Going Beyond Zero by Using Safety Leading Indicators & Predictive Analytics

CFMA - Boston

April 9, 2013
Key Industry Financial Indicators

The top key industry financial indicators are displayed below to give an overview of the most current industry trends. Click on each arrow to be taken to the detailed report for each indicator.

- **CFMA CONFINDEX™**
  - Confidence Falls 2.6% from September Through December.
  - 114
  - December 2012
  - Next Update March 2013

- **ARCHITECTURE BILLINGS INDEX**
  - Architecture firms continued to report improving business conditions in December.
  - -1.2 POINTS 52
  - December 2012
  - Next Update February 2013

- **FMI CONSTRUCTION OUTLOOK REPORT**
  - FMI’s Forecast calls for an 8% increase in total construction put in place for 2013.
  - 8%
  - November 2012
  - Next Update March 2013

- **MCGRAW-HILL CONSTRUCTION INDUSTRY CONFIDENCE INDEX**
  - Confidence Industry Confidence Index remains unchanged.
  - 50
  - Fourth Quarter
  - Next Update March 2013

- **ASSOCIATED BUILDERS & CONTRACTORS INC.'S BACKLOG INDICATOR**
  - ABC reports its Construction Backlog Indicator rose in the 3rd quarter.
  - 3.5%
  - November 2012
  - Next Update March 2013
Agenda

- What is CII?
- The RT 284 Research Team
- Definition of leading indicators
- Common leading indicators
- Making leading indicators work in your company
- Zurich Construction Leading Indicator
  Construction research team findings
- Utilization of a system to track
What is the Construction Industry Institute?

- CII is based at The University of Texas at Austin and was formed in 1989
- It is a consortium of more than 100 leading owners and contractors from both the public and private sectors and more than 30 leading U.S. Universities
- These organizations have joined together to enhance the business effectiveness and sustainability of the capital facility life cycle through CII research, related initiatives, and industry alliances
- The result of this has been the creation of best practices and implementation tools in 15 key areas such as: Constructability, Front End Planning, Project Risk and Zero Accident Techniques
RT 284 Research Team
Safety Leading Indicators

- Team of 20 individuals representing owners and contractors
- The two lead researchers were from the University of Florida and the University of Colorado at Boulder
- The team chair was Steve Trickel from Zachry and the vice chair was Dave Wulf from Conoco Phillips
- Two year research effort

Finish Product
- RT 284-1 Measuring Safety Performance with Active Safety Leading Indicators
- RT 284-2 Implementing Active Safety Leading Indicators

1. Demonstrated Management Commitment
2. Staffing for Safety
3. Planning (pre-project and pre-task)
4. Safety Education: orientation and specialized training
5. Worker Involvement
6. Evaluation and recognition/reward
7. Subcontractor Management
8. Accident/incident investigations
9. Drug & Alcohol testing

Plus – Fall Management program – with 100% 6’ fall protection
Safety in Design
CII TRIR Trends

What can we do to accelerate improvement?
Scope of the Research

To identify the characteristics of passive and active leading indicators that most effectively predict safety performance on construction projects and to create a leading indicator measurement tool that facilitates the integration of leading indicators in a comprehensive safety program.
What are leading indicators?

**Leading indicators** are measures of attitudes, behaviors, practices, procedures, techniques or conditions that influence construction safety performance.

Another definition:

**Leading Indicators** are proactive measurable actions and/or results that may predict incidents, injuries and/or illness.
What are leading indicators?

**Passive Indicators** – An indicator that does not have an actionable metric. Example - requiring pre-task planning takes place.

**Active Leading Indicators** – A metric that prompts a proactive response relative to the process it measures. Example – measuring whether pre-task plans are completed, by who, addressing appropriate hazards, reviewed with crews and reviewed for quality.

*We will concentrate on Active Leading Indicators*
Measurement is important to evaluate the efficiency of any process.
Where should the measurements take place?

Input → PROCESS → output

HERE?
Where should the measurements take place?

OR HERE?
• Traditional view of safety is from the pessimistic perspective. (the focus is on our failures)

• If unacceptable numbers of injuries occur, it is too late to prevent them.

• The question: can we or should we change the way we look at safety?
Consider the Contrast of Lagging Indicators and Leading Indicators of Safety Performance
Lagging vs Leading Indicators of Safety Performance

Lagging Indicators
- Fatality: 1
- Lost Time Injury: 200
- Medical Case Injury: 2,000

Leading Indicators
- Near Miss incidents
- First aid injury
- Unsafe Behavior and Unsafe Conditions

Underlying Causes for Unsafe Behavior and Unsafe Conditions

Strategies to reduce or eliminate risk and to promote a safe work environment

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Lagging, Downstream or Trailing Measures Focus on the End Results, not the Process
The traditional measures of safety force us to focus on our failures (when it is too late)

- RIR
- DART
- Litigation
- Regulatory Citations
- Loss ratio
- EMR
What are Leading Indicators of Safety?

Proactive measures of processes that precede or influence safety performance

Signal the need for interventions before incidents occur

While lagging indicators indicate that there is a problem, leading indicators help identify the source of the problem
While lagging indicators give information about end results only, leading indicators focus on the safety process.

The focus is on the actions or behaviors that lead to success.
Focus of leading indicators

Input ➔ Process ➔ output
Focus on the Safety Process

Provides management with assurances when the process is working as intended

Provides management with the opportunity to respond when weaknesses in the process are identified
Studying safety leading indicators

19 case study projects
Studying safety leading indicators

14 award-winning project descriptions
Studying safety leading indicators

Research team brainstorming

Resulted in identifying many safety leading indicators
If you go onto a project and don’t know the injury rate, how do you know whether it is safe or not?
Most Common Leading Indicators

- Near Miss Reporting
- Project Management Team Safety Process Involvement
- Worker Observation Process
- Stop Work Authority
- Auditing Program
- Pre-Task Planning
- Housekeeping Program
Most Common Leading Indicators

- Owner’s Project Manager participates in Worker Orientation
- Foreman Feedback Meetings with Owner’s Project Manager
- Owner Performs Safety Walk Through
- Pre-task Planning for Vendor Activities
- Vendor Safety Audits
- Vendor Exit Debrief
- Vendor Design for Safety
What is the best safety leading indicator?

- There is no best leading indicator.
- Different processes require different indicators.
- Strong safety commitment from management is necessary for success.
The concept

Safety leading indicators can be measured and can alert management about the need for a positive response before an injury occurs.

Some are strategies most companies are already doing!

- Site safety audits
- Toolbox meetings

A shift toward:

- Measurement of the strategies
- Setting thresholds
- Implementing an action plan if the values are not desirable
Example: Near Miss Reporting

- Most firms have near miss programs BUT few measure, track, and respond in an organized fashion
- This may be a great place to start

  - Evaluate your near miss reporting process (who, what, how often)
  - What might you measure?
  - What is your target?
  - What if your measurements show unacceptable results?
Near Miss Reporting

1. Select "Indicator"  
2. Define Actionable "Metric"  
3. Develop Measurement Process  
4. Engage Responsible Parties  
5. Implement  
6. Analyze Information  
7. Publicize Performance  
8. Evaluate Effectiveness  
9. Celebrate  
Continuous Improvement: Learn and Adjust
Other Findings from the research of Leading Indicators

- Very few leading indicators are fully implemented (case average TRIR approx. 2.0).
- Projects where leading indicators were measured and fully implemented had an average TRIR of 0.19!
- **Every** firm can benefit from safety leading indicators.
- A strong foundation of safety is a **prerequisite**.
- A **champion** must be committed to success.
- The next step is to **carefully** select a few safety leading indicators and implement them on your project.
Zurich Construction Roundtable Recommendations and Solutions:

- Perform a cultural assessment to establish a baseline
- Educating management (both client and company) on understanding lagging indicators vs. leading indicators
- Reporting results on a continuous basis at all levels of the company (example: company dashboard)
- Determine what, why and how to measure (develop a plan)
- Behavioral Based Observation Process Is In Place and Working
- Focus Observation Process Is In Place and Working
- Near Miss/Near Hit Reporting Process Is In Place and Working
- Employee Perception Surveys Are Conducted To Determine State of EH&S Health.
- Pre-Hire Screening of Employees Is Conducted.
Zurich Construction Roundtable Recommendations and Solutions:

- Contractor Selection (EH&S) Process Is In Place Prior to Start of Project.
- Active Management Safety Participation – Tours / Walkabout / Written Communications
- Supervisor Safety Activity Evaluated.
- Hazard ID/Analysis Process Is In Place Prior To Start of Project.
- JHA/JSA Are Conducted Prior To Start of New Work/At The Beginning of Shift
- Recognition for achievement based on leading indicators vs. lagging indicators:
  - Educating owners to shift focus to leading indicators
Measure the process – do they align

– What do you state
– What is written (the plan)
– What is implemented
Continuous Improvement

- Accountability
- Feedback
  - Positive & Negative
- Develop Action Plans
- Data-driven decisions

Plan

- Purpose
- Expectations
- Data Use Plan
- Communication

Act

- Periodic Review
- Identify Gaps & Trends
- Measure Progress

Do

- Inspection Strategy
- Observe
- Initial Correction

Study

- Accountability
- Feedback
  - Positive & Negative
- Develop Action Plans
- Data-driven decisions
How companies predict and prevent
How organizations predict

From basic...

...to advanced...

...to predictive models
Predictive Solutions safety data set

- Over 130 million observations – over 1.7 million added each month
- Over 3 million inspections
- Nearly 40,000 unique observers
- Over 15,000 worksites
Safety truths overview

• Do a large quantity of inspections
• Involve a wide & diverse population
• Empower to report unsafes
• Fix unsafe issues
Case Study: Electrical Contractor

Overall Program Results

- 230% increase in inspections
- Advanced/predictive analytics to create leading indicators
- Targeted improvement opportunities
- Consistent results
  - 90% decrease in Incidents
  - 60% decrease in workers comp last two years

Company Results

- Safety Inspections per Quarter
- Incidents per Quarter

Zurich HelpPoint
There are many examples

Incident/Injury Reduction
In Summary

- Safety leading indicators tell you the safety potential of your project and provide signals when specific corrective actions should be taken.
- Predictive Analytics can target your focus, to lead to Zero Incidents
- Who measures your leading indicators? Internal/external
Questions
What does a safety inspection look like?

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Safe Observation</th>
<th>Unsafe Observation</th>
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**What does a safety inspection look like?**

- **Safety Inspection**
- **Safe Observation**
- **Unsafe Observation**

**Zurich HelpPoint**
Safety truth #1: More Inspections result in safer outcomes
Safety truth #2: More quantity and diversity in safety inspectors result in safer outcomes

Widespread involvement performs best
The risk curve

- Robust safety culture
  - Engagement
  - Empowerment
  - Supported by leadership

- Execution
  - Process
  - Feedback
  - Accountability

- High Risk (Incidents)
- Low Risk (Incidents)
- Low At-Risk Observations (Frequency)
- High At-Risk Observations (Frequency)
## Exhibit 1: Zero Injury Safety *Culture Building Blocks*

<table>
<thead>
<tr>
<th>Representatie Examples</th>
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<tbody>
<tr>
<td><strong>Attitudes</strong></td>
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<tr>
<td>Zero injury is attainable on every shift and every project</td>
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<tr>
<td>Zero injury culture needs to permeate all company activities and not be viewed as a separate process</td>
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<tr>
<td><strong>Beliefs</strong></td>
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<tr>
<td>All levels of the organization believe that zero injury is achievable – from company executives to all craft/trade employees</td>
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<tr>
<td>All employees accept personal responsibility and accountability for zero injury</td>
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<tr>
<td><strong>Values</strong></td>
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<tr>
<td>The company values the health and safety of all employees</td>
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<td>The company is committed to employees going home safe at the end of every work day</td>
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<tr>
<td><strong>Assumptions</strong></td>
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<tr>
<td>Employees are not taking unnecessary risk</td>
</tr>
<tr>
<td>New employees accept safe work practices as the expectation</td>
</tr>
<tr>
<td><strong>Norms</strong></td>
</tr>
<tr>
<td>Employee behavior on projects rejects shortcuts and recognizes that unnecessary risk-taking is not acceptable</td>
</tr>
<tr>
<td>Zero injury is ingrained in the way the company builds every construction project – regardless of size, location, company division, manager/supervisor, and/or schedule</td>
</tr>
<tr>
<td>Assessment Category</td>
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<tr>
<td>---------------------------------------------------------</td>
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</table>
| 1. Organizational Leaders Operationalize Commitment    | Demonstrable senior leadership participation and involvement  
|                                                          | Resource allocation  
|                                                          | Core processes and results measured  
|                                                          | Accountability system for safety at all levels of the organization                                                                                   |
| 2. Identify Safety and Reliability as Goals             | Safety as a goal is consistently and clearly articulated  
|                                                          | Multiple and independent channels of communication  
|                                                          | Decentralized decision-making authority                                                                                                                |
| 3. High Levels of Redundancy in Personnel and Technical Safety Measures | Continuous operations and training  
|                                                          | Job hazard analyses are owned, continuously reviewed, and updated                                                                                     |
| 4. Organization Strives for a “High Reliability Culture” | Presents optimism toward a desired future state  
|                                                          | Consistent communications  
|                                                          | Adaptability to change                                                                                                                              |
| 5. Sophisticated Forms of Trial and Error Organizational Learning | Capacity to learn and act  
|                                                          | Accident investigations are blame-free and pursue systemic improvements  
|                                                          | Hazard analysis occurs before accidents                                                                                                              |