Lessons Learned from SLAC Type A Accident Investigation Electrical Arc Injury

Task Hazard Analysis/Hazard Control

Butch Meier

What Happened?

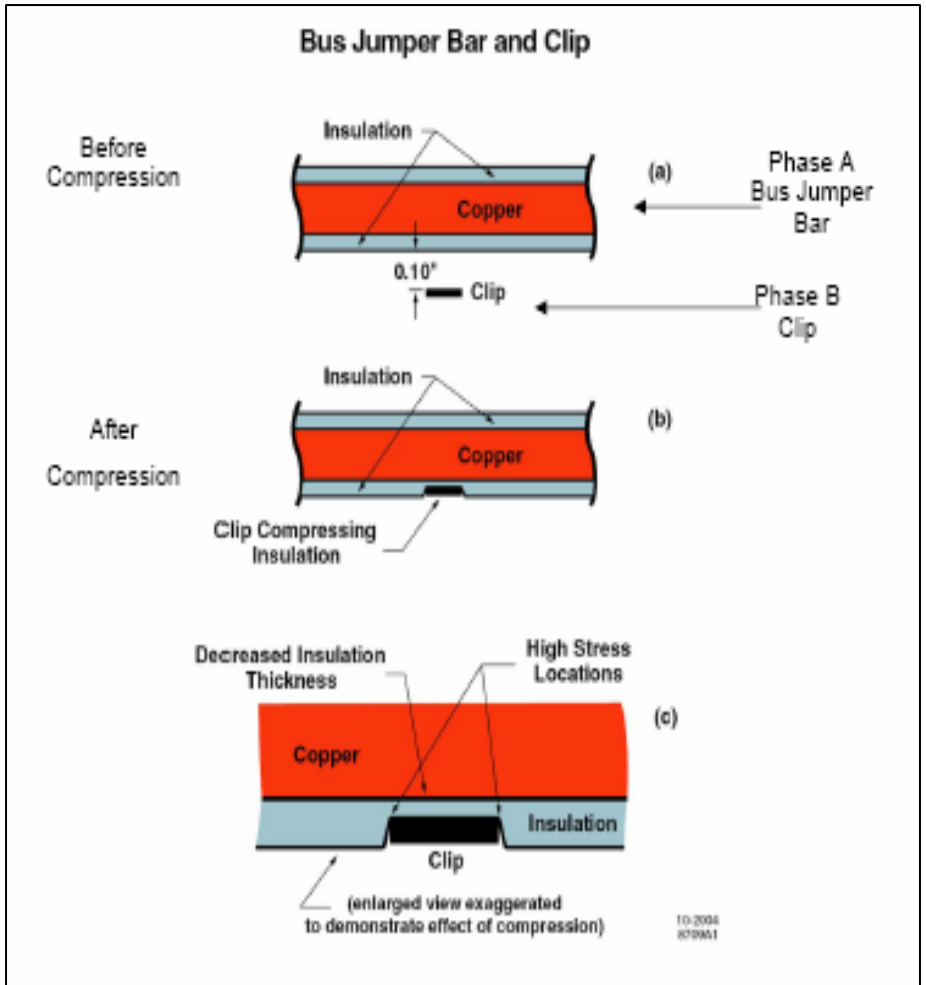


Figure 3-2. The effect of contact between the bus jumper bar and the clip (not to scale)

—**Breaker installation in energized panel**

—**Two 480 volt phase busbars came in close contact during install**

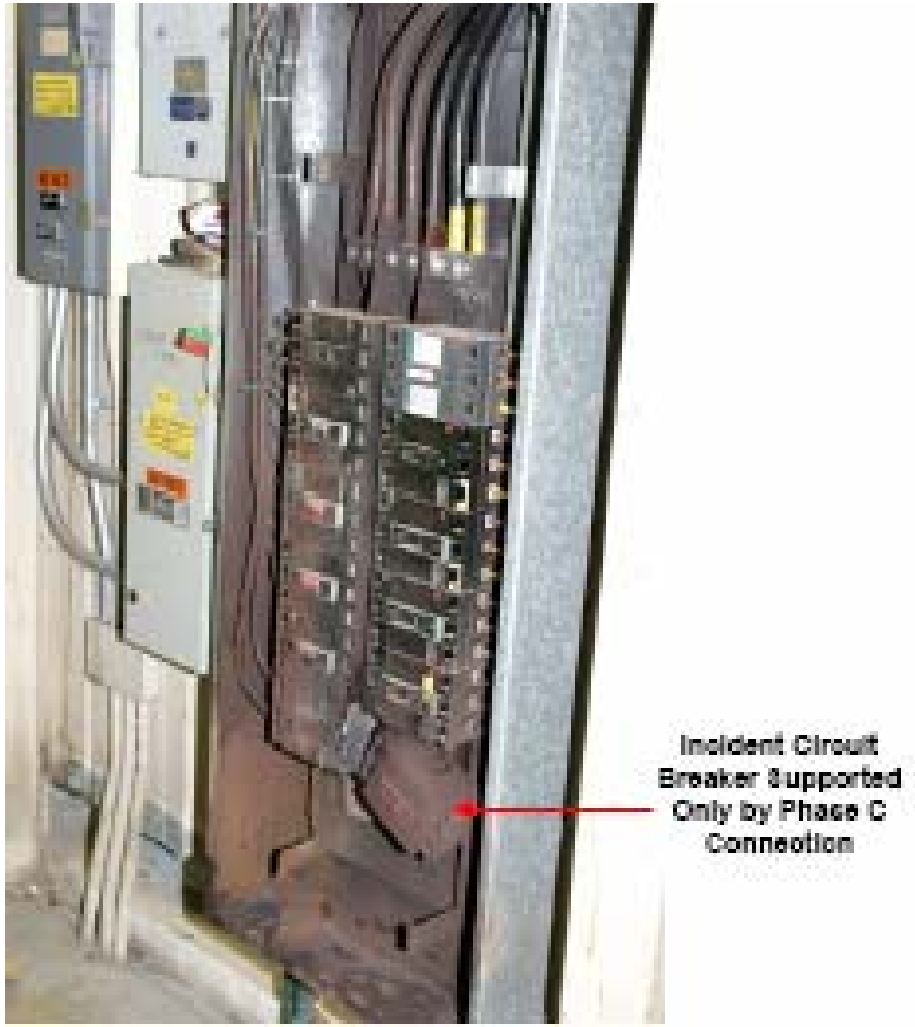
"…the work being done violated every ISM Core Function and every ISM Guiding Principle"

SLAC Type A Investigation Report

Arc Flash Hazards

- Temperatures up to 35000 F
- Brilliant flash
- Loud noise
- Spreading hot gases
- Molten metal
- Flying objects

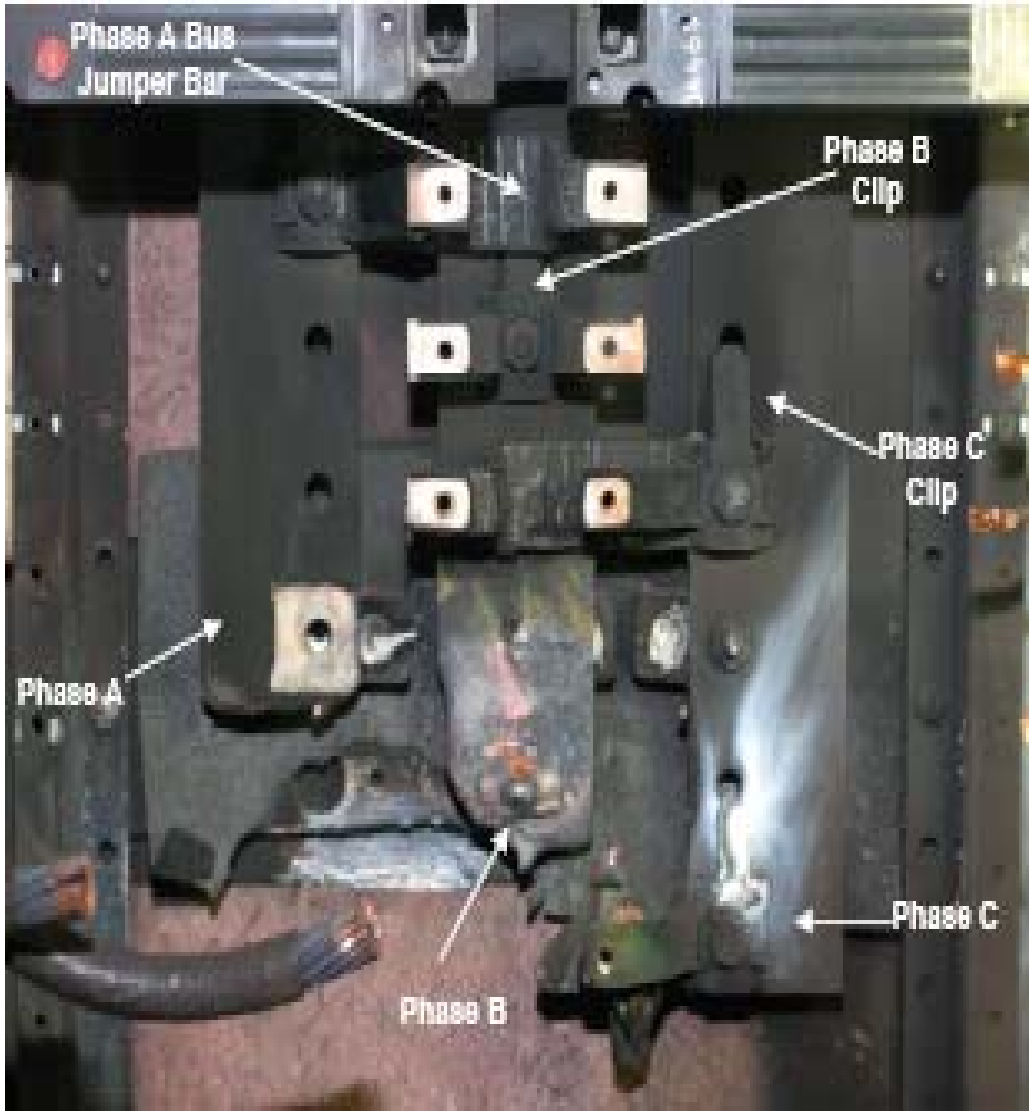
What Happened (cont.)



ISM Functions and Principles violated

- **Define the work**
- **Analyze hazards**
- **Develop/implement hazard controls**
- **Line Management responsible for safety**
- **Competence commensurate with responsibilities**

Key Findings



- No need or justification to work energized
- OSHA/NFPA 70E requirements not followed or known
  - Qualification
  - Hazards/PPE
  - Permits
  - Boundaries
- Field Supervisor knew worker PPE was improper

SLAC Accident Lessons Learned

- **JLab managers and supervisors are responsible to:**
  - **Determine if hazards are present or likely**
  - **Perform hazard analysis**
  - **Select proper PPE based on analysis**
  - **Communicate selection to employee, making sure it fits properly**
- **Supervisors and workers must stop when work steps do not go as expected**
- **Subcontractors are to comply with our safety requirements**

Final Thoughts on SLAC Accident

"ISM Core Functions and Guiding Principles have no impact because operations are placed above safety concerns"
"Rigorous safety oversight … is frowned upon and given very low priority"

- SLAC Type A Electrical Arc Injury Investigation Report

Keys to remember so this analysis doesn't apply here

- **Complacency in hazard analysis leads to injuries**
- **Supervisors must communicate PPE requirements**
- **Don't accept unsafe conditions or practices**
- **Even simple jobs have hazards - follow EH&S Manual procedures for hazard analysis**

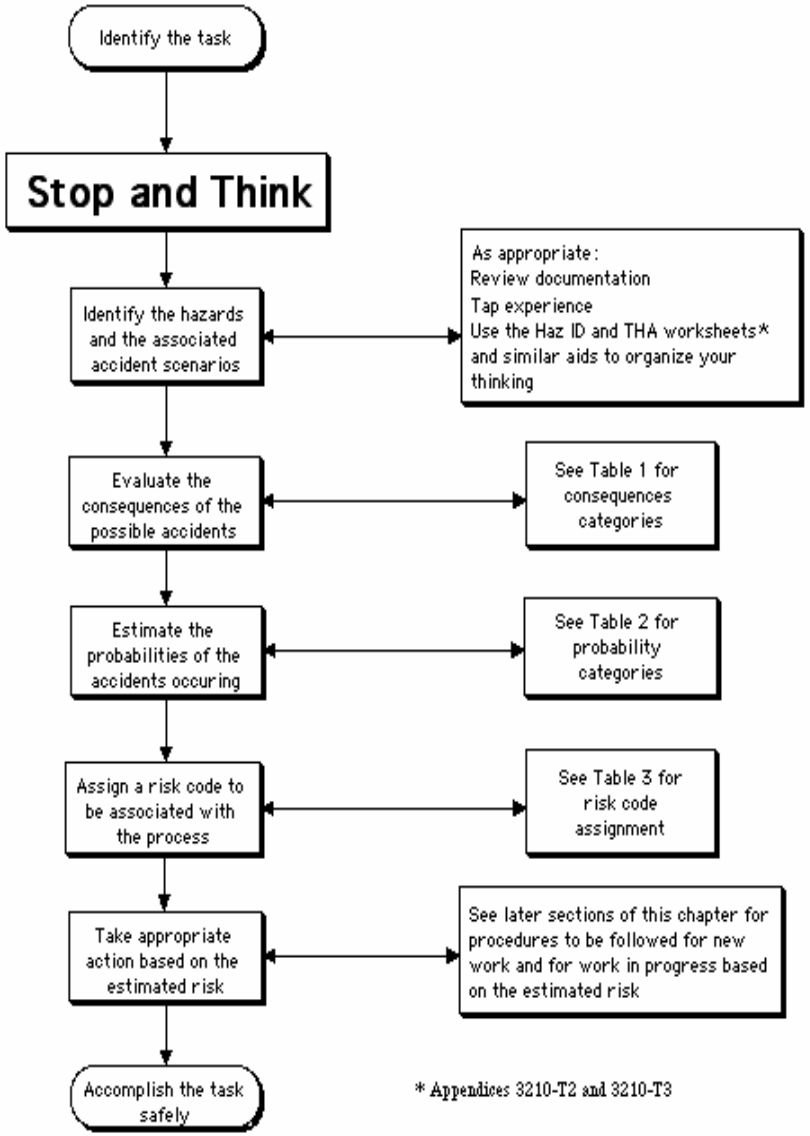


Figure 1 Overview of the Jefferson Lab hazard identification and risk evaluation process

- **EH&S Manual 3210 requires task hazard analysis**
  - **Implement OSHA/ISM requirements**
  - **New and in progress tasks**
  - **Reevaluate periodically and when things change**
- **Supervisors tasked with responsibility**
- **Safety professionals available – use them**

Table 3: Risk Code Assignment

		Personal injury	Property loss or environmental impact				
Severity of outcome	IV	Death or permanent disability	> $100,000	1	3	4	4
	III	Hospitalization required or ≥ 5 lost workdays	> $10,000	1	2	3	4
	II	First aid or medical treatment required and < 5 lost workdays	> $500	0	1	2	3
	I	First aid not required	< $500	0	0	1	1
				> 500 yrs	≤ 500 yrs > 10 yrs	≤ 10 yrs > 10 days	≤ 10 days
				A	B	C	D
				Likelihood of accident (Estimated likelihood per full-time active person)			

Table 4: Risk Codes and Task Review Requirements

Risk Code assigned based on hardware and procedures already in place		Level of Task Review required before new work can begin
4	High	**Formal written and approved procedures** in the form of an SOP, OSP, or temporary work permit. Division EH&S Officer may require additional approvals.
3	Medium	**Formal written and approved procedures** in the form of an SOP, OSP, or temporary work permit.
2	Low	None Workers and supervisors should explicitly review the hazards and mitigating measures.
1	Minor	None This level of risk is common for appropriately trained personnel.
0	Negligible	None This level of risk is common, and the relevant measures are addressed as part of general education of the public.

- **Risk Code 3 & 4 jobs get much supervisory planning and attention**
- **Risk Code 2 jobs require worker and supervisor to "explicitly review hazards and mitigating measures"**

Risk Code 2 is our area of focus for the shutdown – four reportable injuries in 2004 occurred in Risk Code 2 tasks

Final Safety Thoughts

- **Within DOE complex, electrical safety and hoisting and rigging are the two tasks of current high level interest**
- **At JLab, slips/trips/sprains and hand injuries are our most common injuries**
- **Injuries are preventable – zero is our goal!**
- **Open every meeting with a short discussion of a recent safety item of interest – gets everyone thinking of safety!**