Safety Harness Prevents Fall to Ground

When Worker Steps onto Skylight

3rd Annual BlueDragon Users Group Meeting
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BROOKHAVEN NATIONAL LABORATORY

a passion for discovery

U.S. DEPARTMENT OF ENERGY | Office of Science

Overview and Timeline

- **July 27, 2020:** As part of bldg. upgrades, a sub-contractor is installing steel roof trusses through openings cut in the existing roof
  - During the lift, an ironworker acting as spotter for the crane (standing on the roof) walks to grab a tag line and falls through a skylight
  - The worker is using a personal fall arrest system (PFAS) and there is no injury. The worker is able to self-rescue.

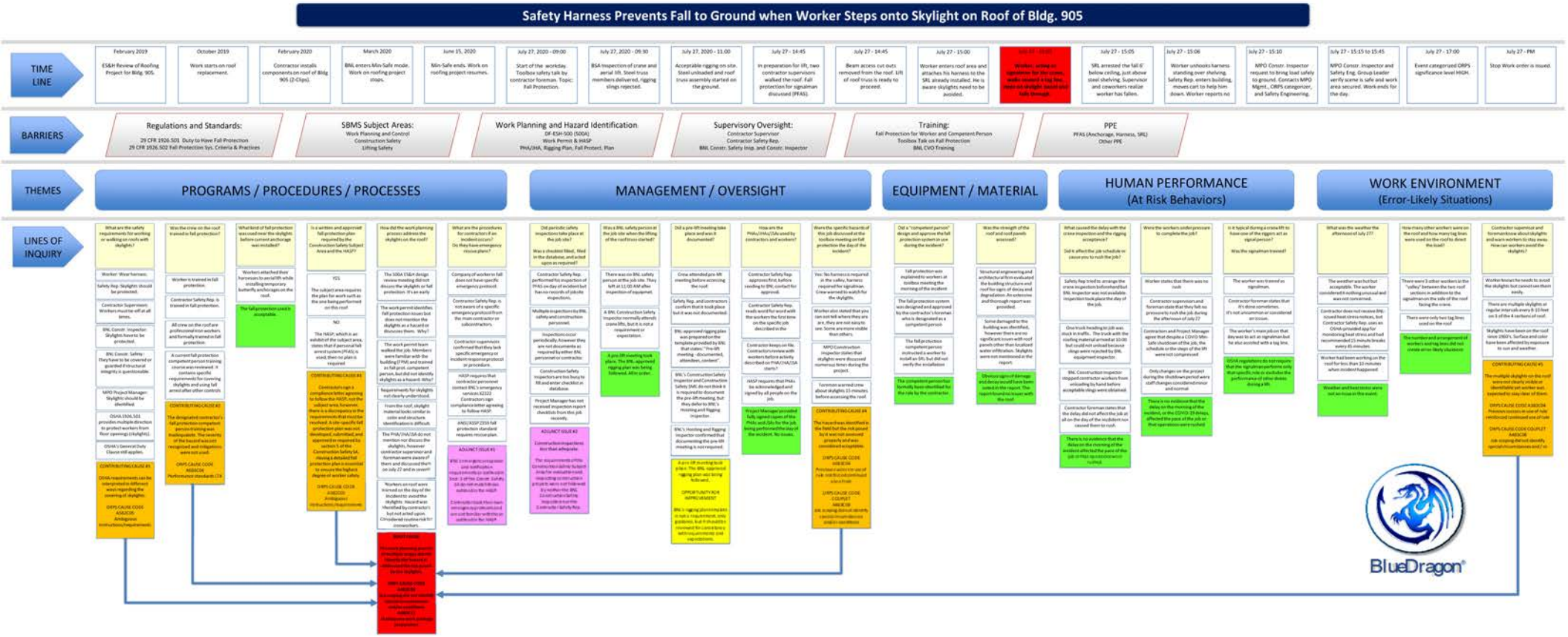
Overview and Timeline

- **July 27:** After initial response, the scene was made safe and preserved
  - Categorization - High Level ORPS Report
  - Stop Work letter issued to contractor on the same day
- **July 28:** Investigation team charged with conducting a comprehensive review of the event and delivery of a report by **August 4**
  - Fact finding is initiated: Visit scene, initial interviews & doc. review
- **July 29:** Causal analysis starts – deadline must be met
  - Blue Dragon method selected for its **flexibility and efficiency**
- **July 29, 30, 31:** A total of five causal analysis sessions were held
- **August 3:** Draft report is submitted for review and approval
- **August 5:** Final report is issued. A follow up document was prepared with recommendation for a C.A.P. and with a set of specific **conditions** for the **safe restart of work**
- **August 7:** Corrective action plan development commenced
- **September 15:** Work restarts. Project is completed as planned without further incident.

Causal Analysis

- **Cross-functional investigation team consisted of:**
  - Safety Engineering Manager (BlueDragon trained but new to causal analysis)
  - Safety Engineer knowledgeable in fall protection and lifting safety
  - Construction Project Manager
  - Quality Assurance Specialist (BlueDragon trained and experienced causal analyst)
  - Human Factors Scientist
- **Initial team meeting:**
  - Establish timeline, identify and study barriers, develop LOIs
  - Management requested update on LOIs for their review but did not interfere
- **Causal analysis sessions:**
  - Management made it a high priority (high visibility event / work on project stopped)
  - Subcontractors and Brookhaven personnel at all levels in the organization cooperated fully and enabled the team to complete the task under pressure
  - Five sessions: workers, supervisors (subcontractor & BNL), SMEs, project managers.

Blue Dragon Chart



Root and Contributing Causes

- **Root Cause:** The **work planning** process at multiple stages **did not identify the hazard** or addressed the risk posed by the skylights on a working/walking surface
  - Work planning at BNL for construction activities includes different stages, from high level early reviews at the project management level, to work permit preparation, contractor interaction and flow down or requirements contractor safety inspections, etc.
  - The work planning at all levels failed to identify the skylights as a fall hazard, and when it was identified in the field, the risk posed by it was not properly assessed, which resulted in LTA mitigation.
- **Contributing Cause #1:** OSHA **requirements** can be **interpreted** in different ways regarding the covering of skylights
- **Contributing Cause #2:** The severity of the hazard was not recognized and mitigations, **other than PPE**, were not considered or implemented

Root and Contributing Causes

- **Contributing Cause #3:** The **requirement** for a site-specific fall protection plan **differs** between the Construction Safety Subject Area and the Health and Safety Plan (HASP) signed on by the contractors
- **Contributing Cause #4:** The skylight hazard was identified in the field, but the **risk** posed by it was not assessed properly and **was considered acceptable**
- **Contributing Cause #5:** The multiple skylights on the roof were not clearly visible or identifiable yet worker was expected to stay clear
  - Although the ironworker was aware of the skylights, their reduced visibility and the need to avoid them, the risk was perceived as routine

Root and Contributing Causes

Event Conclusion

- The Team concluded that although there was no injury and the harness performed as expected, the potential for serious injury existed.
- Multiple opportunities to identify the hazards and assess the risk during the work planning were not effective. When the hazard was identified proper mitigation to eliminate the hazard was not implemented.

How the BlueDragon Process Worked

- The BlueDragon method allowed a relatively inexperienced causal analyst to lead the team and complete the analysis
- The process proved its flexibility and efficiency:
  - The team conducted a streamlined yet rigorous investigation of a high-level event
  - The tight deadline was met, and the report delivered in 5 days