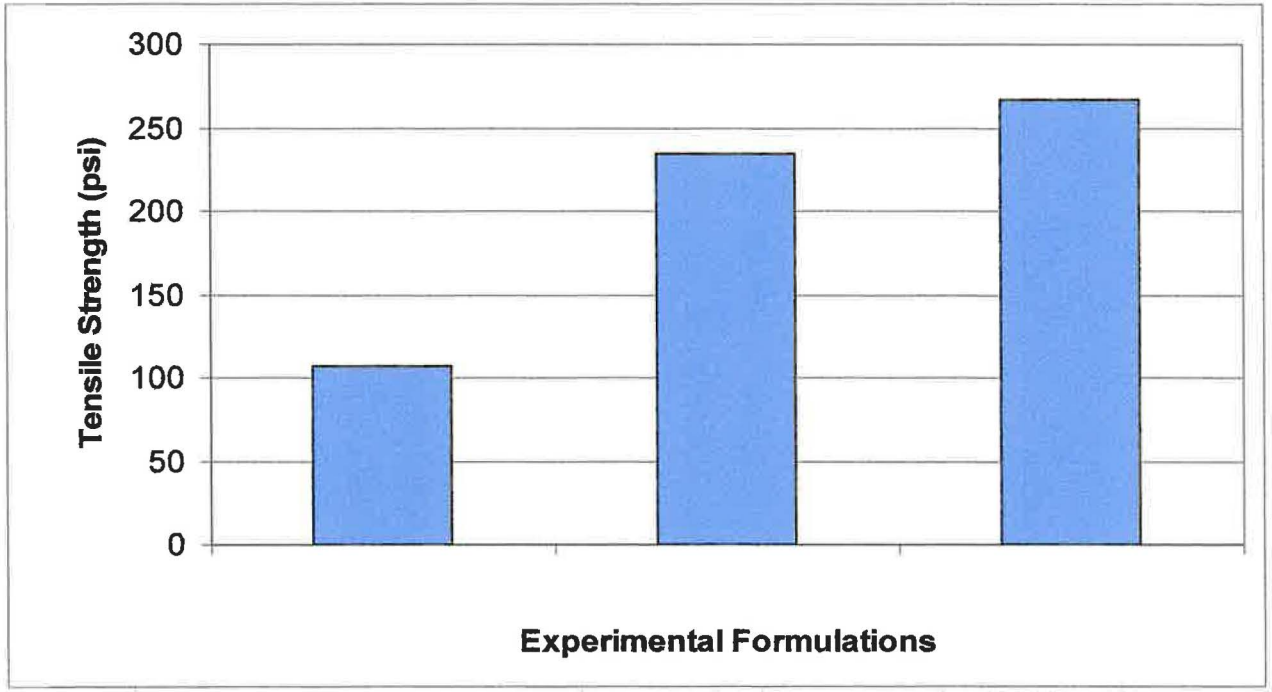
	39 Crtl A	39 I	39 G
A	470.28	459.17	458.38
B	29.04	40.00	40.00
C	0.08	0.00	0.00
D	0.60	0.60	0.60
E	0.00	0.00	0.94
Tensile (psi)	128	155	256

40g B vs. 40g B'



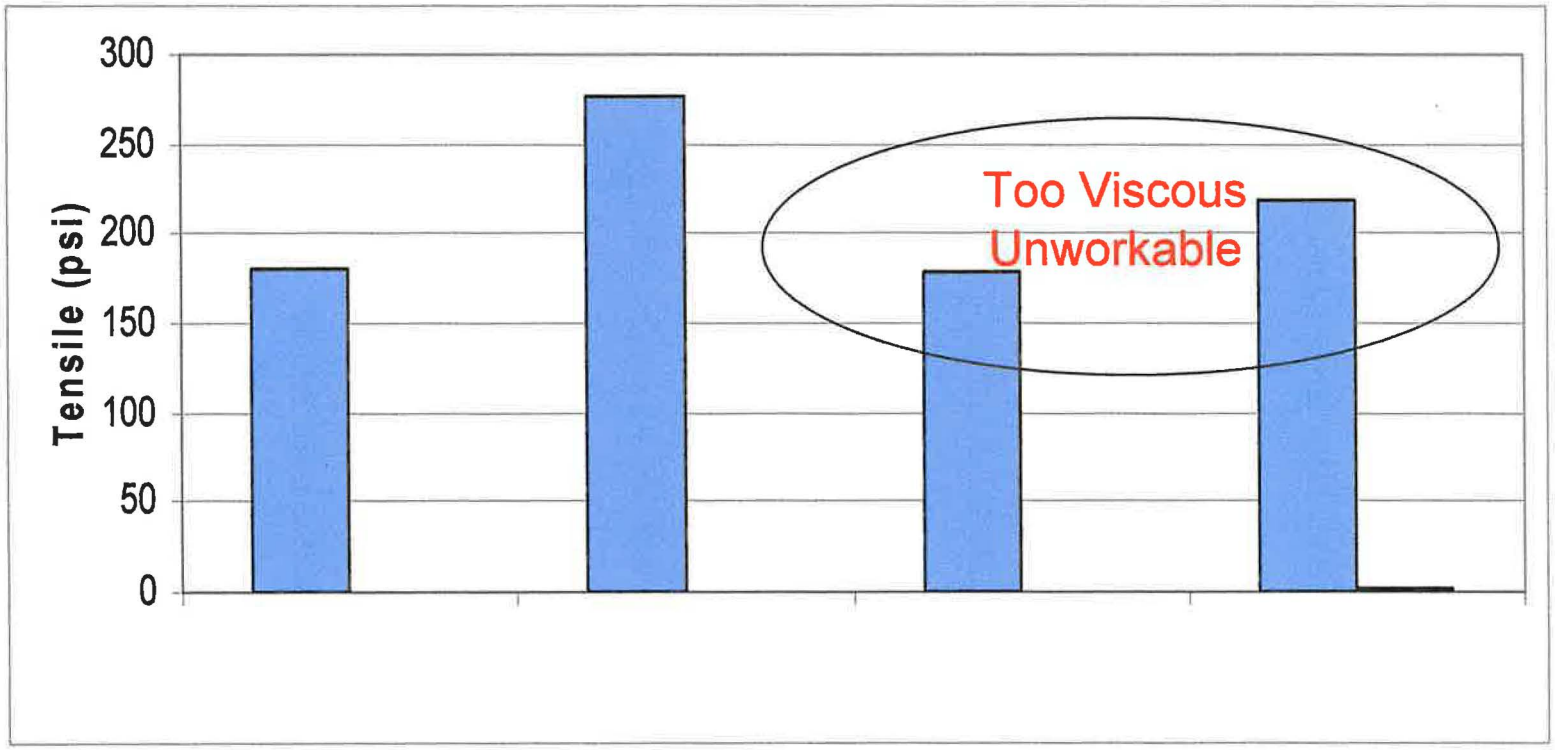
	39 Crtl A	39 G	39 L
A	470.28	458.38	458.38
B	29.04	40.00	0.00
C	0.00	0.00	40.00
D	0.08	0.00	0.00
E	0.60	0.60	0.60
F	0.00	0.94	0.94
Tensile (psi)	128	256	267

Additions of D



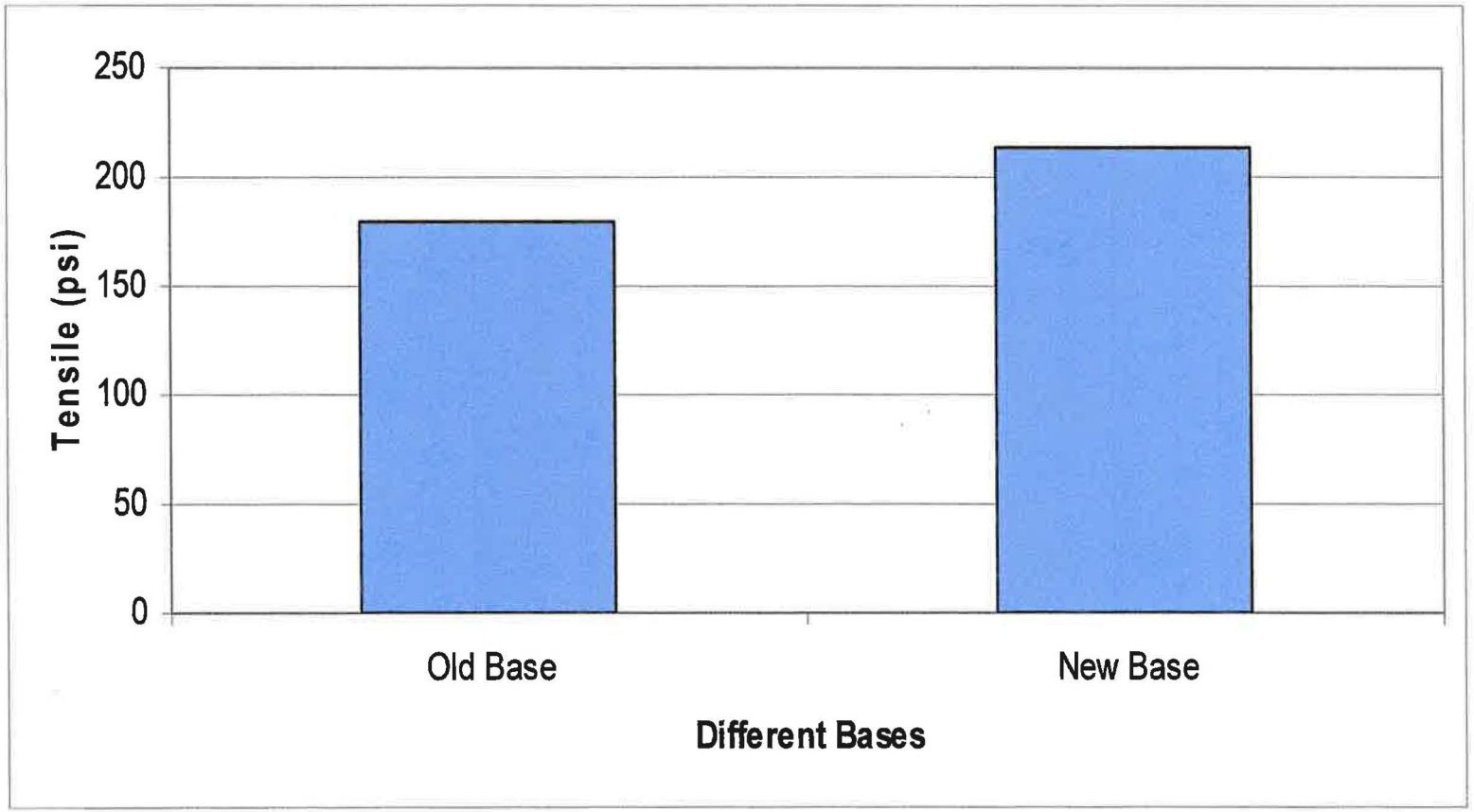
	39 Crtl A	39 K	39 L
A	470.28	458.38	458.38
B	29.04	0.00	0.00
C	0.00	40.00	40.00
D	0.08	0.00	0.00
E	0.60	0.00	0.60
F	0.00	0.94	0.94
Tensile (psi)	128	235	267

Various Levels of G



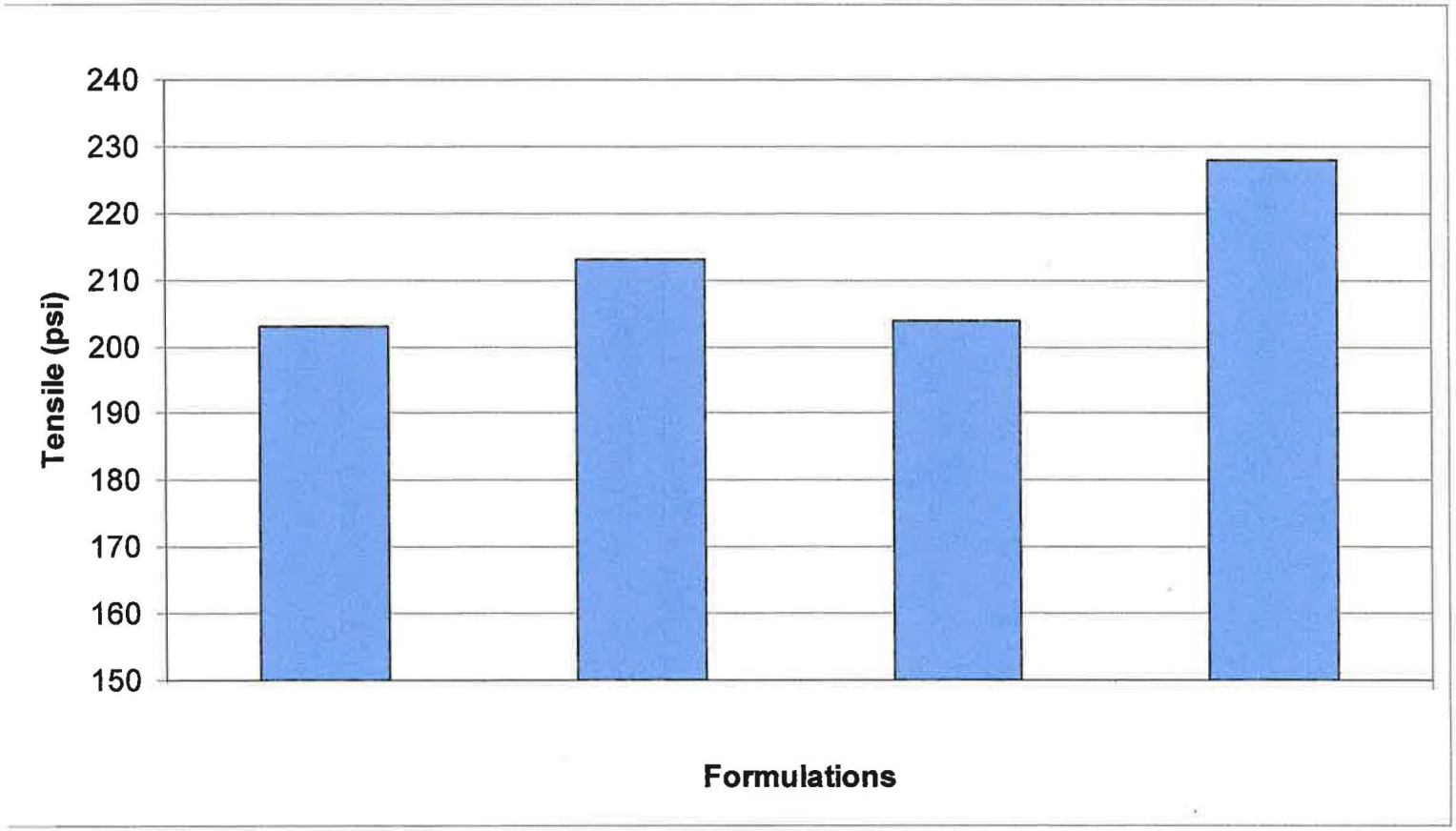
	39 N	39 O	39 Q	39 P
A	459.40	459.12	458.85	458.30
B	40.00	40.00	40.00	40.00
C	0.60	0.60	0.60	0.60
D	0.00	0.28	0.55	1.10
Tensile (psi)	180.00	276.00	180.00	219.00

Comparisons of Base Materials



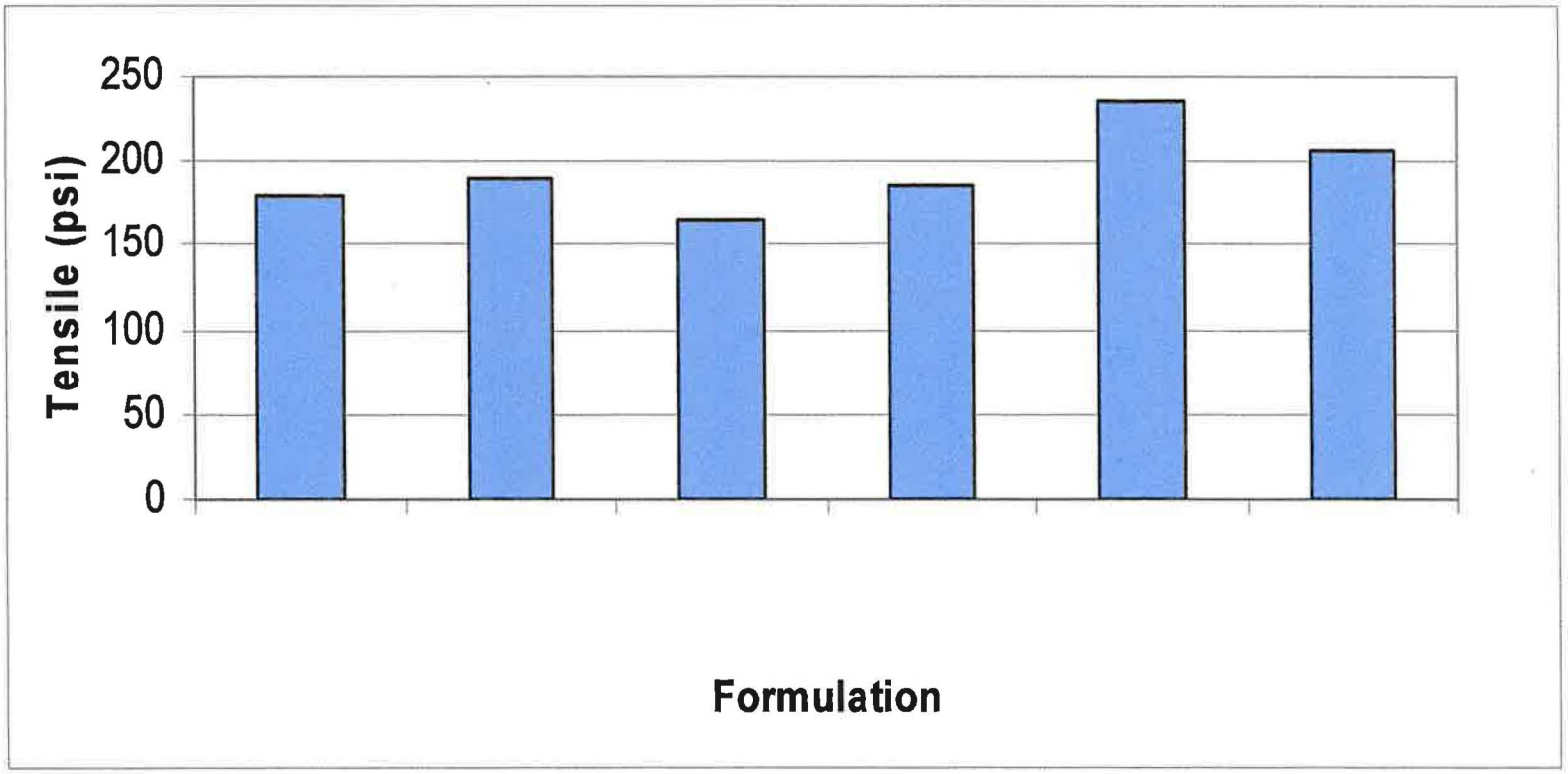
	Q (old base)	QA (new base)
BASE	458.85	458.85
B	40.00	40.00
D	0.60	0.60
(psi)	180.00	213.00

Varying Levels of G



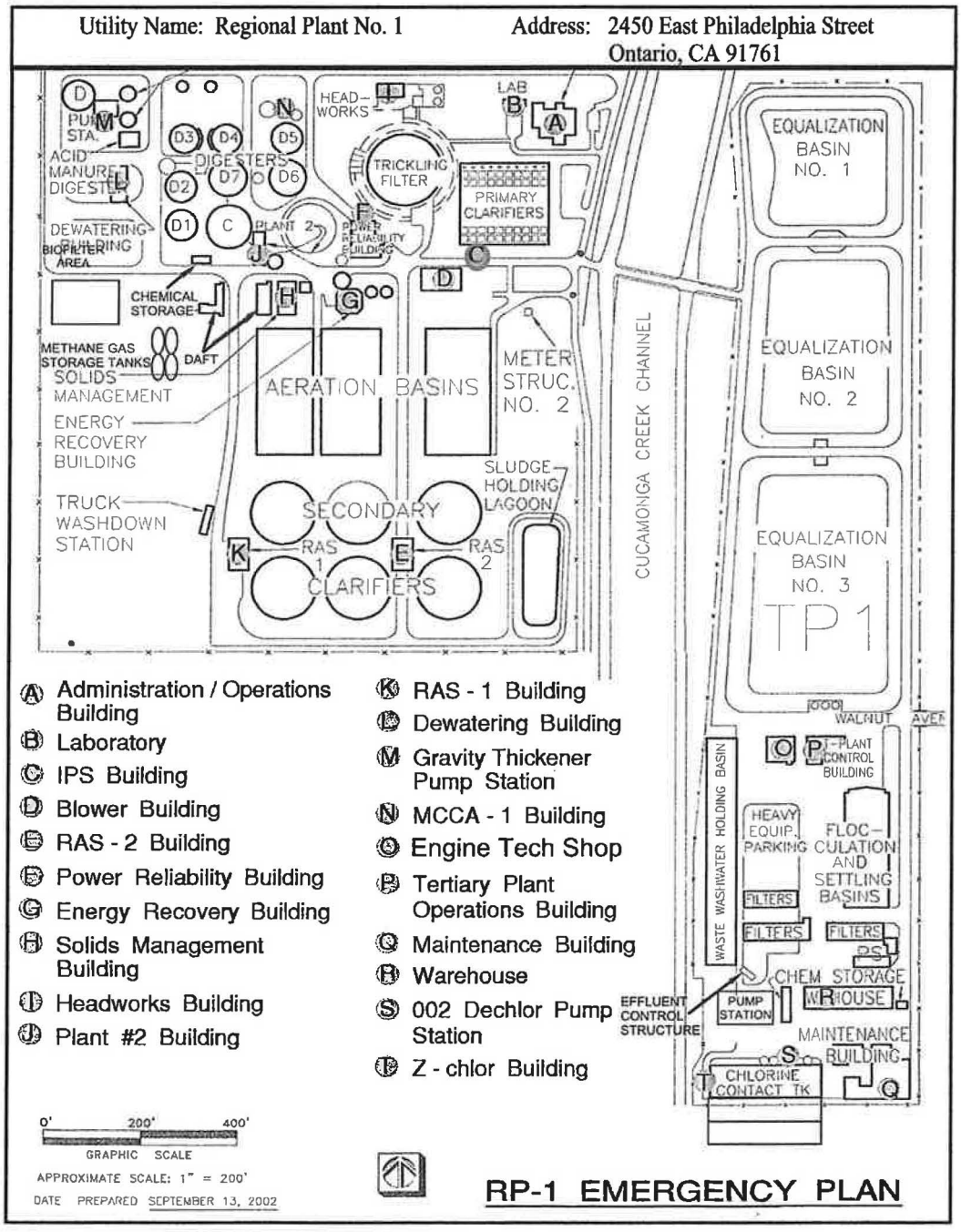
	39R	39N	39S	39T
A	459.60	459.40	459.20	459.00
B	40.00	40.00	40.00	40.00
C	0.40	0.60	0.80	1.00
Tensile	203	180	204	228

Variations in Substance Concentration



	39N	39U	39V	39W	39L	39X
A	459.40	459.15	458.90	458.65	458.46	458.18
B	0.00	0.00	0.00	0.00	0.00	0.00
C	40.00	40.00	40.00	40.00	40.00	40.00
D	0.60	0.60	0.60	0.60	0.60	40.00
E	0.00	0.25	0.50	0.75	0.94	0.94
F	0.00	0.00	0.00	0.00	0.00	0.28
Tensile	180	190	165	184	235	207

Appendix D
Site Plan for Regional Plant One



Appendix E

The Water Treatment and Recycling Process

1. Preliminary Treatment
    - Wastewater passes through bar screens that trap and remove large materials. It then flows into grit chambers where the heaviest materials, such egg shells, coffee grounds and sand, settle out. The materials removed during these processes are sent to a sanitary landfill.
2. Chemical Addition
    - Ferric chloride is added to the incoming wastewater to help reduce hydrogen sulfide and control odors. Chemical coagulants are added to the wastewater to enhance the primary settling process.
3. Air Emissions Control
    - Foul air containing hydrogen sulfide is removed through air ducts and forced though a natural bio-filter bed made up of several forms of media, to include wood chips, bark mulch, waste compost and even ground oyster shells!
4. Primary Treatment
    - Following preliminary treatment, the wastewater is pumped to large primary clarifiers where liquids and solids separate. The heavier solids settle and are scraped off the bottom, and the lighter material is skimmed off the top. The materials that are removed are sent to solids

processing facilities. Adding coagulants to raw wastewater improves settling of the solids resulting in advanced primary treated wastewater. The treated wastewater is pumped to secondary treatment facilities.

5. Secondary Treatment
    - Advanced primary treated wastewater is pumped to aeration basins where microorganisms, called activated sludge, consume the remaining organic solids. The wastewater is them pumped into secondary clarifiers where the activated sludge settles out. Most of it is scraped off the bottom and returned to the aeration basins to regenerate this process, while the excess is sent to solids processing.
6. Tertiary Filters
    - Water from the secondary process flows through sand filters for removal of fine particulate matter.
7. Solid Processing
    - Solids removed in the primary and secondary treatment processes are pumped into anaerobic digesters where they undergo natural decomposition for 15-25 days. Half the solids convert to a gas mostly made up of methane, which is sent to our own energy recovery facilities. The remaining solids are pumped to dewatering facilities to achieve 23 percent solid material (with a cake-like consistency) called bio-solids. The bio-solids are composted for direct land application as a soil amendment used to make fertilizer.

8. Energy Recovery
    - The methane gas derived from the digesters is used to power engine-generator units that produce the electricity used as the energy source to operate the treatment plant.
9. Water Recycling
    - Tertiary treated wastewater is distributed to the cities we serve as recycled water for various land applications.

Reference Citations

1.) Advisory Committee Meeting. *Chemical Laboratory Technology*, Meeting Minutes, Aug. 2003.

2.) American Chemical Society. "Futures Through Chemistry-Charting a Course". ACS Division of Education and International Activities. Washington DC, 1999.

3.) American Chemical Society. " Focus on Analytical Careers". *Chemical and Engineering News*. Jan. 22, 2007: 62.

4.) Inland Empire Utility Agency <**http://www.ieua.org/index.html**>

5.) Del Rio, Roxanne. "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report. Spring 2006.

6. Dayrit, Jeremy and Nidhi Gandi. "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report, Summer 2006.

7. Kang, Peggy and Janice Gatzke. "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report. Fall 2007

8. Hong, Connie, Heather Pace and Diwyacitta Nandini. "Wildlife Sanctuary Physical and Chemical Water Analysis". Chemistry 99 Report. Winter 2007.

9.) LaCuran, Alec, and Michael Olague. "Analysis of Chemical and Physical Compositions of Three Natural Streams", Chemistry 99 Report. Winter and Spring 2007.

10.) Ravanbakhsh, R. "The Viscosity of Motor Oil", California State Science Fair. 2003. <http://www.usc.edu/CSSF/History/2003/Projects/J1531.pdf >

11.) Arceo, Salvador. "Viscosities of Various Oils at Temperatures from 0 to 100°C", Chemistry 99 Report. Summer 2007.

Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC
10/06/2008 02:11 PM

To vburley@mtsac.edu
cc Linda Potter/InstructionOffice/MtSAC@MtSAC, lredinge@mtsac.edu
bcc
Subject Fw: Sabbatical Report Status

Dear Dr. Burley,

Today, I'll be contacting both laboratory managers where I volunteered for my sabbatical assignment. I'll politely ask if they could read, comment and return their portions of my report within five working days. I do plan on telling both managers that my project report is late and I'd appreciate a quick turn around. My plan is to electronically send one part of the sabbatical on Wednesday and hand carry the other portion on Wednesday afternoon. I'm hand carrying one portion because it would be difficult to send electronically. (One of the projects I participated with involved proprietary information that the business considers a company secret.)

This is my projected timeline

Oct 8 send to both facilities for corrections and comments.
Oct 15 receive corrected company portions
incorporate corrections and comments.
Oct 17 submit for copying
Oct 20 submit final report

I realize the submission of my report will be terribly late.

Again, I apologize that I've placed you in the position of repeatedly following up.

Regards

Charlie

Charles G. Newman, Ph.D.
Chairperson, Department of Chemistry
Mt San Antonio College
1100 North Grand Ave.
Walnut, CA 91789-1399
(909) 594-5611 ext. 4014

----- Forwarded by Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC on 10/06/2008 01:38 PM -----

Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC
10/03/2008 08:14 AM

To Virginia Burley/InstructionOffice/MtSAC
cc
Subject Re: Sabbatical Report

Dear Dr. Burley,

I apologize that you had to follow up with me. I know you didn't like writing your email. This is entirely my fault.

As with many faculty we have difficulties in saying "No!" to accepting additional responsibilities. That is the case with me. My plate is full and I'm doing the best I can.

I have been working on my report admittedly secondarily behind my classwork and Department work.

One of the conditions for volunteering at both facilities was that management could review their portions of my report before it was submitted. The first portion is still in progress. I will be submitting the second portion of my report to the other businesses early next week.

If you wish to talk with me, I will make myself available at the time of your choosing.

I apologize again,

Charlie

Charles G. Newman, Ph.D.
Chairperson, Department of Chemistry
Mt San Antonio College
1100 North Grand Ave.
Walnut, CA 91789-1399
(909) 594-5611 ext. 4014
Virginia Burley/InstructionOffice/MtSAC

Virginia Burley/InstructionOffice/MtSAC

10/02/2008 04:22 PM

To Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC@MtSAC

cc

Subject Sabbatical Report

Charlie,
I am concerned that we have not received a Sabbatical report from you. The faculty agreement states very clearly that the sabbatical report is due on the first working day of September, and it is now October. It is important for you to understand that if you do not submit a sabbatical report immediately you could be liable for paying the District back for the money you earned on sabbatical. You indicated some weeks ago that you were aware of missing the deadline but that colleagues had told you it didn't matter when you turned it in, or some such explanation. Four weeks have passed, and still we have heard nothing from you on the subject.

Charlie, you are a valued faculty member, and we want to support you in every way possible. However, it is my responsibility to make sure that we are following the faculty contract and you are now in serious violation of the contract deadline for your sabbatical report. Please contact me immediately and let me know when the report will be submitted. If it is not in my office very shortly, we will have to consider the possibility that you have not met your contract obligation to turn in a satisfactory report of your sabbatical leave project.

Virginia Burley, Ph.D.
Vice President, Instruction
Mt. San Antonio College
1100 N. Grand Avenue
Walnut, CA 91789
909.594.5611 ext. 5414

Linda Potter/InstructionOffice/MtSAC
10/06/2008 12:53 PM

To Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC@MtSAC
cc
bcc
Subject Fw: Sabbatical Report Guidelines Attachment

Charlie

It's now five weeks delinquent -- the Salary & Leaves Committee has already met and is in the process of reviewing reports. What is the status?

Linda Potter
Executive Assistant - Vice President of Instruction
Mt. San Antonio College
909.594.5611 ext. 5414
----- Forwarded by Linda Potter/InstructionOffice/MtSAC on 10/06/2008 12:53 PM -----

Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC
09/08/2008 10:54 AM

To Linda Potter/InstructionOffice/MtSAC@MtSAC
cc
Subject Re: Sabbatical Report Guidelines Attachment

Thanks Linda,

Will do!

Regards,

Charlie

Charles G. Newman, Ph.D.
Chairperson, Department of Chemistry
Mt San Antonio College
1100 North Grand Ave.
Walnut, CA 91789-1399
(909) 594-5611 ext. 4014
Linda Potter/InstructionOffice/MtSAC

Linda Potter/InstructionOffice/MtSAC
09/05/2008 03:20 PM

To
cc Matthew Munro/Mathematics/NaturalSciencesDiv/MtSAC@MtSAC, Tammy Trujillo/Art/ArtsDivision/MtSAC@MtSAC, Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC@MtSAC
Subject Sabbatical Report Guidelines Attachment

I apologize -- I didn't attach the Sabbatical Report guidelines in my prior email. Remember that we need two sets - 3-hole punched.

Thanks,

[attachment "Sabbatical Report.doc" deleted by Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC]

Linda Potter
Executive Assistant - Vice President of Instruction
Mt. San Antonio College
909.594.5611 ext. 5414

MT. SAC 1946-2006 60 YEARS OF EXCELLENCE!

SALARY AND LEAVES COMMITTEE 2006-07

APPLICATION FOR SABBATICAL LEAVE

Name of Applicant: CHARLES G. NEWMAN Date: 11/30/06

Department: CHEMISTRY Division: NATURAL SCIENCES

Address: 17292 CORALWOOD CIRCLE

City: YORBA LINDA CA Zip: 92886

Date of Employment at Mt. SAC: FALL 2000 Dates of last sabbatical: From — To —

Length of sabbatical leave requested: [X] One semester [ ] Two semesters

Effective dates for proposed sabbatical leave: Fall (year): — Spring (year): 2008

[ ] Study [ ] Travel [X] Project

[ ] Combination (specify):

I plan to use banked leave to supplement my sabbatical leave. ☐ no ☒ yes

(Note: If yes, a separate "Use Banked Leave" form must be submitted to your Division office, be approved and received by Human Resources by the third week of the semester preceding your leave.)

±

NOTE: Sabbatical periods are limited to contractual dates of the academic year.

Attach:

1. A comprehensive, written statement of the proposed sabbatical activity(ies) including:
   - description of the nature of the activity(ies)
   - timeline of the activity(ies)
   - an itinerary, if applicable
   - proposed research design and method(s) of investigation, if applicable
2. A statement of the anticipated value and benefit of the proposed sabbatical activity(ies) to the applicant, his/her department or service area, and the College.
3. An abstract of your plan for use in the Board of Trustees agenda. ATTACHED

Any change or modification of the proposed sabbatical activity(ies) as evaluated and approved by the Salary and Leaves Committee must be submitted to the Committee for reconsideration.

Applicant's Signature: [signature] Date: 11/30/06

(continued on the next page)

ACKNOWLEDGMENT BY THE DEPARTMENT/DIVISION

The acknowledgment signatures reflect awareness of the sabbatical plan for the purpose of personnel replacement. Comments requested allow for recommendations pertaining to the value of the sabbatical leave plan to the college.

Applicants must obtain the signatures of acknowledgment prior to submitting application to the Salary and Leaves committee.

Department Chairperson:

Signature: Eileen M. DeMaino Date: 11/29/06

Comments: The learning modules that will result from this project will be incredibly valuable to the Chem Tech program. They will also be valuable to the courses that nurses, scíene & engineers take in our Department! These modules will make a connection to the working world that is rarely made in classrooms!

Division Dean:

Signature: D. Bower Date: 11/30/06

Comments: A great proposal. Charlie has our full support.

Note: Deans are requested to submit a statement of recommendation regarding the value of the sabbatical plan to the College, division/department, and individual, in consultation with the appropriate department chairperson.

ACKNOWLEDGMENT OF THE APPROPRIATE VICE PRESIDENT (INSTRUCTION OR STUDENT SERVICES)

Signature: Date:

Comments:

Natural Sciences Division

AGRICULTURE•BIOLOGY•CHEMISTRY•EARTH SCIENCES/PHOTOGRAPHICS/ASTRONOMY
MATHEMATICS/COMPUTER SCIENCE•NURSING•PHYSICS/ENGINEERING

INTER-OFFICE MEMORANDUM

To: Salary and Leaves Committee

From: Debbie Boroch, Associate Dean DJB
Natural Sciences Division

Date: 30 November 2006

Subject: Proposed Sabbatical Leave for Charlie Newman, Spring 2008

This memo is being written on behalf of Dr. Charlie Newman, Professor of Chemistry, in support of his proposed sabbatical leave, Spring 2008. Charlie's project will contribute significantly to his personal professional development as he learns first-hand about the work of Chemical Technicians on the job in various industries. From this experience, Charlie proposes to craft a series of learning modules that will be included in our Chemical Laboratory Technician program. In this way, Charlie's enhanced professional expertise will directly translate into tangible and extremely relevant applications with direct benefits to students in the program.

I have spoken with Professor Newman about how his absence would be accommodated to insure continuity in the Chem Tech Program during his absence. I'm convinced that we have sufficient resources available to avoid interruption of planned course sequences for these vocational students. We should also find suitable replacements for his remaining courses in the Chemistry Department.

Please give Professor Newman's proposal your serious consideration. I have every confidence that he will deliver on his promise to produce a comprehensive and valuable set of learning resources, and will take every opportunity to enhance his personal growth via this experience.

Board of Trustees
Abstract

Sabbatical Request

February through June 2008

The sabbatical project will concentrate on understanding the professional and technical roles of Chemical Laboratory Technicians. During spring semester, 2008, considerable effort will be placed on identifying critical areas where professional skills are required in the work place. This project will be a combination of first hand knowledge gained by working as a laboratory technician and by surveys collected from both faculty and employers. Sabbatical findings will be utilized to build Learning Modules to improve professional skills and to write an article to be submitted in a peer reviewed journal.

Respectfully submitted for your consideration,

Charles G. Newman
Department of Chemistry

Sabbatical Request

February to June 2008

Summary

The sabbatical project will concentrate on understanding the professional and technical roles of Chemical Laboratory Technicians. During spring semester, 2008, considerable effort will be placed on identifying critical areas where professional skills are required in the work place. This project will be a combination of first hand knowledge gained by working as a laboratory technician and by surveys collected from both faculty and employers. Sabbatical findings will be utilized to build Learning Modules to improve professional skills and to write an article to be submitted in a peer reviewed journal.

Justification

Academic intuitions stress technical knowledge based skills and do little to stress professional working or interpersonal skills. Although workplace technical competency is critical, non-technical skills may be equally or possibly more important in a business environment. To confirm this, data will be collected and measured against the metric of employer expectations.

Plan

I intend to volunteer as a Chemical Laboratory Technician at two different businesses, in two different industries, and learn as much as I can of what employers expect from entry-level employees. Required and highly desired skills will be identified, documented, categorized and ranked by importance. The information gained during this sabbatical project will be distilled into Learning Modules and taught to our Chemical Laboratory Technology students so they are aware of employer expectations. This first hand knowledge will be supplemented with surveys from industrial employers and chemistry faculty. If these Learning Modules are shown to be beneficial, they could be shared with other degree programs on campus. Sabbatical project findings and sample Learning Modules will be submitted for publication to the Journal of Chemical Education.

The Proposed Sabbatical Project

Objectives:

Part 1: Acquire Technical and Non-technical Skill Set Information through Work Experience.

1. I've offered to volunteer as a Laboratory Technician to several local businesses.
2. Two facilities have responded (See attached emails)
    a. Inland Empire Utility Agency – Waste Water Treatment Facility in Ontario
    b. Custom Building Products – Manufacturer of cements, grouts, tile adhesives and ceramic material cleaners in City of Industry
3. With prior written consent from each employer, collect information on working skills.
4. Accurately document essential technical and non-technical skill competencies and competency levels.
5. Gain first-hand information on skill set requirements for entry-level lab technicians.
6. Using an "Activity Journal" (diary format), document the activities preformed and the necessary skills required for success.
7. Rank essential and desired skill set requirements by each employer.

Part 2: Verify Required and Highly Desired Skill Competencies by Survey.

1. With assistance from Research and Institutional Effectiveness (RIE), construct a survey to be given to Chemistry Department faculty and local employers.
2. Compare the responses from each group, identify the specific skill areas where discrepancies exist and determine the magnitude of the discrepancy.
3. The results from survey respondents will define the specific areas that may define topics for Learning Modules.

Part 3: Construct Learning Modules for the Chemical Laboratory Technician Program

1. Based on first-hand observations and survey respondent results, build Learning Modules that illustrate the skill sets necessary for success in a working environment.
    a. Construct hands-on laboratory based technical skill set activities.
    b. Construct Learning Modules that illustrate Professional skills.
    c. Construct Learning Modules that illustrate Interpersonal skills.
2. Test Learning Modules during fall 2008.

Part 4: Compile Findings and Draft Journal Article

1. Write and submit article for publication to the Journal of Chemical Education.
2. Test the Learning Modules and validate importance based on employer and student responses.
3. Plan to make the Learning Modules available to other disciplines.

Project Goals:

The overriding goal of this sabbatical project is to

- better equip our students for a professional career,
    - provide real world situational examples, through Learning Modules, that illustrate typical situations,
    - provide credible, verifiable and essential skill sets requirements for work,
    - teach students the necessary technical, professional and interpersonal skills that employers are looking for,
- disseminate project findings to the department, division and college,
- disseminate findings to the educational community at large,
- build stakeholder commitment with the community and local employers

Project Timeline:

Sabbatical Project Timeline is found on page 6.

Final Report and Findings:

The final report will be submitted on-time for review and presentation

The following information will be available for dissemination

- Survey Results from Chemistry Faculty, Employers and Supervisors
- Learning Modules, both lecture and hands-on laboratory activities
- Article submitted to the Journal of Chemical Education for possible publication

Benefit to the Community

Along with the goal to better equip our students to enter the workforce comes the opportunity of grow our industrial contact base, to gain increased stakeholder involvement by local industries and to further identify industrial sectors that seek to hire our Chemical Laboratory Technician graduates.

Benefit to the College and the Department of Chemistry

This proposed sabbatical project complements the existing department and division goals with respect to supporting the Chemical Laboratory Technician program. The completion of this project will provide an increased understanding into the technical and professional skill set competencies necessary to becoming a successful Chemical Laboratory Technician. These findings will be integrated into the existing Chemical Laboratory Technician curriculum so our program graduates are sought after by local employers.

Having a tenured faculty gain first hand experience working as a technician underscores our dedication and commitment for all program stakeholders. From an employer's perspective, this sabbatical project is a statement of assurance to maintain a current and relevant program content in a changing professional environment. By working in their facilities, employers will feel more connected to the college. They will feel their voices are being heard where specific professional skill needs are being addressed and integrates into our program. The results of this sabbatical project would increase stakeholder involvement between the community and the college.

Since most chemistry department faculty has little industrial experience, sharing this sabbatical experience would benefit the entire department. Since the overwhelming majority of our students will work in some sort of a for-profit business, the industrial experience gained by this sabbatical project would be valuable to all our students as well. Again, these sabbatical project findings would be available to everyone to use or integrate into their specific program.

Benefit to the Instructor

Ever since I began graduate school, I questioned the standard education model used in the sciences to equip graduates for a career. It became painfully obvious to me that the State University and University of California systems educate students to become academic researchers. In a sense, University professors were propagating themselves. Since most academicians have never worked in an industrial environment, it is reasonable that they teach what they know, basic research from an academic perspective. However, more that 80% of science majors begin their careers in a business environment. Therefore, we as educators should realize and make provisions to address this disconnect.

This sabbatical would benefit me by increasing my understanding of the businesses that surround our community. This experience would also add confidence and authority to my presentations to industrial members and to potential employers of our graduates.
Even though I have 21 years of industrial experience and have supervised numerous technicians, a current fresh experience could only refresh, compliment and validate my lecture presentations.

Benefit to the Students

The overriding goal of this sabbatical project is to provide students with the best educational experience possible so program graduates not only become successful entry-level employees, but employers request to hire our graduates.

Comment:

Prior to the submission of this proposal, project goals, objectives and outcomes were shared with two consultants from College Chemistry Consultants, an advisory group that works closely with the American Chemical Society. (One these consultants, a former laboratory technician and now a Ph.D. in Chemical Engineering who was a key participant in the formation of the Technician branch of the American Chemical Society. The other consultant initiated and was a Program Director of the Chemical Technician program and later became the Dean of Sciences and Letters at City College of New York.) Both consultants believe this sabbatical project would benefit our program and our students.

Projected Timeline

The following is a projected timeline for the proposed sabbatical project scheduled for spring 2008.

Month	Proposed Projects				
	Industrial Site	Observations	Surveys	Findings	Learning Modules
February	Custom Building Products	Document skills necessary	Construct Survey with RIE		
March	Custom Building Products	Document skills necessary	Complete and test Survey with RIE		
April		Draft summary findings	Disseminate Survey	Data Collection	Build Modules
May	Inland Empire Utility Agency	Document skills necessary	Disseminate Survey	Data Collection	
June	Inland Empire Utility Agency	Document skills necessary		Data Reduction	
July – Sept.		Draft summary findings		Formal Report of Findings	Write Article Build Modules

The Sabbatical Project final report will include the all observations made on-site

"Nel Groenveld"
<ngroenveld@ieua.org>
11/28/2006 08:01 AM

To "Charles Newman" <CNewman@MtSAC.edu>
cc
bcc
Subject RE: Volunteering at your Facility

Charles,

We would be very interested in having you volunteer at the IEUA laboratory during your sabbatical. Either I or someone from our Human Resources department will get in touch with you to work out the details.

Thank you,

Nel Groenveld
Manager of Laboratories
Inland Empire Utilities Agency
909-993-1813

From: Charles Newman [mailto:CNewman@MtSAC.edu]
Sent: Tuesday, November 21, 2006 10:27 AM
To: Nel Groenveld; tlcatlin@verizon.net; sdadah@associatedlabs.com; randyb@cbpmail.net
Subject: Volunteering at your Facility

Dear Supporters,

To improve the quality and relevance of our Chemical Laboratory Technician program, I am looking for opportunities to work as a technician and pass this knowledge to our students.

I am proposing a one-semester sabbatical, to the College, that would strengthen our program and train our students in the skills that employers desire. My goal would be to volunteer at two different facilities, for between six and eight weeks each, complete the tasks assigned to me and document the skills necessary to meet employer expectations. I hope to gain current real world practical experience in the technical as well as non-technical skills that employers consider advantageous.

I could be available March through June of 2008. I know this is long way off, but my sabbatical proposal is due in December.

If you have an opening at that time, may I volunteer as a technician at your facility? Thank you

Regards,

Charles Newman
Department of Chemistry

"Randy Bright (SFS)" <Randyb@cbpmail.net>
11/21/2006 02:01 PM

To "Charles Newman" <CNewman@MtSAC.edu>
cc "Arjun \(SFS\)" <Arjun@cbpmail.net>, "George Marcina \(SFS\)" <Georgem@cbpmail.net>, "John McMullen \(Corp\)" <Mac@cbpmail.net>
bcc
Subject RE: Volunteering at your Facility

Prof. Charlie:

We would be honored to have you work for several weeks here at our Research and Development facility in Santa Fe Springs. I'm positive that we could put together a well defined project for you that would give you a very good feel for the way we work here.

Please let me know ASAP. Thank you for the note.

Randy

Randall P. Bright, Ph.D.
562-968-2980 x165

From: Charles Newman [mailto:CNewman@MtSAC.edu]
Sent: Tuesday, November 21, 2006 10:27 AM
To: ngroenveld@ieua.org; tlcatlin@verizon.net; sdadah@associatedlabs.com; Randy Bright (SFS)
Subject: Volunteering at your Facility

Dear Supporters,

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I am proposing a one-semester sabbatical, to the College, that would strengthen our program and train our students in the skills that employers desire. My goal would be to volunteer at two different facilities, for between six and eight weeks each, complete the tasks assigned to me and document the skills necessary to meet employer expectations. I hope to gain current real world practical experience in the technical as well as non-technical skills that employers consider advantageous.

I could be available March through June of 2008. I know this is long way off, but my sabbatical proposal is due in December.

If you have an opening at that time, may I volunteer as a technician at your facility? Thank you

Regards,

Charles Newman

Sabbatical Request

Spring 2008

Resubmitted for Review

January 11, 2007

Learning Modules to Teach Professional Skills

Charles G. Newman

Department of Chemistry

Sabbatical Request

March to June 2008

Summary

This sabbatical project will concentrate on understanding the professional and technical roles of Chemical Laboratory Technicians. During spring semester, 2008, considerable effort will be placed on identifying critical areas where professional skills are required to be successful in the work place. This project will combine first-hand knowledge working as a laboratory technician, and surveys collected from both faculty and local employers. Sabbatical findings will be utilized to build Learning Modules expected to improve professional skills for those students within the Chemical Laboratory Technician program and to other degree programs within the college.

Justification

Academic intuitions stress technical knowledge based skills and do little to stress professional working or interpersonal skills. Although workplace technical competency is critical, non-technical skills may be equally or more important in a business environment. To confirm this, data will be collected and measured against the metric of employer expectations.

Plan

I intend to volunteer as a Chemical Laboratory Technician at two different businesses, in two different industries, and learn as much as I can what employers expect from entry-level employees. Required and highly desired skills will be identified, documented, categorized and ranked by importance. The information gained during this sabbatical project will be distilled into Learning Modules and taught to our Chemical Laboratory Technology students so they are aware of employer expectations. This first hand knowledge will be supplemented with surveys from industrial employers and chemistry faculty. If these Learning Modules are shown to be beneficial, they will be shared with other degree programs on campus.

The Proposed Sabbatical Project

Objectives:

Part 1: Acquire Technical and Non-technical Skill Set Information through Work Experience.

1. I've offered to volunteer as a Laboratory Technician at several local businesses.
2. Two facilities have responded (See emails attached to the original proposal.)
    a. Inland Empire Utility Agency – Waste Water Treatment Facility in Ontario, CA
    b. Custom Building Products – Manufacturer of cements, grouts, tile adhesives and ceramic material cleaners in City of Industry, CA
3. With prior written consent from each employer, collect information on desired working skills.
4. Document essential technical, non-technical skills and competency levels.
5. Gain first-hand information on all skill set requirements for entry-level lab technicians.
6. Using an "Activity Journal" (diary format), document the activities performed and the necessary skills required for success.
7. Rank essential and desired skill set requirements by each employer.

Part 2: Verify Required and Highly Desired Skill Competencies by Survey.

1. With assistance from Research and Institutional Effectiveness (RIE), construct a survey to be given to Chemistry Department faculty and local employers.
2. Compare the responses from faculty and employers, identify the specific skill areas where discrepancies exist and determine the magnitude of the discrepancy.
3. The results from survey respondents will define the specific areas that may be included as Learning Module topics.

Part 3: Construct Learning Modules for the Chemical Laboratory Technician Program

1. Based on first-hand observations and survey respondent results, build Learning Modules that illustrate the skill sets necessary for success in a working environment.
    a. Construct hands-on laboratory based technical skill set activities.
    b. Construct Learning Modules that illustrate Professional skills.
    c. Construct Learning Modules that illustrate Interpersonal skills.

2. Test Learning Modules during fall 2008.
3. Based on employer and student responses validate Learning Module importance.
4. Plan to make the Learning Modules available to other disciplines at the college.

Project Goals:

The overriding goal of this sabbatical project is to:

- better equip our students for a professional career,
    - provide real world examples, through Learning Modules, that illustrate typical workplace situations,
    - provide credible, verifiable and essential skill sets requirements for the workplace,
    - teach students the necessary technical, professional and interpersonal skills that employers desire,
- disseminate project findings to the department, division and college,
- disseminate findings to the educational community at large,
- build stakeholder commitment with the community and local employers

Project Timeline:

Sabbatical Project Timeline is found on page 6.

Final Report and Findings:

The final report will be submitted on-time for review and presentation. The following information will be available for dissemination:

- Survey Results from Chemistry Faculty, Employers and Supervisors
- Professional skill Learning Modules - both lecture and hands-on laboratory activities

Benefit to the Community

Along with the goal to better equip our students to enter the workforce comes the opportunity of grow our industrial contact base, to gain increased stakeholder involvement by local industries and to further identify industrial sectors that seek to hire our Chemical Laboratory Technician graduates.

Benefit to the College and the Department of Chemistry

This proposed sabbatical project complements the existing department and division goals with respect to supporting the Chemical Laboratory Technician program. The completion of this project will provide an increased understanding into the technical and professional skill set competencies necessary to becoming a successful Chemical Laboratory Technician. These findings will be integrated into the existing Chemical Laboratory Technician curriculum so our program graduates are sought after by local employers.

Having a tenured faculty gain first hand experience working as a technician underscores our dedication and commitment for all program stakeholders. From an employer's perspective, this sabbatical project is a statement of assurance to maintain a current and relevant program content in a changing professional environment. By working in their facilities, employers will feel more connected to the college. They will feel their voices are being heard where specific professional skill needs are being addressed and integrates into our program. The results of this sabbatical project would increase stakeholder involvement between the community and the college.

Since most chemistry faculty have little industrial experience, sharing this sabbatical experience would benefit the entire department. Since the overwhelming majority of our students will work in some sort of a for-profit business, the industrial experience gained by this sabbatical project would be valuable to all our students as well. Again, these sabbatical project findings would be available to everyone to use or integrate into their specific programs throughout the college.

Benefit to the Instructor

Ever since I began graduate school, I questioned the standard education model used in the sciences to equip graduates for a career. It became painfully obvious that the State University and University of California systems educate students to become academic researchers. In a sense, University professors were propagating themselves. Since most academicians have never worked in an industrial environment, it is reasonable that they would teach what they know, basic research from an academic perspective. However, more

that 80% of science majors begin their careers in a business environment. Therefore, we as educators should realize this fact and make provisions to address this disconnect.

This sabbatical would benefit me by increasing my understanding of the businesses that surround our community. This experience would also add confidence and authority to my presentations to industrial members and to potential employers of our graduates. Even though I have 21 years of industrial experience and have supervised numerous technicians, a current fresh experience could only refresh, compliment and validate my lecture presentations.

Benefit to the Students

The overriding goal of this sabbatical project is to provide students with the best educational experience possible so program graduates not only become successful entry-level employees, but employers requesting to hire our graduates.

Comment:

Prior to the submission of this proposal, project goals, objectives and outcomes were shared with two consultants from College Chemistry Consultants, (an advisory group that works closely with the American Chemical Society). (One these consultants, was a former laboratory technician and now a Ph.D. in Chemical Engineering who was a key participant in the formation of the Technician branch of the American Chemical Society. The other consultant initiated and was a Program Director of the Chemical Technician program and later became the Dean of Sciences and Letters at City College of New York.) Both consultants believed this sabbatical project would benefit our program and our students.

Projected Timeline

The following is a projected timeline for the proposed sabbatical project scheduled for spring 2008.

Month	Proposed Projects				
	Industrial Site	Observations	Surveys	Findings	Learning Modules
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This Sabbatical Project final report will include the all observations made on-site at the industrial facilities previously mentioned.

Virginia Burley/InstructionOffice/MtSAC

03/13/2008 02:12 PM

To Linda Potter/InstructionOffice/MtSAC@MtSAC
cc Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC@MtSAC
bcc
Subject Re: Fw: Change in Sabbatical Schedule

Thanks for keeping us updated on changes occurring for you. We will accept the change and consider the new arrangement to be an acceptable implementation of your project.
Ginny

Virginia Burley, Ph.D.
Interim Vice President, Instruction
Mt. San Antonio College
1100 N. Grand Avenue
Walnut, CA 91789
909.594.5611 ext. 5414

Linda Potter/InstructionOffice/MtSAC

Linda Potter/InstructionOffice/MtSAC

03/13/08 09:33 AM

To vburley@mtsac.edu
cc
Subject Fw: Change in Sabbatical Schedule

Linda Potter
Executive Assistant - Vice President of Instruction
Mt. San Antonio College
909.594.5611 ext. 5414

----- Forwarded by Linda Potter/InstructionOffice/MtSAC on 03/13/2008 09:33 AM -----

Charles Newman/Chemistry/NaturalSciencesDiv/MtSAC

03/13/2008 09:27 AM

To Linda Potter/InstructionOffice/MtSAC@MtSAC
cc edimauro@mtsac.edu, lredinge@mtsac.edu, mjudd@mtsac.edu
Subject Change in Sabbatical Schedule

Hi Linda,

Based on situations beyond my control, I'm making the following sabbatical adjustments.

My first assignment was to begin on March 3rd. However, shortly before my start date I received a call from my assignment that HR prefers to hire me as an Intern rather than a volunteer. They believed this would be "cleaner" because I would be covered under their Workman's Compensation insurance. As of

March 12th, I've completed the application process, background check and a company physical. I am still waiting for a specific start date.

Last night I found that my second assignment wanted me to begin on March 17th, several weeks earlier than the original plan. I've contacted the supervisor of my first assignment and have requested an adjustment to the original schedule. (Left vmails at both her office and cell phone and a detailed email requesting this change) My first assignment supervisor will be out of the office until Monday, 3/17.

My approved sabbatical proposal showed dates working at two different businesses, Custom Building Products (CBP) and Inland Empire Utility Agency (IEUA). (See attached proposal) In the fall, based on the needs of the two facilities the assignment start dates were reversed. (see page 7) Now with IEUA being my first assignment and CBP being the second. However, their needs have changed again and the schedule order has been returned to what was originally proposed.

Even with this reversal and re-reversal of assignments, I will be able to complete my sabbatical project on time.

Sabbatical Request Resubmit.doc

Sabbatical Request

Spring 2008

Resubmitted for Review

January 11, 2007

Learning Modules to Teach Professional Skills

Charles G. Newman

Department of Chemistry

Sabbatical Request

March to June 2008

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