



Environment, Health,  
& Safety Manual



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# The University of Arizona 2012 Annual Steward Observatory Safety Report





The University of Arizona places a high priority on the personal safety of its students, faculty, staff, and visitors. The Steward Observatory Safety committee is committed to this mission, as well as to provide our individual sites with a safe work environment.

The University of Arizona Steward Observatory Safety Committee is comprised of thirty (30) volunteer members from twenty (20) sites. One of their responsibilities is to know and observe the safety regulations of all twenty (20) sites, including the Steward Observatory main building. You can never be too vigilant and there is nothing more important than the health and safety of all Steward Observatory faculty, staff, and students.

In 2011 Steward Observatory was recognized for a Community Safety Award for our Safety management System by the American Society of Safety Engineers (ASSE). The Safety Committee is very proud of this achievement and has vowed to make the upcoming 2012 New Year another banner year.

The first order of business for the safety committee in the New Year was to vote on going from Trimester to Bi-annual meetings now scheduled for April and September, which will better accommodate the committee members from all Steward Observatory telescope locations. The new schedule will allow those members to work around their telescope maintenance schedules and permit them to attend safety committee meetings and safety training sessions.





## Safety Committee Goals, Objectives, and Achievements for 2012

- **Develop a new action plan for the MGIO Fire Warning System**
  - Much effort was contributed in trying to obtain a satisfactory fire warning system for the Mount Graham telescopes but no plans have been finalized to date.
- **Consider contracting an outside Safety Engineer to evaluate our existing Safety Management System and perform site inspections to identify potential safety concerns. This would allow the safety committee to focus on safety issues the committee inadvertently overlooked, processes which need improvement, and recommendations on how to enhance our existing Safety Management System**
  - In the end this objective proved to be too expensive so the plan was dropped. Although we did not have the funds available to bring in an experienced Safety Engineer, the committee members conducted ten (10) facility inspections in the second half of 2012. The inspections results proved what we expected. That is, most of the people responsible for the telescopes and sites are now much more "Safety" oriented and demand "Safety" excellence in the work of their employees.

During 2012 there were a total of twenty-two (22) safety inspections conducted at the Steward Sites. At these inspections we found a total of seventy-three (73) infractions. In addition, Sumith Wijeweera of Risk Management inspected the machine shops in Building 65 and the Mirror Lab.

Again this year during the inspections, we noticed a number of safety improvements were made to various facilities, without mention from the Safety Committee.

- The Mount Graham Power House, the controls and containment for the fuel system which power the generators, had all been upgraded and automated.
- The base camp, constructed a brand new second floor office and lunch room with new regulation stairs to obtain access to the area.
- On Mt. Lemmon at the Schmidt #1101 telescope, new handrails were installed to make access easier for an observer. Also on Mt. Lemmon, a new fence was erected around the back yard of the power house, to keep possible visitors out of the area and away from the collapsed water tank roof.



- The Sunnyside facility erected the long awaited and planned addition for cleaning mirrors. This addition now provides a new and improved water filtration system, a good exhaust system, air conditioning, and a much cleaner and safer atmosphere for cleaning mirrors.
- New red cargo nets were installed at MMTO on the chamber hatch, to prevent personnel or equipment from falling through when the hatch is open for maintenance operations. Guard rails were installed around the shop heat exchanger, replacing the mule tape previously used to cordon off the area. An Automated External Defibrillator (AED) was installed in the front passageway by the Mountain Directors office door.
- **Develop a joint collaboration effort between Steward Observatory, University Facilities Management and University Risk Management Services to comply with NFPA 70E regulations**
  - The joint collaboration between the three departments is continuing to develop.
- **Adaptive Optics team was assigned to develop a new protective warning system to prevent unauthorized personnel from entering the fifth floor lab of Steward Observatory, while a class 4 laser is in operation**
  - The Adaptive Optics Team developed and installed the protective warning system which was fully operational by 2012 year end. This project was a major step forward for the Safety Committee in preventing potential blindness for anyone who would have walked in the lab while a class 4 laser was in operation.

**Design and install a new platform and ladders which allows employees to safely access the LBT ARGOS system**

- The design for the new platform was completed and both the platform and ladders were installed. This now allows the employees to safely access the LBT ARGOS system.
- **Install emergency lighting at the Steward Mirror Lab test tower**
  - After investigating the implications of installing the emergency lighting system, the Mirror Lab concluded the lighting system would generate an additional heat source during mirror testing and therefore the project was not implemented.





- **Coordinate training for site employees**

- The first half of 2012 was spent trying to arrange training sessions that fit the new Safety Committees schedule. Questionnaires were sent to the Safety Committee members requesting feedback on desired training activities and times. The result of the questionnaires contributed to the following training.
  - Generating Equipment Training
  - Rigging and Crane Operator Training
  - Fall Protection Training
  - Fall Arrest Training
  - Hearing Conservation Training
  - OSHA NFPA70-W Training

Mt. Lemmon employees attended the “Generator Equipment Training” and two (2) webinars conducted by the Electrical, Construction and Maintenance Magazine, with the last webinar focusing on arc flash.

Steward employees also attended Forklift “Train the Trainer” training and a “General Machine Safeguarding” training. We also asked those employees who had taken last year’s “Arc Flash” training, to attend an additional Arc Flash Training in 2012, which included changes to NFPA 70E and new arc flash clothing now available.

Another major effort was the revival of the Potty Poster Program. This program has been very well received by all employees and even contributed to a lifesaving experience by one Steward Observatory employee.

### **Additional Accomplishments:**

This year Karen Kenagy, Jonathan Piakis, Cory Knop, and Dale Webb were able to attend the local SCF Arizona 2012 Safety Works Expo.

The first major success of 2012 was the development of a new lock-out tag-out procedure by Matt Rademacher. This procedure addressed the problem of the solar tracker sudden movement, which caused a potentially serious near miss accident. This was essentially a lock-out tag-out plan with specific details. Matt then held safety training classes for the twelve (12) people that would likely to be working on the tracker.



Another major effort during the first half was completed by Jonathan Piakis, on refractory ceramic fiber exposure for the Mirror Lab mirror mold assembly process. Jonathan published the results of each sampling to the casting team so they were informed within two (2) days and could actively work to reduce exposure levels. In guidance with Julia Rosen and Frank Demer from the University Risk Management Services, Jonathan established an internal exposure level below the ACGIH Threshold Limit Value (TLV) of 0.2 f/cc.

We are continuing to monitor the cristobalite exposures during tub wall, floor tiles, and mirror washout processes. This will be the first time in history that all mirror casting processes from start to finish have such documentation.

As a result of the current findings, we will continue to obtain chest x-ray's and lung pulmonary exams every 3-5 years for the five casting team members.

Valuable time was spent focusing on preparing a Solar Safety Plan for the new Solar Tracker, to be installed at the University of Arizona Research Park. By the time we finished the first or second draft of a plan, we were asked to add a Fire Prevention and Response Safety Plan.

Also during the second half there was an organization change that gave Steward Observatory management responsibility for the first floor Optics shops at the Optical Science Center. Late in the second half, a thorough inspection of those facilities was performed and the personnel involved were very anxious to see interest in their safety being taken.

Another positive change this year was the University of Arizona Risk Management Services addition of duties that include inspections of machine shops.

In late November 2012, a meeting was convened with Buell Jannuzi, Jeffrey Kingsley, Karen Kenagy, Russ Warner, Jonathan Piakis and Dale Webb to determine the direction and plans for the Steward Safety Management System. As we begin the New Year, we have definite plans for our first 2013 Safety Committee Meeting to take place on February 27, 2013. We are updating all of the Safety Committee Organization charts, obtaining a new Director's Statement of Safety, updating the Steward Observatory Emergency Contact List, meeting with the new LBTO and MGIO Directors for Safety discussions, and will soon begin working with the new Director of Development to possibly establish outside funding sources to help pay for additional Safety Training.





**Other Training not mentioned above:** A new employee orientation safety document was created for all Steward Observatory sites. It provides a comprehensive overview of safety equipment, safety procedures, and location of first aid kits.

All MMTO employees (100%), have reviewed the Steward Observatory Safety Manual. At this time, 70% MMTO employees are certified in CPR and First Aid procedures. MMTO employees also attended Rigging Training, Fall Arrest Training, and a majority of employees participated in a hands-on Fire Extinguisher Training.

CPR and first aid training classes were held at the U of A Mirror Lab and the Mt. Hopkins site.

**Statistics According to Official U of A Data:**

|                      | <b>2012</b> | <b>2011</b> | <b>2010</b> | <b>2009</b> | <b>2008</b> | <b>2007</b> | <b>2006</b> |
|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Accidents            |             |             |             |             |             |             |             |
| OSHA Recordable      | 07          | 08          | 08          | 04          | 8           | 13          | 14          |
| Injuries             | 14          | 13          | 12          | 11          | 23          | 25          | 6           |
| Illnesses            | 00          | 01          | 03          | 01          | 01          | 02          | 04          |
| Lost Time Accidents  | 01          | 01          | 01          | 00          | 00          | 01          | 03          |
| Total Lost Work Days | 10          | 33          | 06          | 00          | 00          | 07          | 164         |

This year we had a slight improvement from last year, but still not ZERO which is the goal. Again it must be noted that all of the above statistics include all of Steward Observatory, the LBT, and the Steward Observatory Mirror Laboratory. This year the MMT Observatory had a total of three injuries, one of which was considered to be OSHA Recordable. There were no lost time injuries at the MMTO.



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Steward Observatory Site Inspections

|                       | Site            | Inspected | Rem. | +        | New      | Inspected | Rem. | +         | New      | Inspected | Rem. | +         | New      | Inspected | Rem.     | +        | New      |          |
|-----------------------|-----------------|-----------|------|----------|----------|-----------|------|-----------|----------|-----------|------|-----------|----------|-----------|----------|----------|----------|----------|
| Continued from above: | MT Lem & C Tele | 11/17/11  | 0    | +        | 2        | 05/16/12  | 0    | +         | 7        | 11/19/12  | 5    | +         | 2        |           |          |          |          |          |
|                       | KP & Sunny      | 11/22/11  | 0    | +        | 2        | 05/29/12  | 0    | +         | 0        | 11/15/12  | 0    | +         | 0        |           |          |          |          |          |
|                       | MGIO            | 09/19/11  | 0    | +        | 1        | 05/09/12  | 0    | +         | 1        | 11/09/12  | 0    | +         | 0        |           |          |          |          |          |
|                       | VATT            | 09/19/11  | 0    | +        | 0        | 05/09/12  | 0    | +         | 0        | 11/09/12  | 0    | +         | 0        |           |          |          |          |          |
|                       | LBT             | 09/19/11  | 0    | +        | 4        | 05/09/12  | 1    | +         | 0        | 11/09/12  | 0    | +         | 1        |           |          |          |          |          |
|                       | SO & Annex      | 02/27/12  | 8    | +        | 18       | 09/17/12  | 8    | +         | 6        | 04/09/13  | 9    | +         | 11       |           |          |          |          |          |
|                       | Imaging Tech    | 05/01/12  | 0    | +        | 1        | 01/14/13  | 0    | +         | 0        |           |      |           |          |           |          |          |          |          |
|                       | Solar Tracker   | 03/20/12  | 0    | +        | 1        | 08/14/12  | 1    | +         | 1        | 03/26/13  | 0    | +         | 2        |           |          |          |          |          |
|                       | Optics Shop     |           |      |          |          |           |      |           |          | 12/18/12  | 0    | +         | 18       |           |          |          |          |          |
|                       | 12-Meter        | 11/22/11  | 0    | +        | 0        | 05/29/12  | 0    | +         | 1        | 11/15/12  | 0    | +         | 0        |           |          |          |          |          |
|                       | SMT             | 09/19/11  | 1    | +        | 0        | 05/09/12  | 0    | +         | 0        | 11/15/12  | 0    | +         | 0        |           |          |          |          |          |
|                       | SO Mirror Lab   | 02/29/12  | 0    | +        | 11       | 10/04/12  | 0    | +         | 5        | 04/09/13  |      |           |          |           |          |          |          |          |
|                       | <b>Totals</b>   |           |      | <b>9</b> | <b>+</b> | <b>40</b> |      | <b>10</b> | <b>+</b> | <b>21</b> |      | <b>14</b> | <b>+</b> | <b>34</b> | <b>0</b> | <b>+</b> | <b>0</b> | <b>0</b> |

Total items fixed 727  
Total infractions 775

|                          | Site            | Inspected | Rem. | +         | New      | Inspected  | Rem. | +        | New      | Inspected  | Rem. | +         | New      | Inspected  | Rem.     | +        | New       |
|--------------------------|-----------------|-----------|------|-----------|----------|------------|------|----------|----------|------------|------|-----------|----------|------------|----------|----------|-----------|
| Continued from previous: | MT Lem & C Tele | 11/09/09  | 1    | +         | 0        | 04/29/10   | 0    | +        | 2        | 12/08/10   | 1    | +         | 0        | 04/28/11   | 1        | +        | 1         |
|                          | KP & Sunny      | 11/18/09  | 0    | +         | 1        | 04/14/10   | 0    | +        | 4        | 11/30/10   | 0    | +         | 2        | 03/08/11   | 0        | +        | 0         |
|                          | MGIO            | 11/10/09  | 0    | +         | 0        | 05/12/10   | 0    | +        | 1        | 09/21/10   | 0    | +         | 0        | 05/26/11   | 0        | +        | 0         |
|                          | VATT            | 11/10/09  | 0    | +         | 0        | 05/12/10   | 0    | +        | 0        | 09/21/10   | 0    | +         | 1        | 05/26/11   | 0        | +        | 0         |
|                          | LBT             | 11/10/09  | 0    | +         | 0        | 05/12/10   | 0    | +        | 0        | 09/21/10   | 0    | +         | 3        | 05/26/11   | 1        | +        | 2         |
|                          | SO & Annex      | 02/04/10  | 7    | +         | 12       | 06/22/10   | 5    | +        | 6        | 01/06/11   | 6    | +         | 14       | 07/19/11   | 5        | +        | 18        |
|                          | Imaging Tech    | 03/02/10  | 0    | +         | 0        | 07/21/10   | 0    | +        | 2        | 01/06/11   | 0    | +         | 0        | 07/12/11   | 0        | +        | 0         |
|                          | LBT & Solar Tra | 02/08/10  | 1    | +         | 1        | 06/23/10   | 0    | +        | 5        | 12/14/10   | 0    | +         | 2        | 07/12/11   | 0        | +        | 2         |
|                          | Tumamoc Hill    |           |      |           |          | mothballed |      |          |          | mothballed |      |           |          | mothballed |          |          |           |
|                          | 12-Meter        | 11/18/09  | 0    | +         | 1        | 04/14/10   | 1    | +        | 3        | 11/30/10   | 1    | +         | 2        | 03/08/11   | 0        | +        | 1         |
|                          | SMT             | 11/10/09  | 2    | +         | 1        | 05/12/10   | 0    | +        | 4        | 09/21/10   | 2    | +         | 0        | 05/26/11   | 2        | +        | 2         |
|                          | SO Mirror Lab   | 03/05/10  | 1    | +         | 29       | 07/15/10   | 3    | +        | 4        | 11/22/10   | 0    | +         | 7        | 08/02/11   | 0        | +        | 4         |
|                          | <b>Totals</b>   |           |      | <b>12</b> | <b>+</b> | <b>44</b>  |      | <b>9</b> | <b>+</b> | <b>31</b>  |      | <b>10</b> | <b>+</b> | <b>31</b>  | <b>8</b> | <b>+</b> | <b>30</b> |

Total items fixed 588  
Total infractions 644

|                       | Site             | Inspected | Rem. | +         | New      | Inspected  | Rem. | +         | New      | Inspected  | Rem. | +         | New      | Inspected  | Rem.      | +        | New       |
|-----------------------|------------------|-----------|------|-----------|----------|------------|------|-----------|----------|------------|------|-----------|----------|------------|-----------|----------|-----------|
| Continued from above: | MT Lem & C-Tele  | 03/31/08  | 4    | +         | 13       | 09/04/08   | 8    | +         | 5        | 01/21/09   | 3    | +         | 3        | 07/07/09   | 1         | +        | 3         |
|                       | KP & Sunny       | 05/08/08  | 0    | +         | 4        | 08/07/08   | 1    | +         | 1        | 12/16/08   | 2    | +         | 0        | 06/04/09   | 2         | +        | 7         |
|                       | MGIO             | 06/16/08  | 0    | +         | 0        | 10/01/08   | 0    | +         | 0        | 03/11/09   | 0    | +         | 0        | 07/13/09   | 0         | +        | 0         |
|                       | VATT             | 06/16/08  | 0    | +         | 0        | 10/01/08   | 0    | +         | 0        | 03/11/09   | 0    | +         | 0        | 07/13/09   | 0         | +        | 0         |
|                       | LBT              | 06/16/08  | 0    | +         | 4        | 10/01/08   | 0    | +         | 1        | 03/11/09   | 0    | +         | 1        | 07/13/09   | 0         | +        | 0         |
|                       | SO Office & Labs | 06/19/08  | 17   | +         | 11       | 11/05/08   | 10   | +         | 10       | 04/02/09   | 8    | +         | 30       | 07/28/09   | 10        | +        | 6         |
|                       | Imaging Tech     | 0         | +    | 0         | 11/06/08 | 0          | +    | 2         | 05/18/09 | 0          | +    | 1         | 08/25/09 | 0          | +         | 0        |           |
|                       | LBT Lab & So Te  | 06/17/08  | 0    | +         | 2        | 11/20/08   | 0    | +         | 11       | 04/9&5/6   | 1    | +         | 4        | 08/19/09   | 0         | +        | 2         |
|                       | Tumamoc Hill     |           |      |           |          | mothballed |      |           |          | mothballed |      |           |          | mothballed |           |          |           |
|                       | 12-Meter         | 05/08/08  | 2    | +         | 2        | 06/07/08   | 0    | +         | 0        | 12/16/08   | 0    | +         | 3        | 06/04/09   | 0         | +        | 3         |
|                       | SMT              | 06/16/08  | 1    | +         | 4        | 10/01/08   | 1    | +         | 2        | 03/11/09   | 1    | +         | 2        | 07/13/09   | 3         | +        | 2         |
|                       | SO Mirror Lab    | 06/17/08  | 8    | +         | 7        | 11/20/08   | 3    | +         | 2        | 04/15/09   | 0    | +         | 29       | 07/28/09   | 6         | +        | 2         |
|                       | <b>Totals</b>    |           |      | <b>32</b> | <b>+</b> | <b>47</b>  |      | <b>23</b> | <b>+</b> | <b>34</b>  |      | <b>15</b> | <b>+</b> | <b>73</b>  | <b>22</b> | <b>+</b> | <b>25</b> |

Total items fixed 389  
Total infractions 468

|                       | Site          | Inspected | Found      | Inspected  | Rem.     | +         | New | Inspected | Rem.     | +         | New | Inspected  | Rem.     | +         | New       | Inspected | Rem.      | +         | New |
|-----------------------|---------------|-----------|------------|------------|----------|-----------|-----|-----------|----------|-----------|-----|------------|----------|-----------|-----------|-----------|-----------|-----------|-----|
| Continued from above: | MI Lemmon     | 03/30/06  | 24         | 06/09/06   | 6        | +         | 2   | 03/15/07  | 3        | +         | 4   | 07/05/07   | 3        | +         | 8         | 12/05/07  | 2         | +         | 9   |
|                       | KP & Sunny    | 04/25/06  | 24         | 06/17/06   | 7        | +         | 0   | 01/25/07  | 2        | +         | 0   | 07/06/07   | 1        | +         | 7         | 11/28/07  | 0         | +         | 0   |
|                       | MGIO          | 05/03/06  | 2          | 08/22/06   | 0        | +         | 0   | 04/04/07  | 0        | +         | 0   | 08/29/07   | 0        | +         | 0         | 01/16/08  | 0         | +         | 1   |
|                       | VATT          | 05/03/06  | 28         | 08/14/06   | 24       | +         | 1   | 04/04/07  | 13       | +         | 7   | 08/29/07   | 14       | +         | 2         | 01/16/08  | 2         | +         | 1   |
|                       | LBT           | 05/04/06  | 9          | 06/22/06   | 0        | +         | 3   | 04/04/07  | 0        | +         | 0   | 08/29/07   | 0        | +         | 8         | 01/16/08  | 2         | +         | 1   |
|                       | SO & Tele     | 05/25/06  | 72         | 11/28/06   | 38       | +         | 10  | 05/03/07  | 27       | +         | 21  | 09/05/07   | 22       | +         | 5         | 02/04/08  | 13        | +         | 15  |
|                       | Imaging Tech  | 05/31/06  | 9          | 11/29/06   | 0        | +         | 1   | 04/16/07  | 0        | +         | 0   | 09/11/07   | 0        | +         | 3         | 02/04/08  | 1         | +         | 0   |
|                       | SMP           | 06/02/06  | 5          | 11/29/06   | 4        | +         | 6   | 05/24/07  | 3        | +         | 2   | 09/20/07   | 1        | +         | 2         | 02/05/08  | 0         | +         | 3   |
|                       | Tumamoc Hill  | -         | -          | 08/23/06   | 3        | +         | -   | 02/20/07  | 0        | +         | 0   | mothballed |          |           |           |           |           |           |     |
|                       | 12-Meter      | 04/25/06  | 9          | 09/07/06   | 0        | +         | 6   | 01/25/07  | 4        | +         | 5   | 08/07/07   | 5        | +         | 2         | 11/28/07  | 1         | +         | 2   |
|                       | SMT           | 05/03/06  | 15         | 08/22/06   | 9        | +         | 12  | 04/04/07  | 3        | +         | 4   | 08/29/07   | 4        | +         | 3         | 01/16/08  | 2         | +         | 1   |
|                       | SO Mirror Lab | 05/23/06  | 23         | 12/07/06   | 10       | +         | 10  | 05/24/07  | 6        | +         | 17  | 09/20/07   | 14       | +         | 12        | 02/05/08  | 10        | +         | 5   |
|                       | <b>Totals</b> |           | <b>220</b> | <b>101</b> | <b>+</b> | <b>51</b> |     | <b>61</b> | <b>+</b> | <b>60</b> |     | <b>64</b>  | <b>+</b> | <b>52</b> | <b>33</b> | <b>+</b>  | <b>38</b> | <b>38</b> |     |

Total items fixed 119  
Total infractions 220





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**Goals for first trimester of 2013:**

- Implement Safety Objectives for managers and supervisors
- Implement plan that assures all employees read the Safety Manual
- Finish implementation of the Mount Graham Fire Warning System, which will include warnings to all employees on site
- Obtain fire warning system in Steward Dome and Offices
- Modify and update Emergency Response Chart
- Revise Steward/U of A Injury Reporting system

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