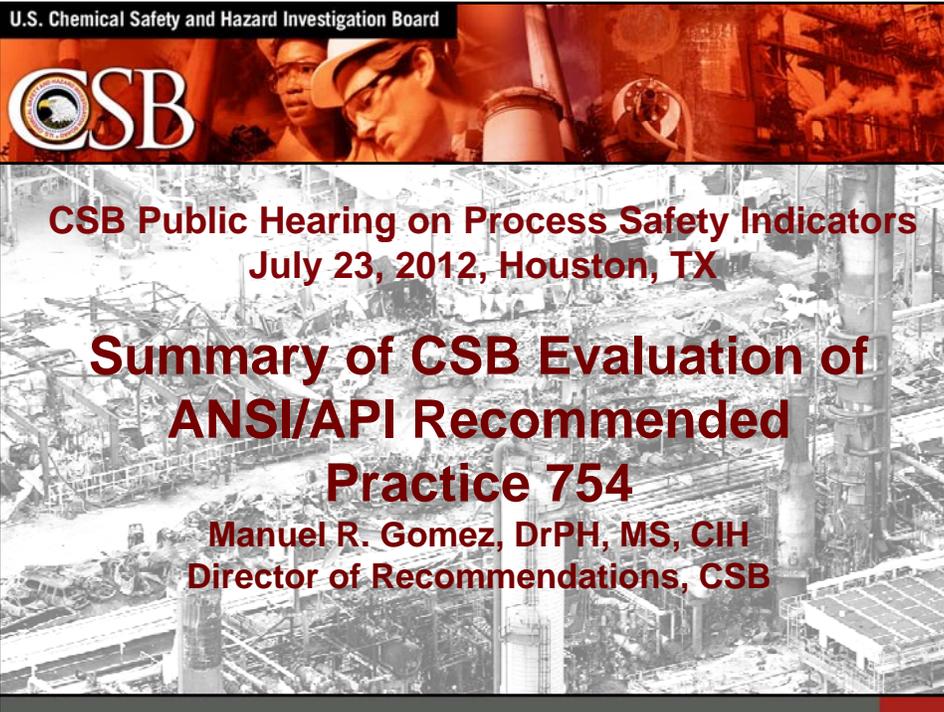


U.S. Chemical Safety and Hazard Investigation Board



**CSB Public Hearing on Process Safety Indicators**  
**July 23, 2012, Houston, TX**

**Summary of CSB Evaluation of**  
**ANSI/API Recommended**  
**Practice 754**

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 U.S. Chemical Safety and Hazard Investigation Board



## Outline

- Background of CSB Recommendation
- Recommendation Recipient Responses
- Summary of Recommended Practice
- Contributions & Shortcomings of RP 754
- Conclusions

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## Background

- **March 23, 2005: BP Texas City Refinery Disaster**
  - 15 deaths, 180 injuries, property losses
- **One of the major findings was that BP and industry did not have effective process safety indicators**
  - To identify potential for high risk events; and,
  - To trigger improved prevention of catastrophic events;
  - Instead, industry incorrectly used personal safety measures as an indicator of process safety performance.
- **As a result, 2007 recommendation to API and USW:**  
Jointly lead development of a consensus standard for leading and lagging process safety indicators to improve performance in the prevention of high risk incidents.

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## Background

- **June 27, 2012: CSB Board designated the recommendation as “Open—Acceptable Response”**
  - The procedure is to review a proposed staff evaluation; and,
  - This status in effect, means that *the Board judges that the recipient is moving in the right direction, but that more remains to be done.*
- **The vote was 2 to 1, with Member Griffon voting against the motion because of his concern regarding “some elements of the recommendation that have not been adequately addressed.”**

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## Recommendation

Work together to develop two new consensus American National Standards Institute (ANSI) standards.

a. In the first standard, create performance indicators for process safety in the refinery and petrochemical industries.

Ensure that the standard identifies leading and lagging indicators for nationwide public reporting as well as indicators for use at individual facilities. Include methods for the development and use of the performance indicators.

In the development of each standard, ensure that:

- a) the committees are accredited and conform to ANSI principles of openness, balance, due process, and consensus;
- b) include representation of diverse sectors such as industry, labor, government, public interest and environmental organizations and experts from relevant scientific organizations and disciplines.

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## Main Goals of Recommendation

- **Develop and use consensus guidance on *leading and lagging indicators to drive performance improvements*;**
- **Facilitate public reporting of performance of plants, companies and industry(ies).**
- **Develop the standard in a process that would meet ANSI principles and include a diverse mix of perspectives and input from**

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## A Sidebar on ANSI

- What is ANSI and does it fit in this picture?
  - The American National Standards Institute (ANSI) is a private organization, historically engaged in developing *commercial* standards;
  - ANSI *supports* development of *voluntary* standards, which have no force of law behind them, unless referenced or adopted in government regulations.
  - ANSI provides *procedures* to achieve balance and other objectives in committees;
  - ANSI does not judge or “approve” the *technical content* of standards, but only the adherence by ANSI committees to certain procedural requirements.

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## Recipient Responses

- Both respondents initially accepted the recommendation;
- API formed ANSI committee & USW joined.
- USW withdrew from committee 8/4/09:
  - In protest for imbalance in committee members
- API completed process and issued the “ANSI-approved” RP 754 in April 2010.

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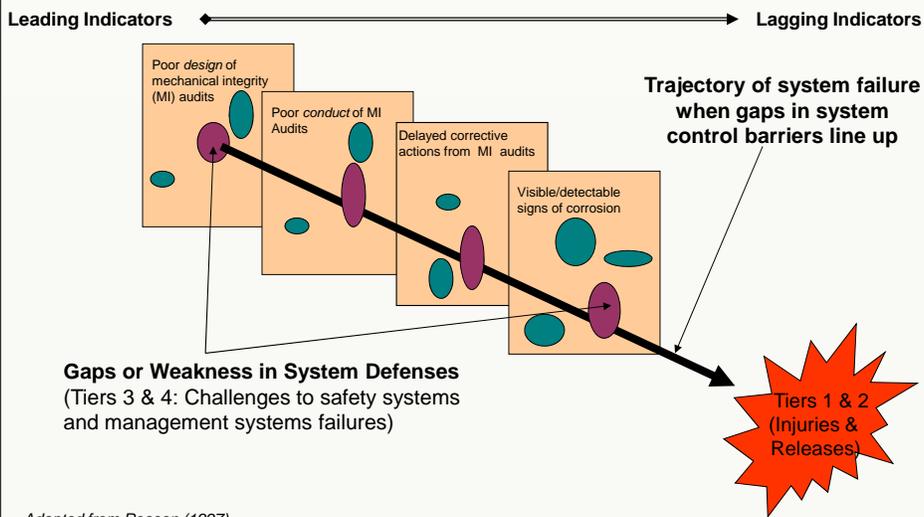


## Summary of Recommended Practice 754

- 754 based on collection, use & some public reporting of 4 tiers of incidents/events:
  - Tiers 1 & 2:
    - “More” lagging indicators/events;
    - Defined by impacts (human, size of releases, costs);
    - “Designed for nationwide public reporting”
  - Tiers 3 & 4:
    - “More” leading indicators/events;
    - Tier 3: Challenges to safety systems;
    - Tier 4: Management system failures;
    - “Intended for internal use at individual sites”



### The “Swiss Cheese” Model of Barriers (Indicators): Simplified Mechanical Integrity Example





## CONTRIBUTIONS OF RP 754

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## Contributions of RP 754

- Highlights the need and establishes some “obligations” (ANSI, *not* legal) for the use of process safety indicators in the industries.
- Defines a framework of 4 tiered indicators that incorporate the concepts of “lagging” measures (clearly defined consequences) to “leading” variables that are likely predictors of serious process failures.

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## Contributions of RP 754 (Continued)

- The indicators are normalized as *rates* of incidents per hours worked:
  - Critical to be able to use them for comparisons
- Tiers 1 & 2 are potentially useful for evaluation of industry-wide performance.
- Tiers 3 and 4 provide guidance for the use of leading indicators, *but at the site level only, and without standardized or normalized definitions.*

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## Contributions of RP 754 (Continued)

- The RP includes incidents and hours worked by *contractor workers* in the indicator measures.
- The RP establishes some “obligations” (ANSI “shall,” *not* legal) for public reporting of lagging Tiers 1 & 2 indicators, but only far more limited and ambiguous reporting for leading Tiers 3 and 4.

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## SHORTCOMINGS OF RP 754

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## Shortcomings of RP 754

### Number of Tier 1 & 2 Events Too Small for Indicator Purposes

- The number of Tier 1 and 2 events will too small to provide effective performance indicators for many individual sites and even for some companies.

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## Power of Likely Numbers of Tier 1 and 2 Events Insufficient

- CSB contracted with a statistical expert to estimate the likely *power* of different comparisons for which indicators would be needed (e.g., analysis of trends, benchmarking)
- Power: The probability that an “effect” (e.g., a decline in rate of events) can be reliably (i.e., with statistical significance, or outside of chance) detected.

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## Likely Power of Tier 1 & 2 Uses

- When events are rare (e.g., 0-1 tier 1 events/yr; 0-3 tier 3 events/yr) the available data suggests that power is only good to detect a relatively large change:
  - At least a *doubling* of the annual event rate for many sites
- **AND** the Data suggest that Tier 1 & 2 events will be rare for many individual refineries
  - Contractor estimated that a refinery with workforce of 2000 will have 1-2 Tier 1 events/year (large site, but low power)
  - Yet roughly 80% of US refineries have fewer than 1000 employees, assuming 50% are contractors)
  - And the equivalent proportion of “chemical” sites is probably larger

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## Shortcomings of RP 754 (Continued)

### Important Events are not Counted

- Tier 1 & 2 definitions don't count events that are reflective of process failures:
  - Loss of containment events where controls “functioned as designed”;
  - “Routine emissions...allowed by law or regulation” (e.g., emissions from unforeseen or unavoidable circumstances, which may often be unregulated)
  - Thresholds apply only to releases of an hour or less
  - Leak fires “controlled” with steam lances

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## Shortcomings of RP 754 (Continued)

### Limited Usefulness for Lagging Indicators

- Tier 3 or 4 (leading) indicators are *not* defined in a standardized or normalized form, so their usefulness will be seriously limited:
  - They will be useful only for indicator use *at individual sites*.
  - They will not permit indicator “comparisons” among sites, corporations, or to national averages.

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## **Shortcomings of RP 754 (Continued)**

### **Public Reporting Requirements Are Insufficient**

- The small numbers of Tier 1 & 2 indicators will limit their usefulness to potentially understanding national trends only.
- The lack of standardized definitions for Tiers 3 & 4 means that, even if reported, they would not allow benchmarking, but only be useful for understanding performance trends for individual sites.
- The language of 754 speaks in terms of reporting “summaries” of indicators, but it is not clear what they will include.
- Together, these facts indicate that 754 falls short of the CSB expectations for effectively reporting performance to stakeholders.

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## **Shortcomings of RP 754 (Continued)**

### **Employee Protection Requirements are Weak**

- The protection of employees, supervisors, or middle-level managers who may report near misses or insist on corrective actions following detection by indicators is not sufficiently emphasized in the RP through “shall” statements that would strongly prohibit discrimination or reprisals.
  - Protections are far weaker than those in existing ANSI standard AIHA/ANZI Z10 for occupational health and safety management systems.

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## Shortcomings of RP 754 (Continued)

### Committee Was Unbalanced and Lacked Diversity

- Independent of the reason(s), the committee was not balanced or sufficiently diverse:
  - Management members were in large majority (vs. union and others)
  - Other stakeholders were largely missing: e.g., government, environmental groups, civic leaders, policymakers, risk communicators

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## Shortcomings of RP 754 (Continued)

### Limited Participation and Input

- Very limited if any participation of critical scientific disciplines or other relevant experts (e.g., statistics, epidemiology, risk communicators).
- Very limited participation or input from other industries with indicator experience (e.g., nuclear, transportation, health care)

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## CONCLUSIONS: Contributions

- RP makes valuable contributions to encourage use and some public reporting of lagging indicators, as well as the use of leading indicators with more limited usefulness and public reporting.

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## CONCLUSIONS: Shortcomings

- RP 754's ability to drive performance improvement and inform key stakeholders *will be hampered by*:
  - Lagging indicators with insufficient statistical power;
  - Lack of well defined, standardized and normalized leading indicators needed for comparisons (trend analysis, benchmarking);
  - Ineffective public reporting requirements; and,
  - Lack of broadly-based consensus in development process.

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## The CSB & Indicators in the Future

- Well designed and used process safety indicators are an essential component of effective management systems that can save lives, so the CSB will remain active in this arena in the future

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## The CSB & Indicators in the Future

- The CSB will monitor future developments in RP 754:
  - Collection, analysis and public reporting of indicator data;
  - The degree of adoption and use by the refinery, petrochemical and other chemical industry segments; and,
  - *Especially* the upcoming accelerated revision of the RP promised in the “Notes” to the first edition, which is scheduled to start after the first two years of data collection or in 2013 as the CSB understands.

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## The CSB & Indicators in the Future

- Advocate changes in 754 to address shortcomings during upcoming revision, through a renewed consensus process if it can achieve:
  - Improved balance;
  - More diverse participation;
  - Increased scientific input for improved rigor; and,
  - Use of data to test predictive ability of different indicators.
- Consider the possible role of regulators in the design, collection, analysis and public reporting of process safety indicators.

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**THANK YOU FOR YOUR  
ATTENTION**

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