# NAC Analysis: "Precursors of High Impact, Low Frequency Events, Including Fatalities"

NAC endorses the work of Construction Industry Institute (CII) Research Team (RT) - 321, which lists 16 "Precursors of High Impact, Low Frequency Events (HILFE), Including Fatalities," as sound, insightful, and provocative. Sound because it explores the bedrock-potential root causes of such events. Insightful in that it gives views of those human actions and inactions that can easily become the root cause of an unwanted event. Provocative because the research stimulates thought on what preventative actions those involved can take.

CII's RT-321 research defines an "event precursor" as *a specific condition that, if left unattended, shows an historic tendency to be a foreteller of an LFHIE*. The RT-321 researchers studying LFHIE identified and arranged 16 LFHI event precursors into four categories (listed below). Categories 1 and 4 are weighted in seriousness as x1.0, while categories 2 and 3 are weighed as x2.0, or twice as serious.

Each of these precursors can be mitigated with specifically planned intervention strategies. For instance, in all four categories preventative measures found in previously conducted CII safety research can be applied to effectively mitigate the likelihood of an LFHIE occurring. Since 2006, NAC has published some 40 Safety White Papers (SWP), 35 of which address means and methods that can be used to effectively mitigate the at-risk behaviors that have been found by CII to be the root cause of an LFHIE.

Following the CII precursor categories below, specific NAC Safety White Papers are noted that can be applied in mitigation. The NAC SWPs are available online at www.naocon.org/publications.

**CII RT-321 LFHI Event Precursors by Category**

1. **Pre-Work Planning -** *(see NAC SWP #6, https://www.naocon.org//wp-content/uploads/2014/12/NACSafetyPaper6.pdf #7, https://www.naocon.org//wp-content/uploads/2014/12/NAC_SafetyPaper7.pdf #16,https://www.naocon.org//wp-content/uploads/2014/12/SafetyPaper16.pdf and #36, https://www.naocon.org/wp-content/uploads/NAC-SWP-No.-36.pdf)*
    - Crew members are unaware of work procedures.
    - No/poor plan to address work changes.
    - No/poor pre-task plan or discussion specific to the work.

2. **Productivity Safety Stressors (x2.0) -** *(NAC SWP #7,https://www.naocon.org//wp-content/uploads/2014/12/NAC_SafetyPaper7.pdf #18, https://www.naocon.org//wp-content/uploads/2014/12/SafetyPaper18.pdf)*
    - Significant overtime
    - Fatigue
    - Schedule/productivity pressure

- Poor prior safety performance
- Crew members are not active in safety.

**3. Vulnerability to High Energy (x2.0) –** *(NAC SWP #3, https://www.naocon.org//wp-content/uploads/2014/12/NAC_Safety_Paper3.pdf #4, https://www.naocon.org//wp-content/uploads/2014/12/NAC_Safety_Paper4.pdf)*

- Lack of control over barrier and/or visual warning
- Line of fire is uncontrolled.
- Improvisation

**4. Outside Safety Influences -** *(NAC SWP #5 https://www.naocon.org//wp-content/uploads/2014/12/NAC_Safety_Paper5.pdf #7, https://www.naocon.org//wp-content/uploads/2014/12/NAC_Safety_Paper5.pdf #8, https://www.naocon.org//wp-content/uploads/2014/12/NAC_Safety8.pdf #9, https://www.naocon.org//wp-content/uploads/2014/12/SafetyPaper9.pdf #15,https://www.naocon.org//wp-content/uploads/2014/12/SafetyPaper15.pdf #21, https://www.naocon.org//wp-content/uploads/2014/12/SafetyPaper21.pdf #25, https://www.naocon.org//wp-content/uploads/2014/12/NAC_SWP_25_Accountability_-_final.pdf)*

- Limited safety supervision
- Poor quality or inexperienced foremen
- Distracted workers
- Working alone
- Congested workplace/crowding

The National Academy of Construction's recent study of LFHIE shows consistency with the CII findings in the RT-321 report.

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- This SWP is an analysis of the research by RT-321 originally presented at the 2016 CII Annual Conference.
- See the CII website at www.construction-institute.org for copies of various research products.

**NAC Safety White Paper authored by Emmitt J. Nelson and provided by the NAC Safety Committee.**
The National Academy of Construction (NAC) is an organization of leaders from industry, construction, the military, and academia formed as a knowledge base of American competence in the construction of capital facilities. NAC Safety White Papers (SWPs) are created from the experience base of NAC membership and are offered to American business and government leaders as answers to challenges facing American enterprise.