Hazard Analysis

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All Hands Safety Meeting

LIGO-G070847-02-D

Hazard Analysis

- Identify and define hazardous conditions/risks for the purpose of their elimination or control.
- Analytical approach requires:
  - » Identification
    - – Identification provides no guarantee that the risk will be eliminated or controlled.
  - » Evaluation
    - – Determination of how frequently a risk occurs and how severe it could be if an accident occurs as a result of the hazard.
  - » Resolution
  - » Timely solutions
    - – Minimize impact on cost and schedule.
  - » Verification
    - – Safety requirements have been met or that risk is eliminated or controlled to an acceptable level.

Severity Categories

Description	Category	Definition
Catastrophic	1	Death or permanent total disability, system loss, major property damage or severe environmental damage.
Critical	2	Severe injury, severe occupational illness, major system or environmental damage.
Marginal	3	Minor injury, lost workday accident, minor occupational illness, or minor system or environmental damage.
Minor or Negligible	4	Less than minor injury, first aid or minor supportive medical treatment type of occupational illness, or less than minor system or environmental damage.

Hazard Levels

Description	Level	Individual Item
Frequent	A	Likely to occur frequently or continuously experienced.
Probable	B	Will occur several times in the life of an item.
Occasional	C	Likely to occur some time in the life of an item.
Remote	D	Unlikely but possible to occur in the life of an item.
Improbable	E	So unlikely, it can be assumed occurrence may not be experienced.

Risk Assessment Matrix

Category Level	Catastrophic 1	Critical 2	Marginal 3	Negligible 4
Frequent (A)	1A	2A	3A	4A
Probable (B)	1B	2B	3B	4B
Occasional (C)	1C	2C	3C	4C
Remote (D)	1D	2D	3D	4D
Improbable (E)	1E	2E	3E	4E

Risk Code

Hazard Risk Assessment	Risk Code Criteria
1A, 1B, 1C, 2A, 2B, 3A	Unacceptable
1D, 2C, 2D, 3B, 3C	Undesirable (Directorate decision required)
1E, 2E, 3D, 3E, 4A, 4B	Acceptable with review by Directorate
4C, 4D, 4E	Acceptable without review

Example

Hazard	Exposure to toxic chemicals leading to dizziness, headache and confusion.
Cause	Poor ventilation at the work space.
Effect	Irritation of the eyes, nose, skin and throat.
Severity	marginal (3)
Level	improbable (E)
Risk Assessment	3E

Retrospectus

- Who should perform the analysis?
  - » Experienced sub-system leader, or delegate, familiar with the system being analyzed.
- What should the level of detail be?
  - » A matter of judgement. Knowing when to stop is just as important as doing the analysis.
- What resources are available?
  - » LIGO System Safety Plan, M950046-D-M
  - » ELIGO FR Magnet Assembly Hazard Analysis, E070201-00-D
    Advanced LIGO PSL Hazard Analysis, T070145-01-D
  - » Caltech and Project Safety
  - » `http://www.faa.gov/library/manuals/aviation/risk_management/ss_handbook/`

Retrospectus (cont.)

- Lessons learned:
  - » Start early, it is more time consuming than one can imagine.
  - » Involve as many people as possible, from designers to users.
  - » Don’t forget steps involved during installation of hardware.
  - » Think through the steps involved to get the task done. This will minimise the use of the streaker’s defence later on.