



Advanced LIGO

Safety Performance Progress

David Nolting
aLIGO/Laboratory Safety Officer

Overall Structure for aLIGO Safety



□ aLIGO/Lab Safety Officer:

- Provides the following support...shares role between LIGO Lab and aLIGO activities
 - Subsystem teams with hazard analyses review
 - aLIGO Site Safety Coordinators on a daily basis, which may include critical lift plans, training needs, Industrial Hygiene monitoring
 - Install Team Leaders
 - Inspect work areas/monitoring activities/annual safety audits
 - Investigate incidents and assist in establishing mitigation methods specific to investigation findings
 - Provide the monthly safety topic...based on specific/seasonal needs
 - Interacts/engages MIT and CIT safety personnel

□ aLIGO Site Safety Coordinators:

- LLO (Anna Holland) and LHO (Mark Hankel)
 - Attend the morning start-up meetings
 - Inspect work areas
 - Review hazard analyses, general safety rules, work permits, critical lift plans, etc., with work teams prior to performing assigned task.
 - Perform task-specific safety training
 - Perform aLIGO new hire/visitor and contractor site safety orientation
 - Conduct the monthly safety topic meeting
 - Provide technical support to the site Safety Committee.
 - Participates in monthly LIGO Lab Safety Steering Committee

□ LIGO Laser Safety Officers (LSO):

- LLO/MIT (David Kinzel), LHO (Michael Rodruck) and CIT (Peter King)
 - SOP's for laser systems...PSL, TCS, etc.
 - Guidance and documentation on PSL Enclosure Access Control and other Laser Hazard Areas
 - Laser safety training for site staff and visitors
 - Safety Interlock System
 - Laser safety eyewear to cover all aLIGO wavelengths
 - Laser Power Control System

How do we manage the safety of people and equipment?

□ Safety Audits:

- The Annual Safety Audit was conducted at LLO (May-2011), LHO (Sept-2011), Caltech Campus LIGO Labs (February-2012)
 - aLIGO work areas for assembly, installation, and clean & bake processes are highly maintained for housekeeping and for safe work environments.
- The MIT aLIGO labs were inspected by MIT EH&S personnel in December-2011. According to their report, there were no findings that required immediate corrective actions; findings were minor.
- Audits continue to show improvement and dedication on the part of management and workers in maintaining a proactive safety attitude.

□ Safety Training:

- LLO and LHO personnel participated in an All-Hands training session in March 2012, on general safety awareness for aLIGO de-install/install activities. A variety of topics were discussed that are in addition to any specific safety procedure requirements that are detailed in subsystem hazard analysis.
- MIT and CIT LIGO Lab personnel participated in an All-Hands safety meeting during the 4th quarter of 2011, on the Good Catch program and lessons learned.
- aLIGO staff at LLO and LHO completed training on forklifts, aerial lifts, scissors lift and overhead crane use. This training was completed prior to the uninstall start date, and continues as needed as new staff members are acquired.
- Both aLIGO Site Safety Coordinators facilitated safety training in fall protection, rigging safety, safety orientation for new hire/visitors, and site safety orientation for contract workers.
- All LSO's attended the Annual LSO Workshop at MIT in August 2011.

□ Communications:

- The LIGO Laboratory safety web page (<https://safety.ligo.caltech.edu/>) serves as a repository for all safety related documents.
 - Safety Policies
 - Hazard Analyses
 - Incident Reports
 - Safety Steering Committee Meeting Minutes
 - Monthly Safety Meeting Topics
 - Quarterly Safety Performance Reports
- The safety web page also has links to LLO, LHO, MIT and CIT web sites
- Links to 3rd party safety resources such as regulatory agencies, ANSI, OSHA and the NFPA
- Special notices and information regarding upcoming events are also posted

□ Communications...cont:

- aLIGO Install Leaders, Operations Managers and aLIGO Safety Engineer share information between the two observatories
- All reported incidents (aLIGO/Lab) are communicated to management, aLIGO site safety and the safety steering committee members so that they can relay the information to their site personnel.
 - Let it be noted, that personal information associated with incidents are held with complete confidentiality, so few people are directly on the automatic distribution of details associated with incidents; if a member of the committee needs to know more about details of incidents then they are instructed to contact the LIGO Lab Safety Officer for further discussion.

How do we remain proactive to ensure the safety of people and equipment?

□ New Safety Programs:

- Electrical Equipment Inspection Program (EEIP)
 - By recommendation of the LIGO Lab Safety Steering Committee:
 - Since the inception of the inspection program back in the Fall of 2010, there have been **2156** items identified, documented, and labeled with stickers that indicate that the equipment is either safe for use, as is, or that special precautions (SOP) is required to be safe to operate. This process of identifying uncertified equipment is ongoing at this time, and will continue until all equipment is documented based on LIGO inspection protocols.

□ New Safety Programs...cont:

- Qualified Electrical Worker Training Program
 - LIGO Laboratory Safety developed a training program to authorize LIGO staff that work on energized electrical equipment that is rated at 50V or higher, as the “Qualified Electrical Worker”.
- 213 - completed General Awareness in Electrical Safety
- 91 - completed Qualified Electrical Worker

□ New Safety Programs...cont:

- The LIGO Lab Safety Officer and Larry Martinez of CIT Campus Safety, recently administered a “Safety Perception Survey” at LHO.
- Ten percent (10%) of the workforce were randomly selected from a variety of job assignments.
- As a result of the questions asked, the responses revealed a very strong perception of management involvement in safety, and that everyone strongly agrees that they, and everyone else at LHO, have the authority to stop work if they observe something is unsafe; be it a job task, equipment problems, or just not being sure about what's required to perform a job safe.
 - LLO will also be surveyed during the upcoming annual safety audit in May 2012.

□ New Safety Programs...cont:

- During the fourth quarter of 2011, the “Good Catch” reporting program was implemented.
- These reports identify safety hazards that if not reported, may have led to an injury or damages to project equipment and property.
- So far, there have been 7 “Good Catch” reports that have been filed. All are investigated to determine what caused the hazard and how to mitigate, and is communicated to all LIGO sites.
- They involved a variety of issues, like faulty equipment, work place hazards, damaged equipment and equipment left in unsafe condition, to name a few.
- This program is gaining momentum, and has created a personal interest in workplace safety among LIGO workers.

aLIGO Safety Incidents

- ❑ Over the last 12 months, since the NSF review in April 2011, the following aLIGO related incidents were reported and investigated:
 1. CIT-Injury 04/22/2011 – Minor injury to workers right hand/stuck by falling equipment. First Aid.
 2. LLO-Property Damage 05/02/2011 – Contract worker damaged water line.
 3. LLO-Property Damages 08/03/2011 – Worker dropped/spilled bottle of acetone.
 4. MIT-Injury 09/07/2011 – Worker sustained minor cut while building crate. First Aid.
 5. LHO-Injury 10/05/2011 – Worker sustained minor contusion while disassembling overhead control box. First Aid.

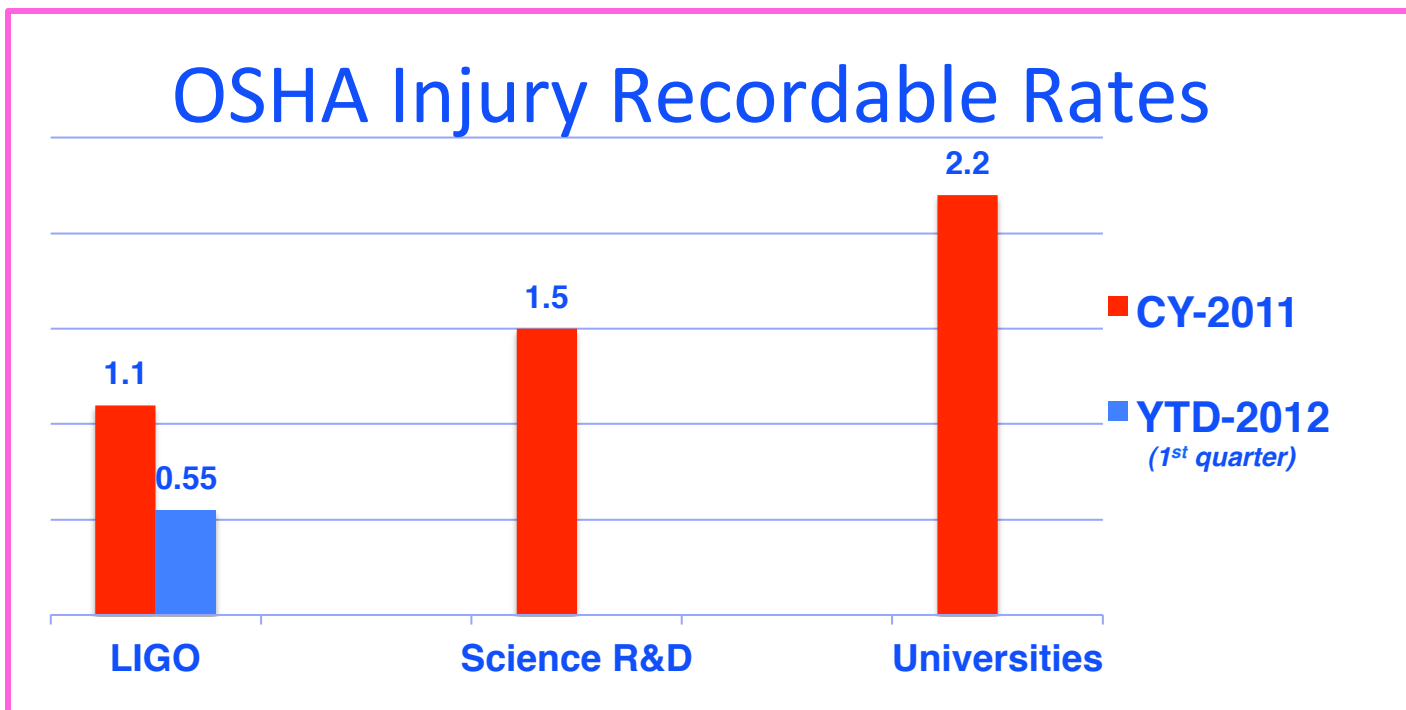
aLIGO Safety Incidents

6. CIT-Injury 10/06/2011 – Minor hand injury/splinter as worker was moving equipment with sharp/broken edge. First Aid.
7. LHO-Injury 11/07/2011 – Minor contusion to nose as worker was turning ratchet/slipped. First Aid.
8. CIT-Injury 02/24/2012 – Worker cleaning optics accidentally sprayed with small amount of methanol to face as equipment malfunctioned. Medical Care-OSHA Recordable/No lost time.
9. LHO-Laser 03.28.2012 – While testing new laser, a stray beam made contact with the laser and nearby technician/burring a hole in smock. No injuries.

Incident Response

- All incidents were fully investigated and communicated to safety and management personnel at all LIGO Lab sites.
- Mitigation measures applied to prevent reoccurrence.
- Of injuries reported, only one was classified as an OSHA Recordable incident.
- All incidents reported were unique; in that none were repeats and no trends noted.

Incident Response



Note: Number of recordable injuries X 200,000 (standard number for 100 FTE in one year) / hours worked entire calendar year.

Summary

Over the last year, the efforts of the aLIGO safety team has managed to ensure a safe work environment, educate staff and visitors on best safety practices, while providing a leadership roll that enables the project to remain on schedule, with few interruptions as possible.

This is very clear by the safety performance of our workers, noting that since the beginning of the aLIGO project on April 1, 2008 to present time, we have worked 1482 days or 1,120,000 man-hours without a lost time incident.

Our goal is to ensure a safe and productive work environment for all.