

Chemical Sciences Division

Self-Assessment Report

Ergonomic Safety in Chemical Sciences Division Laboratories

Written by:

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10/29/2012
Date

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Executive Summary

The Chemical Sciences Division's (CSD) Ergonomics Assessment last year (FY2011) focused principally on ergonomic practices and procedures employed by CSD personnel when working in offices. A number of ergonomic injury cases were discussed and analyzed, with emphasis placed on how to proceed in addressing and repairing the ergonomic discomfort. The key point in this past assessment was to establish to what extent ergonomically caused discomforts could be handled by CSD personnel and when it was necessary to call in the Subject Matter Experts (SME) in the EH&S (EHSS) Ergonomics Program to propose solutions.

This year's (FY2012) Ergonomics Self-Assessment focused almost exclusively on potential and actual ergonomic problems encountered in one multi-faceted CSD group's laboratory efforts. Assessment of procedures or equipment most effective in addressing identified ergonomic problems in the varied laboratory environments were the principal objective of this assessment. How well do CSD and EHSS personnel collaborate in the discovery process, and in mutual cooperation to effectively implement solutions to actual or potential laboratory based ergo problems? Specific topics included are as follows:

- 1) Search for and testing of special tools to be used with work on high-vacuum chambers and associated pumping equipment and instrumentation. Units are used both in the ALS and laboratory environments.
- 2) Development of smaller scale lifting and crane systems which are effectively operated by trained laboratory researchers. These systems are quite effective in relieving potential lifting and manipulation of apparatus problems, a type of problem which has been experienced by several group members in the past at other workplaces.
- 3) Examination of ergonomic processes encountered in high powered laser setups. Reconstruction of several high-vacuum chamber closures, which are integrated into these laser systems, meant that the potential for musculoskeletal injury was greatly diminished.
- 4) Consideration of and development of conceptual designs for auxiliary support equipment to preclude a researcher's often awkward positions from causing back or neck ergo injuries, when working with optical and mechanical elements on a laser table.

Efforts by the group members, as stimulated by discussions in the weekly research group meetings, resulted in nearly every member participating in the search for better tools, in review and judgment of suggested tools and designs, in development of effective "crane" equipment with unexpected LBNL monitoring system modifications, and in exploring ideas about better ways to construct experimental apparatus. In short, the group members became actively engaged in contributing analysis of, control of hazards and improvement of workplace efforts; good ISM. The EHSS Ergo team was equally involved in working with these group members over an extended period (~8 months), giving the benefit of experience for judgment of some group member ideas, and enthusiastically developing additional resources from discussions with associates and their own investigative literature searches.

Finally, a new EHSS training course titled EHS0056 – Ergo Material Handling & Body Mechanics in Labs, was developed in a tripartite arrangement between CSD personnel, Ergo Team members and the EHSS training course developer. This online ergo safety course better prepared outside LBNL collaborators, jointly doing experiments with CSD researchers, to become acquainted with good ergonomic workplace practices before their arrival.

Introduction

A multiple tasked work group, doing extensive laboratory work in Bldg. 2 and also at the ALS, was frequently observed for approximately eight months during FY2012. Their diverse tasks included many potentially sensitive ergonomic techniques.

1) Work on experimental vacuum chambers requires extensive use of tools, much of the time in ergonomically awkward positions, to manually tighten or loosen the required numerous bolts holding the equipment together. Revisions and improvements to the apparatus contained in these vacuum chambers also require frequent assembly or disassembly. Hard-to-reach work being done on the internally mounted experimental configurations also generates potential ergonomic problems.

2) Lifting and manipulation of experimental equipment parts constantly exposes the group members to potential ergonomic injuries, most likely back injuries. Identification of and discussion of this problematic area were done in FY2011 – Ergonomic Safety in Chemical Sciences Division – Self-Assessment Report. In this self-assessment, solutions to the identified problems described within are achieved.

Impetus to examine these workers' laboratory ergonomics was strengthened by the realization that two members of this work group being assessed had already suffered serious ergonomic related injuries. Both persons have existing neck and back problems as a result of not using suitable ergonomic techniques while previously doing workplace activities. One of the group members injured his back, over eight years ago, while he was a postdoctoral scholar at LBNL. He still experiences the consequences.

Consequently, there was a strong motivation by these injured people to ensure other group members would not suffer similar or other ergonomically deficient fates. Leadership was shown (and continues to be shown) at the regularly scheduled weekly group meetings. Extensive discussions resulted in fulfilling the goal of group members wrapping their arms around this broad ergonomic area, thereby gaining a satisfactory degree of ergonomic control over their associated work place activities.

Coincidentally, a person arrived at the EHSS Ergo Team in FY2012, who had become very familiar with laboratory workplace ergonomic problems through having worked in solving very serious ergonomic problems in production-line work at the DOE Joint Genome Institute (JGI). She and the EH&S Ergo Team became actively interested in extending themselves by identifying, exploring and possibly solving ergonomic problems arising in many laboratory workplaces at LBNL. A large amount of time was spent by this Ergo Team member in working with many of the CSD group members on topics already described. Additionally, new ergonomically sensitive areas were explored and sometimes developed.

While members of the Ergo Team were certainly more experienced about favorable or unfavorable consequences resulting from any given posture or body position, they were not any better prepared than the group members in proposing and testing new ergonomic friendly tools and procedures for the types of laboratory work encountered. Both parts of the combined team seeking answers to potential ergonomic problems were on equal footing and hence felt comfortable collaborating interactively on the numerous ergonomic problem areas. Active give and take between both groups was observed and certainly contributed to a speedier solution of various existing laboratory ergonomic difficulties.

Current Requirements

According to PUB-3000 Chapter 17, responsibilities for controlling ergonomic hazards are shared by management and workers within the division.

17.3 Responsible Parties

“All LBNL division directors, department heads, group leaders, supervisors, work leads and staff have responsibilities to help ensure a safe and healthful work environment. Commitment and cooperation from all employees, students, and subcontractors at all levels are required to successfully implement this policy.”

17.3.3 Employees

“Employees identified as being at elevated risk for developing work-related musculoskeletal disorders (WRMSDs) based on their work tasks (e.g., an average of 4 or more hours per day at computer or 4 or more hours per day performing repetitive or static office work) or performing repetitive or ergonomically awkward) must complete appropriate training: the classroom-based Ergonomics Awareness for Computer Users (EHS0060), or Remedy Interactive Web-based self-assessment *and training* (EHS 0059) *and the WorkSmart Ergonomics* (EHS0062) *training course*. The JHQ JHA will trigger a brief annual re-evaluation for all employees. using a computer for an average of 4 or more hours per day.

Employees have the responsibility to:

- ☐ Properly utilize tools, equipment, and accessories, and perform work safely.
- ☐ Request an ergonomics evaluation to identify and control at-risk conditions.
- ☐ With assistance from supervisor, implement evaluation recommendations in a timely manner.
- ☐ Promptly notify their supervisors of ergonomics concerns or early signs and symptoms of musculoskeletal discomfort.
- ☐ Report to Health Services for medical assistance when indicated.

CSD extends the work tasks covered by ergo evaluation not only for prolonged computer usage but also to include numerous laboratory workplace activities that involve repetitive motion movements and many potential ergonomically awkward motions and postures.

Example: lifting of components and apparatus has been, and is a major consideration in many CSD research groups. Another example centers on repeated tightening and loosening of bolts on high vacuum chambers.

Assessment Scope

Notice of evaluation of the interactive collaborative efforts between a multiphase CSD experimental group and the ERGO TEAM from EHSS. Work activity areas studied are documented in detail in the Appendix sections. These areas included work on experimental apparatus used in high vacuum chamber experiments, lifting and manipulating of the equipment and development of a new useful On-the-Job Training (OJT) class. The latter class is an extension of EHS course: *WorkSmart Ergonomics EHS0062*. This new course is concerned with developing good ergonomic practices similar to those covered in EHS0062, but for work outside of the office environment (i.e., work done in the laboratory and experimental areas).

Assessment Results

Findings:

None noted.

Observations and Lessons Learned:

Last year's Chemical Sciences Ergonomic Self-Assessment Report finished with the following observation. "The LBNL Ergo Team did a survey of work practices in this group's laboratories (AMO group). Among the suggestions offered was the advice to obtain special tools to do the bolt and nut manipulations on their vacuum chamber devices. Good suggestion, but no leads (in FY2012) were ever supplied as was promised. Consequently, gathering information on specialized tools has become one of the goals for the group members. They are showing the same refreshing competence in researching and developing this ergonomic task as they did for independently designing and building their "portable laboratory lifting crane unit." Item discussed in FY2011 CSD Ergonomic Self-Assessment.

In this FY2012 CSD Laboratory Ergonomics Self-Assessment report, observation and reporting of further progress by this sizeable and diverse group's efforts are presented primarily in a chronological order as the several ergonomic items under consideration were formulated and put into place.

Appendix A shows initiation of the dialog on October 27, 2012, between the principal AMO group representative (A1) and the then line leadership of EH&S Ergonomic Safety Team. AMO representative, A1, felt that EH&S Ergo Team could and should be able to provide satisfactory solutions to the numerous laboratory ergonomic problems (see **Appendix B**) that group members had formulated in several group meeting sessions devoted to ergonomic lab safety in their labs. A1 was acting under the belief that Subject-Matter-Experts (SME) in the Ergo Team would be much more skilled in fixing the group identified ergonomic problems. Similarly, it appeared that

the Ergo Team's EH&S line management also entertained this notion. Fortunately for all parties, Melanie Alexandre, who had recently transferred from the Joint Genome Institute (JGI), was assigned the task of interfacing the EHSS Ergo Team with the ergonomic needs of the AMO research group. At the JGI, Melanie (Mel) became quite familiar with the realized possibility of serious laboratory ergonomic conditions as experienced by workers in the genome sequencing production lines.

After several preliminary meetings, a more realistic assessment of how the various AMO group members, Mel and her supervisor, Ira Janowitz (Ergo Program Manager) would act together with AMO personnel to form an effective ergo program tailored to the AMO requirements. If useful answers are to found every group member and the EH&S (now EHSS) personnel need to work together, sharing ideas and solutions for the identified ergonomic problems.

Appendix C shows an effective tool for focusing these combined efforts, organized along the lines of treating the AMO group's ergonomic requests as one large project, with many clearly broken out sub-sections. This Project Tracking sheet showed organization of the project along the items listed in Appendix B. Using the periodic Project Tracking Sheet would also serve the purpose of being an on the mark tool for informing AMO senior management and CSD senior management (Deputy Director for Operations) about progress being made.

Delineation of Laboratory Ergonomic Projects in Appendix C are:

- 1) Project A1 – **Online Ergo Training Course**
- 2) Project A2 – **Electric Forklift Training**
- 3) Projects B1, C1 and D1 – **Rigging for Rooms 102, 104 and 333 in Bldg. 2 laboratories.**
- 4) Project B2 – **Hand Tools in Room 102, Bldg. 2**
- 5) Project B3 – **Power Tools for Room 102, Bldg. 2**
- 6) Project B4 and D2 – **Step Ladders (Stools) and Platforms**
- 7) Project D3 – **Reaching Optics – Room 333, Bldg. 2**
- 8) Project C-333 – **High Vacuum Chamber Lids and Lifting Equipment**

By **11/15/2011**, all affected personnel had, at the very least, formulated action plans for solving their ergo problems. Note Project A2 – **Electric Forklift Training** – was solved already by having three group members take a class from Matt Rice, EHS. Previously, the appropriate EH&S (EHSS) contact to get this training from was not known and wasn't readily available in the general EHSS online information resources, at least to A1. Item 8 was not included in this Project Tracking Sheet – Appendix C.

Appendix E contains emails describing the paths forward being developed to address the serious ergo problem for this group's efforts in working on the nuts and bolts of high vacuum chambers fittings. As highlighted, the problems and solutions center on the concept of "safe wrenching in the lab". Interviews of LBNL personnel in other hill locations were done to determine whether they have already created unique tool solutions which could also be adopted by the AMO group. An ALS resource was identified for development of "custom" tools, but the most helpful contact was the Snap-On Tool representative. He pointed to obscure tools in the catalog, which had been overlooked by AMO A1 worker. Several identified obscure items later proved to be useful. The offer by the Snap-On representative to provide a seminar on "safe-wrenching in the lab" has not yet been acted on by either the EHSS Ergo Team or this part of the AMO group.

Appendix F is a “white paper” summary of ergonomic research and work, prepared by the AMO representative A1, which covers in great detail those problems discussed in this self-assessment report. Lists and photos of many items of hardware which were considered and/or adopted are shown. For example, the special tools from Snap-On, which were ordered, are listed beginning on page 23, of this **Appendix F – “Laboratory Ergonomics in 2-102, 104, 106 (Lab Ergo Report)”**. This Appendix also contains details on hardware considered for solving ergonomic problems encountered in nearly all of the other B, C and D projects. Pages 24-25 and 27-33 contain information on Projects **B1, C1 and D1 – Rigging for Rooms 102, 104 and 333 in Bldg. 2 laboratories, B1, C1 and D1 – Rigging for Rooms 102, 104 and 333 in Bldg. 2 laboratories, B3 – Power Tools for Room 102, Bldg. 2 and B4 and D2 – Step Ladders (Stools) and Platforms**. Decisions are clearly indicated whether to pursue acquisition of a particular identified item in sections of **Appendix F – Lab-Ergo Report**.

Appendix D, a later **Progress Tracking Sheet – 1/12/2012** – is a two month progress report. The enthusiasm in this report, as compared to **Project Tracking Sheet – 11/15/2011** is tempered. Realization that quickly completing solution of identified group ergonomic deficiencies doesn’t happen. As an example note the new entry for project **A2**, which in the previous report was assessed already solved. In this report **A2** was still mired in obtaining the essential On-the-Job Training (OJT) component which fulfills authorization to use the equipment. Progress was going forward in all the tasks, just at a somewhat slower pace than was originally expected.

Appendix G – Lifting Problem details problems encountered in addressing how and when purchase, assembly and testing of small laboratory assisted lifting equipment would be certified and use of authorized. Noted in Appendix G – Feb. 14, are the following criticisms:

“We tackled the next lifting problem in our lab and ran into the same trouble we had before: Nobody at LBNL is allowed to order shackles, chains, slings or other lifting gear besides the contractor from Crane America (Lou Pandolfo).

While we may be able to find alternative slings and shackles on the hill, which would help us temporarily, we have one crucial part which is a special custom design and is not available outside LBNL. We overdesigned and built it and we are sure it would hold the weight but, as I understand it, we are not allowed to use it before it is load tested. This load test is as well backed up by 2 months and we are cornered:

- we already delayed our science by 2 months
- we already spent time on thinking about and finding alternative lifting gear
- with the latter we technically could proceed but we would need to use our not yet certified custom part. It would be good for our backs but it would be against the law and thus we cannot do it.
- we can lift the old way using just our bear hands like before but we would risk hurting us. I want to avoid this.

This problem is a repetition of what happened before. However, we believe that LBNL has to think about a way to improve this situation on the management side and provide him with the necessary assistance.

With an improving safety culture throughout LBNL we think that more and more people will look for ergonomically safe ways to lift equipment and thus the demand for lifting gear and professional assistance will be even increasing. We believe that a way to cut down the waiting time for parts and help is important to work safe at LBNL.” Other included information in Appendix G shows the interactions between the AMO group, EHSS Ergo group and Facilities’ efforts in an attempt to clarify and establish procedures for handling certification and authorizations for lifting equipment. Finally, on May 12, 2012, the AMO group received a signed LIFT Certification authorization notice. Apparently Crane America, the former outside lift authorizing contractor, was replaced by Crane Tech, another non-LBNL outside contractor. A subsequent report from AMO representative, A1, indicates this contractor change has resulted in a much speedier and proactive attitude towards helping the customer.

Appendix H – Successful Approved Lift, May 24, 2012, has numerous photos showing the various steps involved in lifting and flipping an essential part of experimental equipment in 2-104. Picture and design of the custom apparatus used in this operation and other lifting devices fabricated by the AMO group are found in **Appendix. F – “Laboratory Ergonomics in 2-102, 104, 106 (Lab Ergo Report)”** pages 14-19. At last, the lifting system is in place and helps to ensure reduced ergonomic back and upper torso injuries.

Appendix I – Laser Table Ergo Resources – contents show the initial inspiration for a solution to the ergonomic problem of bending over laser tables to adjust optical elements located more towards the center of a laser table, not on the laser table edge. It was thought by AMO-A1 person that by providing an overhead strap to provide support while leaning forward, thereby much reducing back strain. Ergo Team went along with developing this idea. – **Dec. 16, 2011.**

Appendix J – Laser Ergo: Laser Table - registers the complaint from the laser lab workers that the one-arm strap idea isn’t workable. Adjusting or aligning optical elements requires a researcher to use two hands, arms, etc. Hanging from a strap just was unworkable in the researchers’ estimation. An alternative idea was offered by one of the AMO laser group graduate student. This Ergo Leaning frame design was sketched and was offered up for criticism. Concerns were forthcoming from the Ergo Team member, Mel and from AMO rep A1, **March 7, 2012.**

Appendix L – Laser Ergo Stand – was fabricated as a possible alternative leaning frame design. **May 16, 2012.** Lab testing was begun on May 17, 2012, with no conclusive evaluations being offered. Optical element adjustments and alignments were not needed as the well-tuned laser setup was working very well. It is still an open question whether leaning frame designs, as constructed, would be useful to alleviate ergonomic back strains.

Late developing test of laser ergo stand was received from personnel involved in the BELLA project. They have borrowed and adapted this stand for use in the clean-room setup of lasers and optical components in this major project. Email states the design and prototype are working quite well.

Appendix K – Ergo Review of Bldg.2-room 333 laser lab –March 22, 2012 - is constructed similarly to **Appendix F –Lab Ergo Report**. Results detailed in **Appendix K** addressed the topics of leaning frame use and substitution of lighter weight plastic materials in place of lids fabricated from either aluminum or stainless steel. Conclusions reached indicated: 1) leaning

frame probably wasn't necessary at the time for use in this laser lab setup, and 2) replacement of high vacuum chamber lids with non-metallic plastics would significantly reduce back and upper torso strain resulting from the frequent manipulation of these lids in adjusting the experimental setups.

Appendix M – Lid Dimensions –May 10, 2012 – details the dimensions and calculated weights for the six high-vacuum chamber lids associated with the laser system in Bldg. 2, Room 333.

Table 1 – High Vacuum Chamber Lids weights when constructed from metal or plastic

Lid – Quantity - Dimensions	Made from Aluminum or Stainless, lbs	Made from Lexan or Acrylic
#1, 2 lids, (0.75" x 17" x 29") = $6.063 \times 10^3 \text{ cm}^3$	36.1 lbs. - Aluminum	16.1 lbs.
#2, 2 lids, (14" diam. x 1") = $2.524 \times 10^3 \text{ cm}^3$	44.7 lbs. – Stainless Steel	6.7 lbs.
#3, 1 lid, (0.75" x 28" x 28") = $9.636 \times 10^3 \text{ cm}^3$	57.4 lbs. - Aluminum	25.5 lbs.
#4, 1 lid, (1.25" x 28" diam.) = $1.262 \times 10^4 \text{ cm}^3$	75.1 lbs. - Aluminum	33.4 lbs.

Constructing lids using plastics is quite acceptable if a high vacuum level of 10^{-6} to 10^{-7} torr is satisfactory. These materials would not, however, be acceptable for ultra-high vacuum work. The significant reduction in weights offered by using plastic lids means, in most cases, only one researcher is needed to manipulate these awkward but essential vacuum chamber components.

An alternative lid design was developed for the vacuum chambers used in a new laser system installed in **July, 2012**. In this construction the lid was divided into smaller segments, which were supported by flush mounted cross –beam structures installed on the chamber body. This meant the weight of any lid was reduced to the range associated with the plastic lids in the other AMO laser laboratory. Again a researcher would likely be able to handle these lids at shoulder heights.

Appendix N – EHS0056 – Feedback – March 16, 2012 – is a record of criticisms offered on viewing a beta version of the new online ergonomic training class entitled EHS0056 “Ergo Material Handling & Body Mechanics in Labs.”

Appendix O – EHS0056 – Naming – April 19, 2012 – contains discussion of naming of this ergonomic training course centered on dealing with ergonomics in the laboratory workplace. EHS0056 will complement with a companion course EHS0062 – Worksmart Ergonomics, which is more concerned with ergonomics in the office environment. An advantage of EHS0056 is that the course is online and can be taken 24/7. Preparing outside of LBNL collaborators can complete this training before arriving at LBNL.

Final Observations

It is gratifying to observe a group taking charge of their own workplace to produce a safe ergo correct work environment. It is even better to realize this group provides a model for other

Chemical Sciences groups on how to generate a “ground-up” safety culture. Integrated Safety Management (ISM) is being practiced by personnel in the “trenches” on their own initiative, not by directive from line management. This is the desirable goal of safety integration in ISM. Don’t want to take the I out of ISM so the process simply becomes Safety Management.

Conclusions

Chemical Sciences Division personnel can recognize ergonomic needs in the laboratory workplace. In cooperation with EHSS Ergo Team members, the two parties can work together as equals, to develop effective solutions to laboratory ergonomic problems. In a period of 7-8 months of concerted effort, the original ergonomic problem list developed by discussions among the group members were addressed and mitigated. The schedule that was first envisioned was not always the schedule that eventually developed, but the corrective ergonomic actions were nonetheless completed in a remarkable fashion.

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Appendixes

Appendix A – Assignment of EHSS Collaborator

Thorsten Weber tweber@lbl.gov

10/27/11

to Ali, Champak, Daniel, Felix, Hidehito, Irina, Bishwanath, Travis, RRakowski, me

Dear all,

After talking to Richard DeBusk about some ongoing ergonomic issues in the lab he offered to assign an EHS representative (Melanie Alexandre) to help solving these problems.

This is a one-time opportunity and our chance to make our workplace safer and get long-term problems solved or start solving new problems.

The foundation of this process is a list of issues we have. Please find attached the list I came up with so far. Please feel free to come up with more wishes or issues. Reply by email or just swing by – the sooner the better.

I will present this list to Melanie next Thursday and she will help us to get things going.

Best wishes,

- Thorsten

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Appendix B – Laboratory Ergonomic Issues List

Oct. 27, 2011

Lab Ergonomics Issue List

A.) General: contact Person = Thorsten Weber, x5588, TWeber@lbl.gov

A.1.) Online (10 to 20mins) lab ergonomics training (video) needed to educate short time guest workers (< 4weeks). Supplement to EHS0062.

B.1.) Want to be able to use the electric forklift in the building 2 loading dock.
Got the run around (Gill Torres => Mike Wisherhop => Matt Rice => Wayne Greenway => Gill Torres)

B.) 2-102: contact Person = Thorsten Weber, x5588, TWeber@lbl.gov

Information, guidance and help needed with:

B.1.) rigging accessories:

- a.) flat wire rope (~23 and 32in) + shackles + chains
- b.) swivel eye bolts (3/8) + shackles + chains

B.2.) ergonomic tools:

Wrenches with different (handle bar) lengths and thickness
Special shaped wrenches

B.3.) power tools:

Impact wrenches (compressed air and electric)
Torque wrenches

B.4.) light, portable, adjustable, transparent foldable work platforms, stepstools, pedestals that hopefully do not require scaffold or ladder training

C.) 2-333: contact Person = Champak Khurmi, x5613, CKhurmi@lbl.gov

Information, guidance and help needed with:

C.1.) lifting lids of up to 3 vacuum chambers:

- a.) concepts and equipment needed (cranes or telescopic arms ?)
- b.) rigging accessories (slings + shackles + chains)

C.2.) light, portable, adjustable, transparent foldable work platforms, stepstools, pedestals that hopefully do not require scaffold or ladder training

C.3.) how to reach and adjust some optics in the middle of the laser table ?

Appendix C – Report to AMO Contact- 11/15/2011

Project Tracking Sheet as of 11/15/11



Project #/ Title	Progress Report	Actions	Status	Comments from Thorsten
A1 Online Ergo Training Course	Have created strawman of content and Thorsten provided comments. Have spoken with James Basore for support and assistance.	<ol style="list-style-type: none"> 1. Mel to partner with James to create video clips/ graphics/ media to make the course more engaging 2. Mel to partner with James to obtain course # 	In Progress	Looks very good already – it's clearly getting to something very useful. As soon as it shows up I will link it to my specific JHA for guests.
A2 Electric Forklift Training	Three employees took class on 11/ 15	<ol style="list-style-type: none"> 1. Thorsten determine if additional employees need to take the class. If so, notify Matt Rice 	In Progress	We are on our way. No more input from Mel needed.
B1, C1, D1 Rigging for Rooms 102, 104 & 333	Rigging accessories for crane in 102 (B1) have been provided by (B1): Lou	<ol style="list-style-type: none"> 1. Thorsten, et al try out rigging accessories and provide feedback 2. Lou to confirm rigging accessories will be safe 3. Determine rigging needs for 104 and 333 	In Progress	We know what we want for 102. Waiting for Lou's green light on the safety issue – then we just need some more shackles.
B2 B2 room 102 Hand Tools	Snap-On Tools contact Gary Kramer 707-321-4044 Mel has contacted Mech Engineering to determine if they can provide assistance if needed for custom tool design and fabrication	<ol style="list-style-type: none"> 1. Thorsten contact Gary and report back if able to provide assistance or not 2. Explore these options for possible solution for improving functioning of existing tools: Possible options for changing tool grips/ padding: 	In Progress	We will order the mold and the tape from McMasters and give it a try. Tool grip and

	Options for padding tool grip provided for Thorsten to consider	<p>Tool grip: http://www.mcmaster.com/#tool-grips/=exlo0b</p> <p>Plastic dip: http://www.plastidip.com/home_solutions/Plasti_Dip</p> <p>Rubber gripping: http://www.customrubbercorp.com/l_grips.htm http://www.maddak.com/closedcell-foam-tubing-assorted-color-p-28100.html</p> <p>3. Rob Duarte @ X7229 from Small Projects Engineering may be a good starting point if we need assistance with creating custom tools</p>		<p>Plastic dip link don't seem to help us.</p> <p>I got the link to the snap-on catalog from Gary Kramer. I found a couple of items which may be helpful. We will discuss within the group what we like and then order it.</p> <p>Keep us updated if you come across any other vendor who may sell some ergonomically shaped tools.</p>
B3 B2 room 102 Power Tools	Truitt and White http://www.truittandwhite.com/ in Berkeley 1800-600-7644	1. Thorsten contact Truitt and White to visit showroom	In Progress	Thinking about going there with some group members.
B4 & D2 Step Ladder Platform Solutions	Matt Rice is exploring options	1. Mike Rice will continue to communicate options to Thorsten	In Progress	I sent Mike an email with the pedestal dimensions we like.

Appendix D – Report to AMO Contact – 1_12_2012

Project Tracking Sheet as of 1/12/12

Project #/ Title	Progress Report	Actions	Status	Comments from Thorsten
A1 Online Ergo Training Course	Story board completed. Planning for photo shoot scheduled for 1/19. Photo shoot scheduled for 1/24. Irina will be 'short term guest' featured in the course.	3. Take needed pictures 4. Create course (James Basore) 5. Beta test course with visiting scientists coming in March 2012	In Progress	
A2 Electric Forklift Training	Three employees took class on 11/15. Need to complete OJT. Monroe Thomas is the custodian and can provide OJT.	2. Thorsten contact Monroe or Matt to complete OJT	In Progress	
B1, C1, D1 Rigging for Rooms 102, 104 & 333	Rigging for crane in 102 (B1) is completed. Ideas have been generated for 104 (C1) by Dan. Dan will work with Lou. Parts have been ordered to create a rotating part rack. 333 staff did not proceed with obtaining rigging (D1)	4. Ball is in 333 (D1) employees hands and they will notify Lou when further assistance is needed 5. Dan Slaughter can notify Lou for rigging assistance. Mel can be contacted regarding any further assistance needed for creation of rotating rack.	B1 Completed C1 In Progress D1 No actions taken/ needed at this time	
B2 B2 room 102 Hand Tools	Several Snap-on tools have been ordered. Handle molding and tape has also been ordered.	4. Mel to provide any additional vendors who sell ergo shaped hand tools 5. Thorsten will provide feedback about the success of the options selected to determine if further actions are needed	Completed, but ongoing exploration for additional tool options	

	 <p>Torque magnifiers were not pursued as an option due to the torque magnifiers being designed for greater torque than required.</p>			
B3 B2 room 102 Power Tools	<p>Purchased impact wrench</p> 	<ol style="list-style-type: none"> 2. Thorsten will provide feedback about the success of the impact wrench to determine if further actions are needed 	Completed	
B4 & D2 Step Ladder Platform Solutions	<p>Order placed for 8020, but not received yet. They will try to make custom platforms as a first step. Already have kneeling pad solutions.</p>	<ol style="list-style-type: none"> 2. Thorsten will communicate if further resources or support is needed to address B4 and D2 	In Progress	
D3 Room 333 Reaching Optics	<p>Plan to pursue options for an overhead handle/ bar for support while leaning forward and doing some tasks kneeling may reduce forward bending with low back. Awaiting guidance from Jerry Bucher regarding what can safely be used to secure overhead handle/ bar</p>	<ol style="list-style-type: none"> 1. Explore options for using overhead 'handle bar' for support while leaning forward 	In Progress	

Appendix E – Gary Kramer – Snap-On Tools – Lecture Offer

From: Thorsten Weber [mailto:tweber@lbl.gov]
Sent: Thursday, February 09, 2012 1:50 PM
To: 'Melanie Alexandre'; 'Jerome Bucher'
Cc: Kramer, Gary A; 'Ira Janowitz'
Subject: ergo tools

Thorsten Weber tweber@lbl.gov
to Melanie, me, Gary, Ira

Hi Melanie and Jerry,

Today we had Gary Kramer from Snap On Tools over here and we talked about ergonomic tools and oddly shaped and special tools which can make a big difference in reaching hard to access nuts and bolts. In addition to what we already ordered from Snap On we singled out some more tools I have overlooked so far and I will select some, order, and try them out.

Like me Gary hurt himself in the past and is now a passionate advocate for "save wrenching in the lab". He mentioned that he is available for a seminar to share his experience and point out good tools and behaviors to avoid injuries – not so much to promote Snap On but to instill awareness in the young people and keep them safe.

Ergonomics is the main injury source for the lab (80percent or so) and ergo problems are not restricted to office work but play an important role in the labs as well (this is where I got hurt). You may want to think about getting in contact with Gary and take him up on his offer...

Best wishes,
- Thorsten

Dr. Thorsten Weber
Lawrence Berkeley National Laboratory
Chemical Sciences Division
One Cyclotron Road
Berkeley, CA 94720, USA
Tel: [1 510 486 5588](tel:15104865588)
Fax: [1 510 486 5494](tel:15104865494)
Mailstop: 2R-0100, Building 2, Room 118
Web: <http://amo-csd.lbl.gov/>

Ira Janowitz iljanowitz@lbl.gov

Feb 9

to **Richard, Mike, Dennis, Robert**, Thorsten, Melanie, me, Gary

Sounds like a very good idea -- thanks for passing that on. We'll get in touch with Gary and come up with a good way to get the word out at LBNL.

Regards,
Ira

Direct tel: [510-486-6071](tel:510-486-6071)
Mobile: [510-501-9840](tel:510-501-9840)

Kramer, Gary A Gary.A.Kramer@snapon.com Feb 10

to Thorsten, Melanie, me, Ira

Hi Thorsten,

Thank you for taking the time to mention our ergo/safety discussion today for hand tools in the lab.

I know, I could benefit UCLBL, Safety/Ergo Programs for tools and equipment in the Labs & the Shops with my 27 years for tool, ergo & safety experience.

Appreciate the consideration.

Gary Kramer

Snap-On Industrial

(707) 321-4044 Cell

(707) 838-4601 Fax

Appendix F - LABORATORY

ERGONOMICS IN 2-102, -104, and -106

Thorsten Weber tweber@lbl.gov Feb 28

to Melanie, me, Ken

Dear Melanie,

Please go ahead and distribute our findings to whoever you have in mind. The more people profit from this the better.

Please use the updated file attached. Yesterday evening I came across another nice lifting device alternative and took a picture. I included it in the document – it's on page 19.

Unfortunately the original WORD file is 27MB and thus quite large for emailing. I tried to compress it but got it down by 2% only.

If you are interested in the original file with all its pictures to modify or expand it you are welcome to stop by with a USB stick.

Best wishes,

- Thorsten

Dr. Thorsten Weber, Lawrence Berkeley National Laboratory, Chemical Sciences Division, One Cyclotron Road, Berkeley, CA-94720, USA, Tel. [1 510 486 5588](tel:15104865588), Fax. [1 510 486 5494](tel:15104865494), Mailstop: 2R-0100, Building: 2, Room: 118, Web: <http://amo-csd.lbl.gov/>


From: Melanie Alexandre [<mailto:mmalexandre@lbl.gov>]

Sent: Tuesday, February 28, 2012 7:30 AM

To: Ken Barat

Cc: Thorsten Weber; Jerome Bucher

Subject: Re: lab ergo of 2-333 and summary

 LabErgoEquipment.pdf
8171K [View](#) [Download](#)

LABORATORY ERGONOMICS IN 2-102, 104, 106

Contacts:

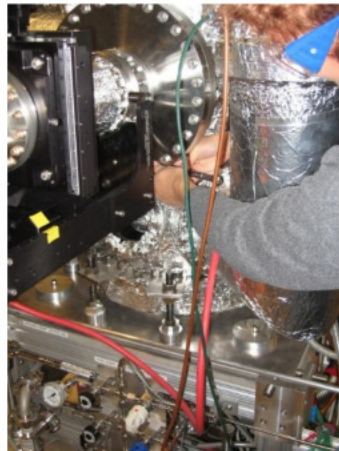
Thorsten Weber
Lawrence Berkeley National
Laboratory Chemical Sciences
Division – AMOS Building 2, room 118,
x5588
TWeber@lbl.gov

Melanie Alexandre
Lawrence Berkeley National Laboratory
Environmental, Health and Safety
Division Building 100, room 151, x2553
MMAlexandre@lbl.gov

Ergo Problems in the Lab:

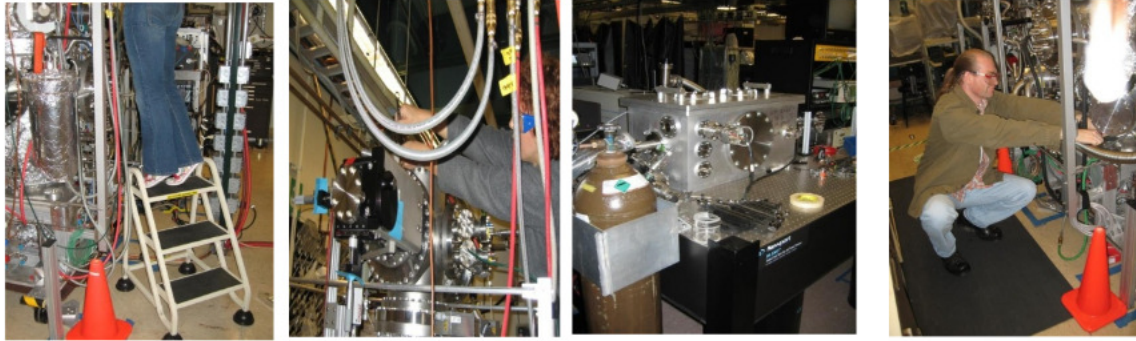
Some Examples

Working in tight spots/confined spaces:



Many nuts and bolts are hard to access on the vacuum chamber. Sometimes they have to be assembled almost blind and the employee is forced to work with a bad posture. Special, ergonomically shaped tools (wrenches, pliers etc.) of different lengths are needed to help tightening these flanges in an easier way.

Sometimes a load of torque needs to be applied to tighten these flanges. Slim power tools are highly desirable to help the worker. **Working with parts and objects that are hard to reach:**



The flanges are hard to reach since the chamber is tall or located in the middle of a laser table. The employee has to tip-toe on the step stool, work with stretched out arms, or overhead. (Foldable) platforms and pedestals are needed to get the worker closer to the object. Longer tools (wrenches, pliers etc.) would help as well.

The scaffolds and platforms need to be removable fast and easy since the worker needs good access to the lower part of the setup too.

Working with heavy loads at hard to reach places:



Portable cranes or crane carts are of high interest as well to help with the load of the parts which need to be attached (the turbo pump weighs about 30lbs; with stretched out arms it can hurt your back quickly).

Trying to tackle these issues we ordered the following equipment

Special Tools:

Snap On:

Gary Kramer, PO Box 9004, 3011 E. Route 176, Crystal Lake, IL 60039, cell: 707 321 4044, Fax: 707 838 4601, email: gary.a.a.kramer@snapon.com

Part Number	Description	Quantity	Unit	Price (\$)
OEXLM10B	Long handle wrench	1	Each	18.59
OEXLM13B	Long handle wrench	1	Each	20.15
OEXLM17B	Long handle wrench	1	Each	28.73
OEXL16B	Long handle wrench	1	Each	18.85
OEXL18B	Long handle wrench	1	Each	20.93
CXM1012	Half moon wrench	1	Each	18.59
CXM1113	Half moon wrench	1	Each	19.63
CXM1417	Half moon wrench	1	Each	22.62
CX1416	Half moon wrench	1	Each	19.63
CX1820	Half moon wrench	1	Each	22.62
SBXM1012	S shaped wrench	1	Each	19.73
SBXM1113	S shaped wrench	1	Each	22.75
SBXM1719	S shaped wrench	1	Each	31.98
SBX1012	S shaped wrench	1	Each	19.73
SBX1416	S shaped wrench	1	Each	20.02
SBX1820	S shaped wrench	1	Each	23.14
FHOF80	Offset flex handle ratchet	1	Each	66.04
912AEP	Pliers Pistol Grip	1	Each	31.17
612AEP	Pliers Pistol Grip	1	Each	32.50
VSM5210B	Four Way Angle Head	1	Each	14.17
VSM5213B	Four Way Angle Head	1	Each	17.13
VSM5215B	Four Way Angle Head	1	Each	17.81
VS14B	Four Way Angle Head	1	Each	14.43
VS16B	Four Way Angle Head	1	Each	15.21
VS18B	Four Way Angle Head	1	Each	16.90

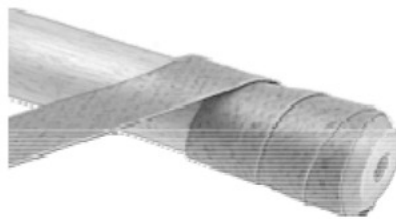
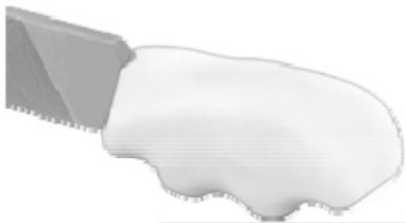
VS20B	Four Way Angle Head	1	Each	18.59
FHOM10B	Flex Combination	1	Each	24.83
FHOM13B	Flex Combination	1	Each	25.09
FHOM15B	Flex Combination	1	Each	31.85
FHO14B	Flex Combination	1	Each	23.40
FHO16B	Flex Combination	1	Each	23.66
FHO18B	Flex Combination	1	Each	28.08
FHO20B	Flex Combination	1	Each	33.54
SGDMRCE44	5 Position Screwdriver	3	Each	42.80
SDM213B	Flat Tip	3	Each	1.33
SDM222IRB	Phillips	3	Each	1.33
86EP	Pistol Grip Cutter	1	Each	25.09



* product(s) acquired

McMasters:

Tool grip: <http://www.mcmaster.com/#tool-grips/=exlo0b>



* product(s) acquired

S & S: Power tool: Makita LCT300W

Compact Lithium Ion 3 Piece Kit Consisting of an Impact Tool, Drill, and four position
Flashlight
Part# SS2605980
Price: \$ 348.72 ea



* product(s) acquired

Overhead Straps at the Laser table:

Pictures of ceiling in B2 Room 333

Goal: Explore feasibility of using a loop strap or handle (similar to something seen on a bus or train) on the overhead support beam to provide some support while scientists are leaning forward to work on laser table.

Example of bus strap:



This would be possible locations
where we would attach a strap

* idea not yet pursued

Step Stools:

http://www.labsafety.com/dixie-step-stands_24550550/?searchterm=step%2bstools



* product(s) not yet acquired

<http://www.harborfreight.com/step-stool-working-platform-66911.html>



* product(s) not yet acquired

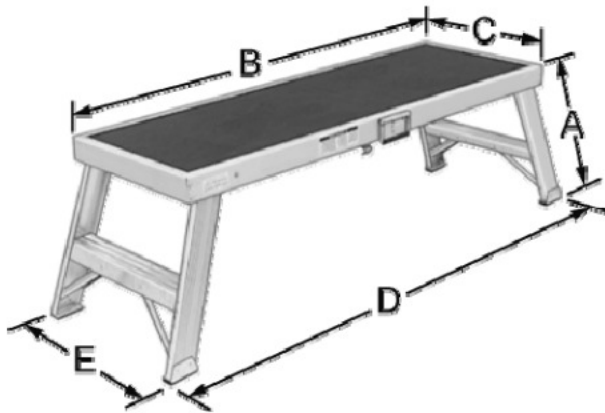
<http://www.stepstooluniverse.com/category-s/7070.htm>



* product(s) not yet acquired



<http://www.mcmaster.com/#step-stools/=f1dfbp>



* product(s) not yet acquired

http://www.productsforindustry.com/eCommerce/eComm?template=product&tran_id=19&ship_no=-1&prod_id=78355&search_criteria=7025501&parent_id=0



* idea not yet pursued

use standard stepstools:



* product(s) acquired

Platforms:

<http://www.strombergcarlson.com/store/products.php?categoryParentName=RV+Steps+%26+Step+Accessories&categoryName=Platform+Step>



* product(s) not yet acquired

http://www.productsforindustry.com/ecommerce/eComm?template=iCatalog/0513&user_id=&cust_no=&ship_no=-1



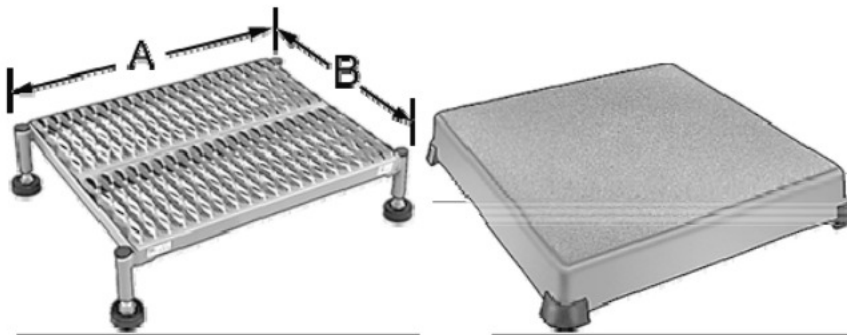
* idea not yet pursued

<http://www.pplmotorhomes.com/parts/rv-steps/rv-step-platform-acar.htm?source=google&gclid=Cl6px-KXyawCFSkZQgodAX4wqg>



* idea not yet pursued

<http://www.mcmaster.com/#work-platforms/=f1uytv> got to “adjustable height steel work platforms” and “fixed height fiberglass work platform”



* idea not yet pursued

8020 custom made Platforms:

2 platforms: 18Dx24Wx7.5in and 18Dx36Wx16Hin

Part Number	Description	Quantity	Unit	Price (\$)
4442	15S SQ Tricorner	8		17.955
3018	LHSCS 15S	24		0.567
4332	15S 2 Hole I.C.G.	20		3.87
3320	5/16-18 X 0.678" FBHSCS & Econ T-nut	40		0.54
1515-Lite	1.5"x1.5" Lite Extrusion 2@21"	42	inch	0.405
1515-Lite	1.5"x1.5" Lite Extrusion 2@33"	66	inch	0.405
1515-Lite	1.5"x1.5" Lite Extrusion 6@15"	90	inch	0.405
1515-Lite	1.5"x1.5" Lite Extrusion 4@5" w/7060 on both ends	20	inch	0.405
1515-Lite	1.5"x1.5" Lite Extrusion 4@13" w/7060 on both ends	52	inch	0.405
7010	Cut to length for 1515-Lite	18		1.755
7060	5/16-18 tap charge 1515	16		1.755

Plus 0.5in thick PVC boards (18x24in and 18x36in) from McMaster



* product(s) acquired

Alternative Platform option (diamond stainless steel plate): B77 at LBNL

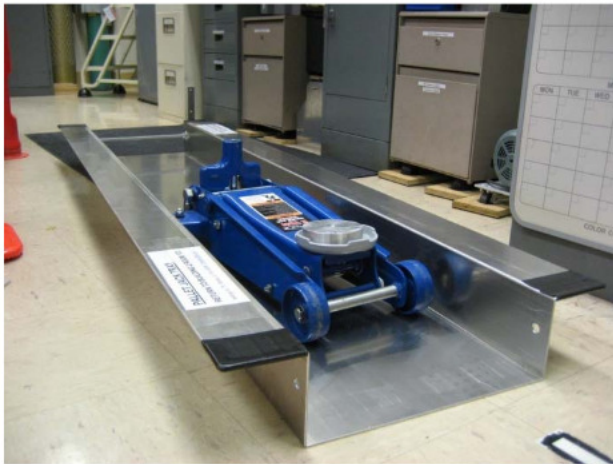


* idea not yet pursued

Pallet Jack Tray to transport mid-weight items:

Custom made at B77 of LBNL

Aluminum Pallet Jack Tray for transporting 3 heavy car jacks at once (72Lx25Wx4inH of 0.125in Aluminum)



* product(s) acquired

Car Jacks. Stands and Carts for lifting and positioning heavy Objects:

Snap On:

Gary Kramer, PO Box 9004, 3011 E. Route 176, Crystal Lake, IL 60039, cell: 707 321 4044, Fax: 707 838 4601, email: gary.a.a.kramer@snapon.com

Part Number	Description	Quantity	Unit	Price
YA1642A	Jack, Hydraulic Service 2-ton (20" max. lift)	3	ea	153.31
				459.93

McMasters:

<http://www.mcmaster.com/#scissor-jacks/=gfnfnt>

<http://www.mcmaster.com/#ball-transfer-plates/=gfng11>

<http://www.mcmaster.com/#equipment-movers/=gfngs9> the go to "steel dollies" and "multidirectional tripod dollies"



* product(s) acquired

Crane Cart to lift midsize Equipment:

SYCLONE ATTCO SERVICE, P.O. BOX 458, EMMETT, ID 83617
 CORPORATE: 8395 W. IDAHO BLVD, LETHA, ID 83636
 TEL (208) 365-5770, FAX (208) 365-5771
www.skyhookmfr.com

QTY	PART#	DESCRIPTION	UNIT PRICE (List price)
1	8570-C-21.3T-98-RSSSSSS-98M-130LB	'Custom' Model 8570 Sky Hook w/Mobile Base Modifications: (see approval drawing) - 98" overall height - 98" length of lift - Rotated hand wheel - 85.7" Hand wheel height - Load limit: 130 lbs - (4) Swivel Casters w/Brake ** Counterweight required; customer to provide or sold as a separate item. ** Counterweight must be at least 125% of load being lifted or 163 lbs for maximum load capacity (130 lb load limit)	\$2,017.44 ea
4	CW1-8570	Individual Cast Iron Counterweight for loads less than 500 lbs, each counterweight weighs 42 lbs (counterweights require mounting hardware for installation, sold separately)	\$100.00 ea
1	CW-HARDWARE-2	Mounting Hardware Kit for up to 7 Cast Iron Counterweights (use with CW1-8570 Individual Cast Iron Counterweights)	\$45.00 ea
1	CERTIFICATION	Certificate of Conformance	\$0.00 ea
1	HANDLING	Handling Charge (billed separately if customer bills freight charges to their UPS or other freight carrier's account#)	\$5.00



* product(s) acquired

Rigging Material:

Via Lou Pandolfo, contact person of CraneAmerica at LBNL (building 76, room 123, x7667, LAPandolfo@lbl.gov)

Shackles and Slings:

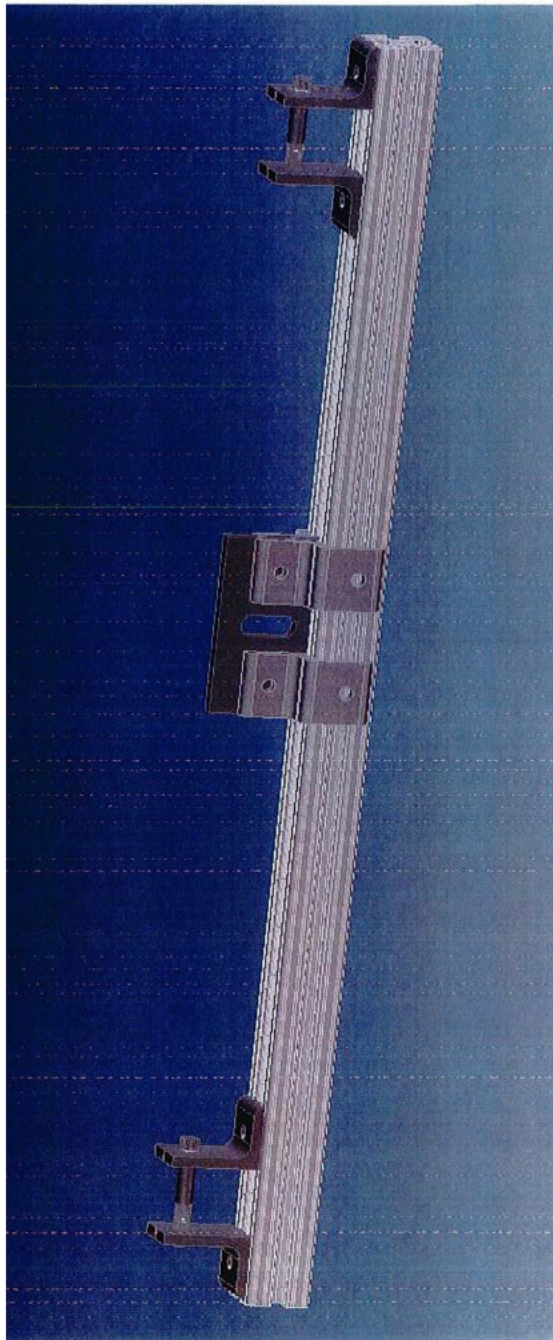
- 2x anchor shackles made of 316 steel rated for 1650kg 7/16 thickness of the material.
- 8x 1/4" anchor shackles
- 2x 12.0" lengths of chain or cable
- 2x 6.5" lengths of chain or cable
- 2x 2ft 1900lbs Nylon Chocker from Lift-It
- 2x 6ft 2400lbs Nylon Chocker from Lift-It
- 1x 7ft 2400lbs Nylon Chocker from Lift-It
- 2x 8ft 1900lbs Nylon Chocker from Lift-It



* product(s) acquired

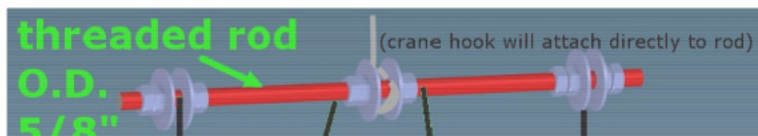
Custom Made Spreader bar:

LBNL approved custom made spreader bar for 250lbs made from 8020



* product(s) acquired

Custom made rigging frame:



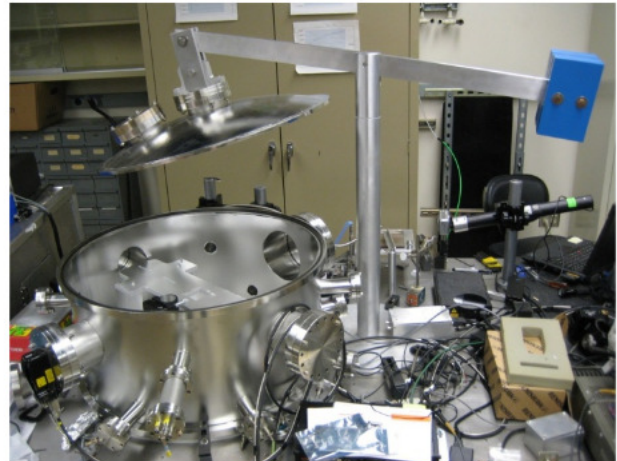
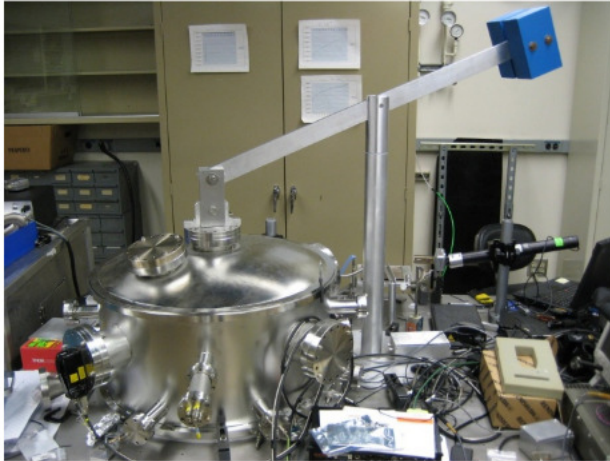
* product(s) acquired

8020 parts:

Quantity	Part Number	Description	Price (\$)	Extended Price (\$)
4	4108	80/20 4108 10S 2 HOLE I.C.B. 1/8"	2.475	9.90
2	4509	80/20 4509 10S TO 15S 2 HOLE TRANS. I.C.B.	2.475	4.95
8	4176	80/20 4176 10S 3 HOLE I.C.B.	3.465	27.72
8	4250	80/20 4250 10S 3 HOLE SLOTTED I.C.B	4.05	32.40
8	4136	80/20 4136 10S 4 HOLE I. C. G. C. B.	5.085	40.68
10	4132	80/20 4132 10S 2 HOLES I.C.G	3.555	35.55
8	4150	80/20 4150 10S 4 HOLE PLATE	4.59	36.72
4	4118	80/20 4118 10S 3 HOLES JOINING PLATE	3.87	15.48
4	4117	80/20 4117 10S 4 HOLE STRIP	4.32	17.28
50	3675	80/20 3675 SS ECON TNUT 1/4-20	0.549	27.45
50	3280	80/20 3280 10S 1/4-20 DBL. ECON T NUT	0.621	31.05
20	2015	80/20 2015 1010 END CAP BLACK W/PUSH INS	0.945	18.90
				\$298.08

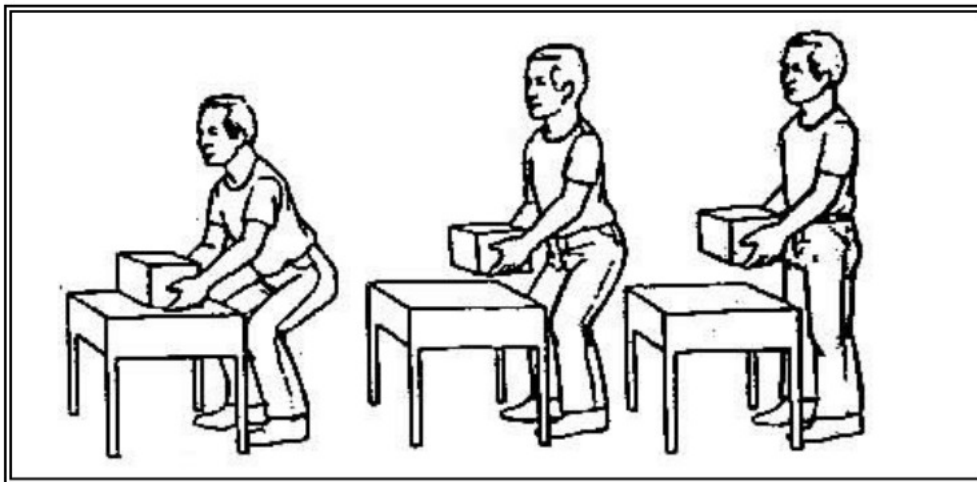
Crane Alternative:

Custom made lifting arm with counterweight



* idea not yet pursued

Also: Put together new Online Course (EHS0061) about preventing lift injuries for short term guests



* work in progress