



The INGAA Foundation, Inc.

Document	Revision	Date
CQ-G-3	0	March 8, 2019

1.0 SCOPE AND APPLICABILITY

- 1.1 This document provides practical guidance for ranking risks associated with construction quality and safety nonconformances. Potential risk types include safety, quality, integrity, compliance, reputation, and financial risks. This guidance applies to personnel identifying nonconformances and ranking associated risks in the functional areas of safety, quality, engineering, integrity management, compliance, construction, or related fields.
- 1.2 This document describes a simple method for ranking risks according to circumstances in the field and utilizing standardized risk matrices. Each nonconformance is reviewed to establish the level of consequence and likelihood. The appropriate risk ranking is then established for each case.
- 1.3 Historically, nonconformances have been identified and addressed with each instance treated in a similar manner. There is emerging work in quality management where risk assessment and risk-based methods are being applied in quality assurance and quality control, particularly in the medical fields¹. In the case of pipeline construction, operators and service providers will be able to evaluate nonconformance based on risk. The use of risk will enable leaders to prioritize mitigation and better communicate on the nature of the risk in raising awareness of nonconformances. A risk ranking may define levels of review within an organization and mitigation of selected high risks may require involvement of peer groups within the organization, internal audit or an independent evaluation.
- 1.4 Using this method, personnel can risk-rank quality and safety nonconformances uniformly and report findings in a standardized, sound manner reflecting a practical view of risk both internally and externally.
- 1.5 This method applies to any breach of safety or quality requirements including application of procedures. Examples of nonconformances include coating defects, backfill issues, welding defects, inappropriate PPE, breaches of safety regulations, or noncompliance with Owner Operator Qualification (OO) specifications and requirements. Such breaches are identified in the field by safety or quality inspectors, quality control (QC) or quality assurance (QA) personnel, or other auditors performing field level quality or safety audits.
- 1.6 Although this method is primarily intended to risk-rank nonconformances at the Quality Assurance (QA) level (upon completion of the work), it can also be used at the Quality Control (QC) level (during execution of the work.)

¹ [Durivage](https://www.pharmaceuticalonline.com/doc/using-risk-based-thinking-to-manage-nonconformances-and-deviations-0001), Mark, Using Risk-Based Thinking To Manage Nonconformances And Deviations, Pharmaceutical Online, Quality Systems Compliance, <https://www.pharmaceuticalonline.com/doc/using-risk-based-thinking-to-manage-nonconformances-and-deviations-0001>, November 20, 2017, and The Complete Guide to FDA-Regulated Supplier Qualification and Quality Management, The FDA Group, Westborough, MA.



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2.0 PURPOSE

2.1 In the absence of a practical, standardized method, low- or medium-risk nonconformances can be misidentified as high-risk or critical-risk. This can diminish the value of comparative rankings leading to inconsistent or inaccurate communication of risk. One cautionary note, the value of risk-based rankings can also be diminished by overreaction to “high” findings. Management focus should be directed towards a commitment to revealing nonconformances so that careful evaluation of individual and repeating nonconformances can be appropriately mitigated and preferably prevented.

2.1.1 The biggest danger of exaggerating or overrating risk is the possibility of “normalization of deviance²” and the resulting catastrophic failure that could result; such as in the cases of the NASA Challenger launch and Deepwater Horizon incident.

2.1.2 Incorrect or inconsistent risk-ranking and communication of nonconformances may also lead to any of the following:

- Erosion of trust among the public, employees as well as peer companies
- Large regulatory fines
- Assigning resources to risk mitigation according to incorrect priorities
- Confusion among external stakeholders as to actual nature of the risk associated with reported nonconformances
- Permit delays due to agencies or affected communities misunderstanding risk associated with projects

2.2 Using an industry-accepted method to consistently review and rationally rank risks supports the appropriate operational response at project, program, and corporate levels, as well as proportionate response from regulators and third-party interest groups. Further benefits include:

- Promoting more effective corrective actions
- Reserving risk-reduction financial resources for the actual highest system risks, rather than diverting those resources to risks whose high rankings are exaggerated
- Strengthening speak-up culture and “see something, say something” habits
- Providing more learning within organizations
- Mitigating risks associated with normalization of deviance

3.0 ROLES AND RESPONSIBILITIES

3.1 Management Responsibilities

3.1.1 Ensure these guidelines are understood and consider their adoption when assessing and communicating risk for safety and quality nonconformances.

3.1.2 Ensure that safety and quality personnel performing field audits are adequately trained in this risk-ranking method.

² Vaughn, Diane, The Challenger Launch Decision, Risky Technology, Culture and Deviance at NASA, University of Chicago Press, Chicago, IL, 1996



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- 3.1.3 Ensure that safety and quality personnel performing field audits are qualified, through adequate field experience in the work assessed, technical expertise, and industry certifications, to understand all associated circumstances in the field that cause nonconformances.

3.2 Safety & Quality Personnel Responsibilities

- 3.2.1 Keep current with all applicable on-boarding and training on these risk-ranking guidelines.
- 3.2.2 Keep current with industry certification and other related company or industry training.
- 3.2.3 Understand the guidelines fully before starting risk evaluation.
- 3.2.4 Conduct evaluations using the guidelines only on completed work.
- 3.2.5 Understand all relevant facts and field circumstances fully before ranking risk. Use photos, interviews, and field visits to gather and verify facts.
- 3.2.6 Perform the analysis process outlined in this guidance.
- 3.2.7 The hierarchy of Safety and Quality Personnel within the inspection and control scheme as it relates to this guidance is as follows:
- Craft Inspector (utility, coating, welding, HDD, etc.): Inspects 100% of the work as part of the construction organization.
 - Quality Control (QC): Provides random inspections on a small portion of the work. The quality control personnel provide inspection of the work as part of the construction organization. They provide an additional layer of protection over and above the craft inspectors directly inspecting the work.
 - Quality Assurance (QA): Provides random inspections over the QC layer, however, at a much smaller sample size. The quality assurance personnel provide inspection of the work as the last layer of protection over QC. This layer generally resides outside the construction organization.

4.0 PROCESS

- 4.1 Select the appropriate table. See Appendix A, Table 1, and Appendix B, Table 2.

- 4.1.1 Use Table 1 for any safety related nonconformances. Examples:

- Lapses in safety that could result in injuries to workers
- Any safety-related item, such as not complying with applicable company or operator safety procedures or standards. This includes not complying with state or Federal OSHA regulations.
- Not wearing required PPE (such as hard hat, safety glasses, safety vest, work shoes, face shields, etc.)
- Performing unsafe acts, such as entering an unshored excavation greater than 5 feet, not using air monitor in an excavation when presence of gas is suspected, entering confined space without following proper procedures, not having tab data for shoring or trench plates on site, walking under suspended load, or excavating with mechanical equipment within the tolerance around an operating facility.

- 4.1.2 Use Table 2 for quality or compliance related nonconformances. Examples:



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- Not complying with company procedures or standards on welding, coating, or backfill.
- Not working with approved or specified tools or equipment
- Working with out-of-calibration tools or equipment
- Performing an OQ covered task without possessing valid OQ
- Not adequately completing or documenting specified inspections
- Work that is not built per plans and specifications
- Any other nonconformance with applicable contracts, standards, laws, or procedures that could generate public safety risks, fines, service interruptions, damages, rework, reputation damage or financial losses.

- 4.2** Gather all facts and circumstances associated with the nonconformance. Review notes, photos and interviews.
- 4.3** From the descriptions at the top of each column, select, in your best judgement, the most likely consequence of the nonconformance; establishing the consequence level (1 to 5).
- 4.4** Using the likelihood descriptions on the left of the table, select the row and level corresponding to the most likely frequency of occurrence; establishing the likelihood level (A to E).
- 4.5** At the intersection of the selected row and column, select the appropriate risk ranking (low, medium, or high).
- 4.6** Once the analysis is complete, seek concurrence and verify the proposed initial rankings with peers and affected field leaders accountable for the work for which the nonconformances are being assessed. Gain concurrence by explaining the method and showing where on the risk matrix the nonconformances lie.
- 4.7** Before communicating a nonconformance and its risk ranking, gain alignment and concurrence on both the validity of the nonconformance and the risk ranking. As needed, do the following:
- Escalate to the next higher leadership level, asking for help in reviewing findings for both validity and original ranking.
 - Reconsider both validity and ranking of finding at the escalated level.
 - Ensure the standard or procedure is interpreted correctly and the facts and circumstances in the field support both the designation of nonconformance and its risk ranking.
- 4.8** If concurrence cannot be achieved, escalate as far as necessary to determine validity and risk ranking.

5.0 EXCLUSIONS

These guidelines are intended to apply to randomly occurring isolated nonconformances. Individual nonconformances should be periodically reviewed and evaluated to identify systemic nonconformances. If systemic nonconformances are identified, they should be reviewed using a different lens and a possibly be ranked with at higher risk level. A prudent practice when reviewing each incident is consider and assess the extent of the condition. If nonconformances are determined to be systemic or extended, then they must be analyzed accordingly and not as single isolated occurrences.



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6.0 DEFINITIONS

- Catastrophic:** Exposure to failures resulting in a fatality to a member of the public or a worker.
- Frequent:** Almost certain to occur. Expected to occur regularly under normal circumstances.
- Improbable:** Rarely occurs. Conceivable but only in extreme circumstances.
- Insignificant:** Exposure to failures resulting in minor injury to a member of the public or to a worker involving no medical treatment other than first aid. Results in no measurable physical limitations.
- Minor:** Exposure to failures resulting in minor injury to a member of the public or a worker requiring medical treatment. Results in no lost time or permanent disability.
- Moderate:** Exposure to failures resulting in moderate injury to a member of the public or to a worker requiring hospitalization of multiple days. Results in no permanent disability.
- Major:** Exposure to failures resulting in serious injury to a member of the public or a worker requiring hospitalization. Results in permanent impairment or disability.
- Nonconformance:** Lack of adherence in the field to an applicable safety or quality standard or regulation.
- Occasional:** Possible to occur. Could happen sometime.
- Probable:** Likely to occur. Expected to occur at some time.
- Remote:** Unlikely to occur. Not likely to occur in normal circumstances.

7.0 REFERENCES

The content of the standards and regulations listed below are hereby incorporated by reference. Current versions of the references automatically supersede any dated references listed below.

7.1 American National Standards Institute (ANSI)

- 7.1.1 ANSI Z49.1:2012, "Safety in Welding, Cutting, and Allied Processes"

7.2 American Petroleum Institute (API)

- 7.2.1 API Standard 1104, Welding of Pipelines and Related Facilities

7.3 Code of Federal Regulations (CFR)

- 7.3.1 Code of Federal Regulations (CFR), Title 49, Part 192—Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
- 7.3.2 49 CFR, Part 194—Response Plans for Onshore Oil Pipelines
- 7.3.3 29 CFR, Part 1926—Safety and Health Regulations for Construction, Subpart D - Occupational Health and Environmental Controls
- 7.3.4 29 CFR, Part 1926, Subpart E - Personal Protective and Life Saving Equipment

8.0 HISTORY OF REVISIONS

Number	Date	Description
0	3/8/19	Initial publication.



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APPENDIX A

Table 1. Safety Risk Matrix

Instructions

To determine the appropriate safety risk ranking: Under **Consequence Level**, identify the most likely resulting injury level (consequence level **1** to **5**), based on the specific facts and circumstances in the field, as defined in the descriptions at the top of the table. Next to **Likelihood**, identify the most likely frequency (likelihood **A** to **E**) with which this consequence would occur. Establish the risk level (**Low**, **Medium** or **High**) by finding the intersection of the selected column and line.

Consequence Level

Effect of exposure to failures on members of the public or workers		1 - Insignificant	2 - Minor	3 - Moderate	4 - Major	5 - Catastrophic
		Minor injury, requiring no medical treatment other than first aid. No measurable physical limitations.	Minor injury, requiring medical treatment and light duty; no lost time. E.g., OSHA recordable; DART.	Moderate injury with multiple-day hospitalization; no permanent disability. E.g., lost work day.	Serious injury requiring hospitalization and causing permanent impairment or disability	Fatality
Likelihood	A - Frequent Almost certain; expected to occur regularly in normal circumstances. (Odds less than 1 in 10)	Medium	High	High	High	High
	B - Probable Likely; expected to occur at some time. (Odds 1 in 10 to 1 in 100)	Medium	Medium	Medium	High	High
	C - Occasional Possible; could happen sometime. (Odds 1 in 100 to 1 in 1000)	Low	Low	Medium	Medium	High
	D - Remote Unlikely; not likely to occur in normal circumstances. (Odds 1 in 1,000 to 1 in 10,000)	Low	Low	Low	Medium	Medium
	E - Improbable Rare; conceivable, but only in extreme circumstances. (Odds greater than 1 in 10,000)	Low	Low	Low	Low	Medium



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APPENDIX B

Table 2. Quality and Compliance Risk Matrix

Instructions

To determine the appropriate Quality and Compliance risk ranking: Under **Consequence Level**, identify the most likely consequence resulting from each Non-Conformance. Select consequence level **1** to **5** based on the specific facts and circumstances in the field, as defined in the descriptions at the top of the table. Note that most likely consequence associated with each non-conformance could include, but is not limited to, financial losses associated with rework, regulatory fines, service interruptions, schedule delays or other damages including brand or reputation damage, or injuries. Next to Likelihood, identify the most likely frequency (likelihood A to E) with which this consequence would occur. Establish the risk level (**Low**, **Medium** or **High**) by finding the intersection of the selected column and line.

		Consequence Level				
		1 - Insignificant	2 - Minor	3 - Moderate	4 - Major	5 - Catastrophic
Value of the most likely financial losses associated with rework, regulatory fines, service interruptions, schedule delays and rework or other damages including brand or reputation damage, or most likely resulting injuries		Losses less than \$10K or Minor injury requiring no medical treatment other than first aid. No measurable physical limitations.	Losses Equal to or greater than \$10K and less than \$100K or Minor injury requiring medical treatment, with no lost time or permanent disability	Losses Equal to or greater than \$100K and less than \$1M or Moderate injury with multiple-day hospitalization; no permanent disability.	Losses Equal to or greater than \$1M and less than \$100M or Serious injury requiring hospitalization and permanent impairment or disability	Losses Equal to or greater than \$100M or Fatality
Likelihood	A - Frequent Almost certain; expected to occur regularly in normal circumstances. (Odds less than 1 in 10)	Medium	High	High	High	High
	B - Probable Likely; expected to occur at some time. (Odds 1 in 10 to 1 in 100)	Medium	Medium	Medium	High	High
	C - Occasional Possible; could happen sometime. (Odds 1 in 100 to 1 in 1000)	Low	Low	Medium	Medium	High
	D - Remote Unlikely; not likely to occur in normal circumstances. (Odds 1 in 1,000 to 1 in 10,000)	Low	Low	Low	Medium	Medium
	E - Improbable Rare; conceivable, but only in extreme circumstances. (Odds greater than 1 in 10,000)	Low	Low	Low	Low	Medium