

Infrastructure Quality Vocabulary Standard

IQI STANDARD VOC1

First Draft Edition — January 2026 (Updated February 2026)



INFRASTRUCTURE QUALITY INITIATIVE

Foreword

Energy and critical infrastructure shape daily life. They deliver heat, power, mobility, industrial capability, and essential services to communities and the economy. These systems are often described in parts—pipelines, compressors, storage, terminals, plants, grids—each with its own technical standards, codes, and regulatory requirements.

Yet infrastructure successes and failures rarely originate from a single part. They emerge from how many compliant elements interact over time, under changing conditions, across complex networks and interfaces. Integrity margins, operability, maintainability, resilience, consequence behavior, and public impact exist at the level of the assembled infrastructure asset and its lifecycle—not at the level of individual components alone.

Across organizations and jurisdictions, there is no shared language for describing infrastructure quality at this asset level. Similar quality concerns may be described differently depending on sector, owner practices, project boundaries, regulatory categories, or engineering discipline. When vocabulary is inconsistent, quality claims cannot be compared, evidence cannot be aligned, and system-level risks remain fragmented across documents and lifecycle stages.

IQI developed this Standard to address that gap.

This Vocabulary Standard translates the conceptual foundation established in *Why Infrastructure Needs Its Own Quality Standards (IQI Foundational Note 1)* into a structured language that can be used consistently across technical, organizational, and regulatory contexts. It does not merely define terms; it defines how infrastructure quality is to be understood, described, and evaluated at the system level.

This document provides a neutral, foundational vocabulary for describing infrastructure assets, infrastructure work, infrastructure outcomes, and infrastructure quality in consistent terms across energy and critical infrastructure systems. It is a shared starting point. Over time, additional terms and refinements may be developed for specific asset types, technologies, and contexts.

This is not an engineering code, and it does not establish technical design requirements. It does not replace laws, regulations, permits, contracts, or industry standards. It does not create compliance obligations. It is designed to support clearer communication and more consistent quality evaluation without imposing a single technology, project model, or regulatory approach.

IQI standards are voluntary. Their purpose is to make infrastructure quality explicit, discussable, and comparable across the full lifecycle—from concept and design through construction, commissioning, operation, major change, and decommissioning.

A shared vocabulary is the starting point. Without it, infrastructure quality cannot be described consistently, evaluated transparently, or improved coherently across stakeholders.

IQI is a public initiative. This Standard is offered as a foundation for clearer communication, better alignment of evidence, and development of infrastructure quality standards that can be understood and used by owners, operators, engineers, regulators, investors, and communities.

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1 Introduction

1.1 Role of This Standard in the IQI Document Set

This Standard occupies the foundational vocabulary layer of the Infrastructure Quality Initiative (IQI) document set.

Its role is to establish shared terms and conceptual reference points for describing infrastructure assets, infrastructure work, infrastructure outcomes, and infrastructure quality in a consistent, neutral, and asset-level manner. All subsequent IQI standards and guidance documents rely on the vocabulary and conceptual relationships defined here.

Within the IQI structure, this Standard precedes and informs:

- the **Infrastructure Quality Standard – Core**, which defines Quality Factors, Quality Indicators, and Quality Outcome Criteria at the infrastructure asset level; and
- **IQI Foundational Guidance and Context Guides**, which apply those concepts to specific infrastructure contexts, lifecycle stages, and operating conditions.

By separating shared vocabulary from quality architecture, requirements, and context-specific application, IQI supports clarity, consistency, and comparability across different infrastructure types, technologies, organizational models, and regulatory environments.

This Standard is intended to remain stable over time. As the IQI document set evolves, new standards and guides may be added or refined, but they shall use the vocabulary and conceptual structure established here without modification.

In this sense, the Vocabulary Standard functions as the conceptual operating system of the IQI framework.

1.2 Voluntary, Non-Regulatory Foundation (What This Standard Is and Is Not)

This Standard is a voluntary, non-regulatory reference document.

It is not a law, regulation, permit requirement, engineering code, procurement specification, certification scheme, or conformity-assessment program. It does not establish mandatory technical requirements, performance thresholds, or compliance obligations, and it does not replace or supersede applicable laws, regulations, contracts, or industry standards.

The purpose of this Standard is descriptive rather than prescriptive. It provides a shared language for discussing infrastructure quality at the asset level, enabling stakeholders to describe quality concerns, expectations, scope, and evidence using consistent terms, even when operating under different regulatory, contractual, or technical frameworks.

Use of this Standard does not imply approval, endorsement, certification, or fitness for purpose by IQI. References to IQI vocabulary are intended solely to clarify meaning and scope.

1.3 Asset-Level Anchoring: The Infrastructure Asset as the Primary Reference

This Standard is anchored at the level of the infrastructure asset.

For the purposes of IQI, an infrastructure asset is an integrated, lifecycle-managed physical system—and its critical interfaces—built to produce, process, transport, store, or deliver energy or energy services.

Many existing standards, codes, and regulations address individual components, products, structures, procedures, or organizations. While essential, such instruments address parts of a system. Infrastructure quality attributes—such as integrity margins, operability, maintainability, resilience, consequence behavior, and public impact—emerge only when those parts operate together as an asset over time.

By anchoring vocabulary at the asset level, this Standard provides a stable reference that is independent of:

- specific technologies or design solutions;
- project phases or contractual arrangements;
- organizational or ownership structures; and
- regulatory classifications focused on individual hazards or components.

All vocabulary defined in this Standard is intended to be interpreted with respect to the infrastructure asset and its lifecycle.

1.4 System-of-Systems and Lifecycle Reality

Infrastructure assets do not operate in isolation. Each asset functions as part of a broader system of interconnected assets, organizations, operating media, and external conditions. Energy and critical infrastructure therefore exhibit system-of-systems behavior, in which performance, risk, and consequence emerge from interactions rather than from any single component or facility.

Infrastructure behavior evolves across the lifecycle. Early design decisions establish long-term constraints. Construction practices embed strengths or latent vulnerabilities. Commissioning defines initial operating envelopes. Over time, assets are affected by aging, degradation, operational choices, maintenance practices, environmental exposure, and modification.

Uncertainty is inherent in this reality. Geological, environmental, operational, and societal conditions cannot be fully known in advance and may change over decades of operation. Infrastructure quality therefore depends not only on conformance at a point in time, but on how well the asset and its interfaces accommodate interaction, uncertainty, and change across the lifecycle.

This Standard reflects that reality by defining vocabulary at the scale where these effects occur.

1.5 Relationship to the Infrastructure Quality Standard – Core

This Standard provides the vocabulary foundation for the Infrastructure Quality Standard – Core.

The Core Standard defines Quality Factors, Quality Indicators, Quality Outcome Criteria, and the role of evidence in evaluating infrastructure quality at the asset level. Those concepts rely on the terms and relationships established in this vocabulary standard and shall be interpreted in accordance with them.

This vocabulary standard does not introduce quality requirements, performance thresholds, or evaluation criteria. It establishes the shared language that enables the Core Standard to define such requirements clearly and consistently across different infrastructure assets and lifecycle stages.

1.6 Relationship to Foundational Guidance and Context Guides

This Standard also provides the vocabulary foundation for IQI Foundational Guidance and Context Guides.

Foundational Guidance elaborates how Core concepts are interpreted across lifecycles, including boundaries, interfaces, uncertainty, change, and evidence. Context Guides apply the Core Standard and Foundational Guidance to defined infrastructure contexts where physical regimes, dominant risk mechanisms, system topology, critical interfaces, or regulatory anchors materially affect quality outcomes.

By using a shared and stable vocabulary, these documents can focus on application and interpretation without redefining core terms.

1.7 Intended Use

This Standard is intended to be used as a shared reference for describing infrastructure quality in clear, consistent terms.

It supports communication and understanding among infrastructure owners and operators, engineering and project teams, regulators and policymakers, investors and insurers, independent reviewers, and affected communities.

This Standard is not intended to be used as a checklist, scoring tool, or substitute for technical standards, codes, or regulatory requirements. Its value lies in clarifying meaning, scope, and relationships—not in establishing requirements.

2 Reference Sources

2.1 IQI Foundational Notes and Framework Documents

This Standard is based on, and shall be interpreted consistently with, the foundational documents of the Infrastructure Quality Initiative (IQI), including:

- **Why Infrastructure Needs Its Own Quality Standards** (Foundational Note 1), which establishes the asset-level anchoring of infrastructure quality; and
- **Infrastructure Quality in the Energy Sector**, which explains system-of-systems behavior and lifecycle dependence.

These documents provide explanatory context only. They do not introduce requirements or compliance obligations and are not incorporated by reference.

2.2 Reference Codes, Regulations, and Industry Standards (Informative Only)

Energy and critical infrastructure are governed by a wide range of laws, regulations, engineering codes, and industry standards. Such instruments remain authoritative within their respective scopes.

References to regulatory or industry standards within IQI documents are informative only. They are not incorporated by reference and do not define, modify, or limit the vocabulary established here.

2.3 General Vocabulary and Evaluation Terms

This Standard uses plain-language meanings of general terms unless explicitly defined in Section 4.

Terms related to evaluation, assessment, and evidence are used descriptively. Their use does not imply certification, approval, verification, or conformity determination unless explicitly stated in a separate IQI document.

Note on metrics and indicators:

1. In this Standard, the term Quality Indicator has a specific architectural meaning defined in Clause 4 and refers to a defined aspect of infrastructure quality used to evaluate the realization of infrastructure functions.
 2. Common terms such as metrics, key performance indicators (KPIs), dashboard indicators, or operational indicators are used in their plain-language sense and do not constitute Quality Indicators unless explicitly identified as such within an Infrastructure Quality Standard.
-

3 Normative Conceptual Framework and Vocabulary Scope

3.1 Normative Reference to the IQI Foundational Architecture

This Standard shall be interpreted in accordance with the IQI foundational architecture for defining infrastructure quality at the asset level.

All core concepts used in this Standard—including asset, boundary, interface, work, outcome, quality, and evidence—shall be understood consistently with that architecture.

3.2 Core Conceptual Dependency

For the purposes of the IQI framework, the following conceptual dependency structure is normative and invariant:

- an infrastructure asset is an integrated physical system and its critical interfaces;
- infrastructure work consists of lifecycle activities performed on or within the asset;
- infrastructure outcomes are the results produced by such work;
- infrastructure functions represent the intended system-level purposes realized through infrastructure work and outcomes; and
- infrastructure quality is the degree to which the asset realizes its intended functions within defined technical, operational, and risk boundaries across the lifecycle, as evaluated against defined Quality Outcome Criteria.

All subsequent IQI standards and guidance documents shall apply this dependency structure consistently.

3.3 Infrastructure Asset as the Primary Reference Point

In this Standard, the infrastructure asset is the primary reference point for describing and evaluating infrastructure quality.

All vocabulary defined in this Standard shall be interpreted with respect to the infrastructure asset and its lifecycle.

3.4 Infrastructure Work, Infrastructure Outcome, and Infrastructure Function

This Standard distinguishes between infrastructure work, infrastructure outcomes, and infrastructure functions to support clear description of how infrastructure operates and how quality is evaluated.

Infrastructure quality is evaluated with respect to the asset's ability to perform its intended functions across the lifecycle, rather than through isolated activities or components.

3.5 Scale Transition and System Boundaries

Infrastructure quality considerations vary with scale. System boundaries determine which elements, interfaces, operating conditions, and operating media are included in quality evaluation.

This Standard establishes vocabulary to support explicit boundary definition without prescribing how boundaries must be drawn.

3.6 Scope of Vocabulary Defined in This Standard

This Standard establishes a foundational vocabulary for describing infrastructure assets, work, functions, and quality within the IQI document set.

The vocabulary is foundational rather than exhaustive and is intended to remain stable over time.

3.7 Relationship to Infrastructure Quality Evaluation

This Standard does not define infrastructure quality requirements or evaluation criteria.

Infrastructure quality evaluation is defined in the Infrastructure Quality Standard — Core and applied through Foundational Guidance and Context Guides using the vocabulary and dependency structure established here.

4 Terms and Definitions

For the purposes of this Standard, the following terms and definitions apply.

4.1 Infrastructure Asset

An **infrastructure asset** is an integrated, lifecycle-managed physical system—and its critical interfaces—built to produce, process, transport, store, or deliver energy or energy services.

An infrastructure asset is characterized by system-level behavior that emerges from the interaction of multiple elements and subsystems over time.

Notes:

1. An infrastructure asset is distinct from individual components, products, or materials.
 2. An infrastructure asset may span multiple facilities, locations, or technical disciplines and may include onshore, offshore, and subsurface elements.
 3. An infrastructure asset persists across lifecycle stages, including design, construction, commissioning, operation, modification, and decommissioning.
 4. Ownership, organizational structure, or regulatory classification does not define the asset.
 5. Illustrative examples (informative) include: a natural gas transmission system; an offshore production and export system; a crude oil trunk pipeline system; an LNG liquefaction and storage facility; an underground gas storage facility; or an electric transmission network.
 6. Additional illustrative asset boundary examples are provided in Annex B (informative).
-

4.2 Infrastructure Element / Component

An **infrastructure element or component** is a discrete physical item, assembly, or subsystem that forms part of an infrastructure asset and contributes to its overall function.

Elements and components are necessary for asset operation but do not, on their own, constitute an infrastructure asset.

Notes:

1. Examples include pipes, valves, compressors, pumps, turbines, cables, transformers, control systems, foundations, structural supports, and instrumentation.
 2. Elements and components are typically governed by product standards, engineering codes, specifications, and inspection or testing requirements.
 3. Conformance of individual elements or components is necessary but not sufficient to demonstrate infrastructure asset quality.
 4. For IQI purposes, quality evaluation is performed at the infrastructure asset level, with elements and components treated as contributors to asset-level quality.
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4.3 Interface

An **interface** is a physical, functional, or operational point of interaction where an infrastructure asset connects with another asset, subsystem, organization, operating medium, or external environment.

Interfaces are locations where operating conditions, responsibilities, or risk profiles may change.

Notes:

1. Interfaces may be physical (e.g., tie-ins, terminals), functional (e.g., control or pressure transitions), or operational (e.g., custody transfer points).
 2. Interfaces are often locations of elevated risk due to changes in operating conditions, materials, or responsibility.
 3. Compatibility at interfaces is a system-level quality consideration.
 4. Interfaces may change over the lifecycle as assets are modified, expanded, or interconnected.
 5. Illustrative examples are provided in Annex B (informative).
-

4.4 Boundary

A **boundary** is the defined physical, functional, and operational extent of an infrastructure asset for the purposes of quality description and evaluation.

Boundaries determine which elements, interfaces, operating conditions, and operating media are included in an evaluation.

Notes:

1. Boundaries may be defined based on physical extent, functional role, system topology, lifecycle stage, or evaluation purpose.
2. Boundary definition is descriptive and does not imply ownership, legal responsibility, or regulatory jurisdiction.
3. Boundaries may evolve over time as assets are modified, expanded, or repurposed.
4. Illustrative boundary examples are provided in Annex B (informative).

4.5 Lifecycle Stage

A **lifecycle stage** is a defined phase in the existence of an infrastructure asset reflecting the dominant activities, decisions, and quality considerations applicable at that time.

Notes:

1. Typical lifecycle stages include concept and planning, design, construction, commissioning, operation, modification, and decommissioning.
2. Lifecycle stages may overlap or repeat for long-lived or incrementally developed assets.
3. Lifecycle stage definitions are descriptive and do not prescribe project management or regulatory processes.

4.5A Lifecycle Gate (Quality Gate)

A **Lifecycle Gate** (or **Quality Gate**) is a defined point at which the realization of one or more infrastructure functions is evaluated against specified Quality Outcome Criteria.

Notes:

1. Lifecycle Gates are conceptual reference points, not prescribed approval or regulatory hold points.
 2. Lifecycle Gates may occur at transitions such as design completion, commissioning, start-up, return to service, modification, or decommissioning.
 3. Multiple Lifecycle Gates may exist within a single lifecycle stage.
 4. Lifecycle Gates support explicit linkage between infrastructure work, outcomes, realized functions, and quality.
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4.6 Infrastructure Work

Infrastructure work is the performance of activities carried out on, within, or in relation to an infrastructure asset across its lifecycle.

Notes:

1. Infrastructure work includes planning, design, construction, commissioning, operation, inspection, maintenance, modification, and decommissioning.
 2. Infrastructure work describes activity, not effectiveness or quality.
 3. Infrastructure work may produce intended or unintended outcomes and may affect asset behavior immediately or over time.
-

4.7 Infrastructure Outcome

An **infrastructure outcome** is a result produced by infrastructure work.

Outcomes describe what has changed, been achieved, or been made available as a consequence of work performed on or within an infrastructure asset.

Notes:

1. Outcomes may be intended or unintended and may be beneficial, neutral, or adverse.
 2. Outcomes may occur immediately or emerge over time.
 3. The existence of an outcome does not, by itself, indicate that quality requirements have been met.
-

4.8 Infrastructure Function / Service

An **infrastructure function** (or **infrastructure service**) is the designated system-level purpose of an infrastructure asset—what the asset is intended to do.

Infrastructure functions are realized progressively across the lifecycle through infrastructure work and the outcomes it produces.

Notes:

1. Infrastructure functions are defined at the asset level and are distinct from individual tasks or component behaviors.
2. Realization of a function may be partial, conditional, or stage-specific.
3. Functional and technical requirements are defined in the Infrastructure Quality Standard — Core, not in this vocabulary standard.

4.9 Infrastructure Quality

Infrastructure quality is an asset-level characteristic evaluated across the lifecycle.

Notes:

- Quality Outcome Criteria are defined in applicable IQI quality standards.
- Infrastructure quality may vary across lifecycle stages.
- Infrastructure quality is distinct from inspection, audit, or certification activities.
- Compliance with individual standards or procedures does not, by itself, demonstrate infrastructure quality.

4.9A Infrastructure Safety

Infrastructure safety is the condition in which an infrastructure asset's realized functions are performed with freedom from unacceptable risk to people, the environment, and property.

Infrastructure safety is a constituent dimension of infrastructure quality.

Notes:

1. Safety is evaluated in terms of risk, including likelihood and consequence.
2. Safety is necessary but not sufficient to demonstrate overall infrastructure quality.
3. This Standard adopts the principle that safety is part of quality.

4.10 Quality Factor

A **Quality Factor** is a broad conceptual domain used to organize related aspects of infrastructure quality.

Quality Factors group related Quality Indicators without prescribing requirements or solutions.

Notes:

1. Quality Factors are conceptual and are not directly measured or scored.
 2. Quality Factors are established in the Infrastructure Quality Standard — Core.
-

4.11 Quality Indicator

A **Quality Indicator** is a specific aspect of a Quality Factor that identifies what is to be examined when evaluating infrastructure quality.

Notes:

1. Quality Indicators specify what is examined, not how well it must perform.
 2. Quality Indicators are evaluated using defined Quality Outcome Criteria.
 3. Quality Indicators are established in the Infrastructure Quality Standard — Core.
-

4.12 Quality Outcome Criterion

A **Quality Outcome Criterion** is a defined condition specifying what must be true for a Quality Indicator to be considered met.

Notes:

1. Quality Outcome Criteria establish acceptability conditions.
 2. Criteria may apply to infrastructure work, outcomes, or both.
 3. Quality Outcome Criteria are defined in Context Guides.
-

4.13 Evidence

Evidence is information used to demonstrate whether a Quality Outcome Criterion has been met. In the IQI framework, evidence is the primary link between conceptual quality definitions and observable infrastructure asset behavior across the lifecycle.

Notes:

1. Evidence may include documents, records, analyses, tests, monitoring data, or observations.
 2. Evidence is evaluated relative to defined Quality Outcome Criteria.
 3. This Standard does not prescribe evidence types or evaluation procedures.
 4. Responsibility for establishing, maintaining, and governing evidence supporting infrastructure quality rests with the entity accountable for the infrastructure asset. Evidence may be produced by multiple parties across the lifecycle but remains subject to asset-level governance.
-

4.13A Technology

Technology refers to the tools, systems, methods, and technical means used to design, construct, operate, monitor, control, modify, or decommission infrastructure assets.

In the context of infrastructure quality, technology influences quality only through how it supports or constrains the realization of infrastructure functions across the lifecycle. Technology itself does not constitute infrastructure quality and does not determine quality outcomes independently of governance, integration, and use.

Notes:

1. Technology may include physical equipment, digital systems, software, models, sensors, automation, analytics, or combinations thereof.
 2. The presence of advanced or automated technology does not, by itself, demonstrate infrastructure quality.
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4.13B Technology Governance

Technology governance is the set of decisions, rules, responsibilities, and controls that determine how technology is selected, integrated, relied upon, interpreted, and acted upon within an infrastructure system.

Technology governance establishes accountability for technology-enabled decisions, including how technological outputs are validated, how limitations and uncertainties are recognized, and how responsibility is retained when technology provides incomplete, misleading, or incorrect information.

Notes:

1. Technology governance does not imply a specific management system, organizational structure, or approval process.
 2. Responsibility for infrastructure quality remains with accountable parties regardless of the degree of technological automation.
-

4.13C Data

Data consists of recorded observations, measurements, or signals associated with the condition, behavior, or environment of an infrastructure asset or system.

Data, by itself, does not constitute infrastructure quality, evidence of quality, or assurance of quality outcomes. Data acquires meaning for infrastructure quality only when interpreted in relation to defined infrastructure functions, Quality Indicators, Quality Outcome Criteria, and lifecycle context.

Notes:

1. Data may be raw, processed, aggregated, or visualized.
 2. Increased data volume or frequency does not necessarily improve understanding of infrastructure quality.
-

4.14 Uncertainty (Geological / Environmental / Operational)

Uncertainty is the condition in which relevant characteristics or future states of an infrastructure asset or its operating context are not fully known.

Notes:

1. Uncertainty may arise from geological, environmental, or operational sources.
 2. Uncertainty is inherent in long-lived infrastructure assets.
 3. This Standard does not prescribe methods for uncertainty analysis or management.
-

4.15 Degradation and Aging

Degradation and aging are processes by which the condition or performance of an infrastructure asset changes over time.

Notes:

1. Degradation mechanisms may include corrosion, fatigue, wear, or environmental effects.
 2. Degradation and aging do not, by themselves, indicate poor quality.
 3. This Standard does not prescribe mitigation or inspection methods.
-

4.16 Modification and Reconstruction

Modification or reconstruction is any change to an infrastructure asset that may affect how its functions are realized.

Notes:

1. Modifications may be incremental or substantial.
 2. Changes may be planned or unplanned.
 3. Modifications may affect quality evaluation across the lifecycle.
-

4.17 Stakeholders and Community (Public-Facing Quality Domain)

Stakeholders and Community are persons or groups affected by an infrastructure asset or its realized functions.

Notes:

1. This domain addresses public-facing quality impacts.
 2. Stakeholder considerations apply across all lifecycle stages.
 3. Evaluation is performed using applicable Quality Indicators and Outcome Criteria.
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4.18 Context Guide (Definition and Role)

A **Context Guide** specifies how Core Quality Factors and Indicators are applied within a defined infrastructure context.

Notes:

1. Context Guides do not introduce new Quality Factors or Indicators.
 2. Context Guides define applicable Quality Outcome Criteria.
 3. Context Guides are normative for the contexts they cover.
-

4.19 Quality Claim Statement

A **Quality Claim Statement** is a statement describing the scope and basis of an infrastructure quality evaluation.

Notes:

1. A Quality Claim Statement specifies asset scope, lifecycle stage, applicable standards, and indicators.
 2. Claims shall not imply quality beyond the stated scope.
 3. A Quality Claim Statement does not constitute certification.
-

4.20 Infrastructure Operating Medium

An **infrastructure operating medium** is a material, substance, energy flow, or physical state present within an infrastructure asset that directly affects realization of its functions.

Notes:

1. Examples include crude oil, natural gas, LNG, electrical current, or process fluids.
 2. Compatibility between operating medium and asset design is a system-level quality consideration.
 3. This Standard does not define commercial or product acceptability criteria for operating media.
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5 Scope, Applicability, and Exclusions

5.1 Scope

This Vocabulary Standard establishes a **common, infrastructure-level vocabulary** for describing and communicating infrastructure assets, infrastructure work, infrastructure outcomes, infrastructure functions, and infrastructure quality within the Infrastructure Quality Initiative (IQI) framework.

The scope of this Standard is limited to **terminology and definitions**. It defines the meaning of key terms used across IQI standards and guidance documents in order to support consistent interpretation, communication, and application of infrastructure quality concepts.

This Standard applies to **capital-intensive infrastructure systems** whose quality, performance, safety, environmental impact, and public consequences arise from the **integrated behavior of the assembled system across its lifecycle**, rather than from individual products, components, or services considered in isolation.

This Vocabulary Standard supports and underpins:

- the **Infrastructure Quality Standard – Core**;
- **IQI Foundational Guidance**; and
- **IQI Context Guides**.

This Standard does **not** establish technical requirements, performance thresholds, design solutions, management systems, or conformity-assessment methods. Its role is to ensure that such requirements, where defined elsewhere, are grounded in a **shared, precise, and unambiguous language** appropriate to infrastructure-level quality.

5.2 Applicability (Energy and Critical Infrastructure; Technology-Neutral)

This Vocabulary Standard applies to **energy and critical infrastructure systems** in which system-level behavior, risk, and consequence depend on the integrated performance of the infrastructure asset over time.

The Standard is **technology-neutral**. It does not assume or privilege any specific energy carrier, technology, design approach, construction method, operational philosophy, ownership model, or regulatory regime. The vocabulary is intended to remain stable and applicable as technologies evolve.

Applicability is determined by the **nature of the infrastructure system**, not by jurisdiction, organizational structure, project phase, or regulatory classification. The vocabulary applies equally to:

- **greenfield** (new-build) infrastructure;
- **brownfield** (existing, modified, or expanded) infrastructure; and
- infrastructure undergoing **life-extension, repurposing, or decommissioning**.

Within the energy domain, this Standard is applicable to infrastructure assets and delivery chains that may include extraction, processing, transmission, storage, liquefaction or regasification, compression or pumping, distribution, and interfaces to downstream systems or end users.

By analogy, the vocabulary may also be applied to other forms of **critical infrastructure** that exhibit similar system-of-systems behavior, lifecycle dependence, public consequences, and multi-stakeholder interfaces.

Use of this vocabulary is **independent of regulatory jurisdiction**. Where laws, regulations, codes, or contracts apply, this Standard provides a common interpretive language without altering or superseding those instruments.

5.3 Relationship to Laws, Regulations, Codes, and Contracts

This Vocabulary Standard is intended to be used **in conjunction with**, and not as a replacement for, applicable laws, regulations, codes, standards, permits, and contractual requirements governing infrastructure assets.

Nothing in this Standard modifies, supersedes, or substitutes for any legal or regulatory obligation. Where a conflict exists between terminology defined in this Standard and mandatory legal or contractual provisions, the latter shall prevail.

The purpose of this Vocabulary Standard in regulated or contractual contexts is to provide a **consistent infrastructure-level language** that supports clear understanding, documentation, and communication across stakeholders, disciplines, and lifecycle stages. Use of this vocabulary does not, by itself, establish compliance, non-compliance, liability, or responsibility.

Where terms defined in this Standard overlap with terms used in laws, regulations, codes, or contracts, the definitions in this Standard are intended to:

- clarify infrastructure-level meaning where external definitions are absent or context-dependent;
- support consistent interpretation across instruments; and
- enable transparent mapping between regulatory or contractual requirements and infrastructure-level quality concepts.

References to laws, regulations, or codes elsewhere in the IQI document set are **informative only** and do not create obligations or endorsements.

5.4 Exclusions

This Vocabulary Standard **does not establish**, and shall not be used as:

- a certification scheme or basis for certification;

- an audit, inspection, or enforcement program;
- a procurement specification, contractual mandate, or pre-qualification requirement;
- a performance rating, scoring, or benchmarking system; or
- a substitute for engineering judgment, regulatory approval, or professional responsibility.

Use of terms defined in this Standard does not, by itself, demonstrate infrastructure quality, safety, compliance, or conformity.

This Standard does not define compliance criteria, pass/fail thresholds, performance targets, or conformity-assessment methods. It does not assign or transfer legal, regulatory, contractual, or financial responsibility among parties, nor does it create rights, obligations, or liabilities for any stakeholder.

Where an organization makes a public or internal statement related to infrastructure quality using IQI terminology, such statements **shall follow the requirements of the Quality Claim Statement** defined in Clause 4.19 and shall not imply certification, endorsement, or regulatory approval unless explicitly stated as part of a recognized and independent scheme.

This Vocabulary Standard does not prescribe technical solutions, design methods, operational practices, inspection techniques, maintenance programs, or risk-assessment methodologies. Such matters are addressed by applicable technical standards, regulations, project specifications, or organizational procedures.

Nothing in this Standard shall be interpreted as limiting innovation, alternative technical approaches, or equivalent solutions, provided they are described and evaluated using clear and consistent infrastructure-level terminology.

Annex A (informative) – Illustrative Regulatory / Code Sources by Infrastructure Segment

A.1 Purpose

This Annex provides **illustrative examples** of regulatory, statutory, and code-based sources that are commonly applicable to energy and critical infrastructure systems.

The purpose of this Annex is **informative only**. It is intended to:

- support orientation for users unfamiliar with regulatory environments commonly associated with infrastructure assets;

- illustrate how the IQI vocabulary may be used **alongside existing legal and regulatory frameworks**; and
- demonstrate typical points of interaction between infrastructure-level quality concepts and external regulatory instruments.

This Annex **does not incorporate** any law, regulation, code, or standard by reference. Inclusion of any example does not imply endorsement, applicability, completeness, or sufficiency for any specific infrastructure asset, project, lifecycle stage, or jurisdiction.

Users remain responsible for identifying and complying with all applicable legal, regulatory, and contractual obligations relevant to their infrastructure systems.

This Annex complements:

- Clause **5.3** (Relationship to Laws, Regulations, Codes, and Contracts); and
- the use of **IQI Context Guides**, which may reference regulatory regimes for orientation and mapping purposes only.

A.2 Illustrative U.S. Examples (Informative Context Only)

This clause provides **illustrative examples** of United States regulatory frameworks commonly applicable to energy infrastructure systems.

These examples are included **solely for contextual orientation** and to demonstrate how infrastructure-level quality vocabulary may be applied in environments governed by established regulatory regimes.

The examples in this clause are:

- **non-exhaustive**,
- **non-normative**, and
- **jurisdiction-specific**.

Their inclusion does not imply applicability outside the United States, nor does it limit the applicability of the IQI vocabulary to U.S. infrastructure.

A.2.1 Liquid Hydrocarbon Infrastructure (Illustrative)

For infrastructure systems associated with the transportation of liquid hydrocarbons (e.g., crude oil, refined petroleum products, natural gas liquids), an illustrative U.S. regulatory framework includes:

- **49 CFR Part 195 — Transportation of Hazardous Liquids by Pipeline.**

This regulatory framework addresses topics such as design, construction, operation, maintenance, integrity management, and emergency response for hazardous-liquid pipeline systems.

Within the IQI framework, such regulations may be referenced **for contextual mapping only**, for example to:

- identify dominant risk mechanisms;
- clarify typical asset boundaries and interfaces; or
- illustrate lifecycle stages addressed by regulatory oversight.

References to this or similar regulations within IQI documents do **not** alter their legal meaning, enforcement mechanisms, or jurisdictional scope.

A.2.2 Gaseous Hydrocarbon Infrastructure (Illustrative)

For infrastructure systems associated with the transportation, storage, and delivery of gaseous hydrocarbons (e.g., natural gas), illustrative U.S. regulatory frameworks include:

- **49 CFR Part 192 — Transportation of Natural and Other Gas by Pipeline;**
and
- **49 CFR Part 193 — Liquefied Natural Gas Facilities: Federal Safety Standards.**

These frameworks address pipeline systems, LNG facilities, and associated infrastructure across multiple lifecycle stages, including design, construction, operation, maintenance, and modification.

Within IQI documents, such regulations may be referenced **only to support orientation**, such as:

- understanding physical regimes and dominant hazards;
- identifying typical interfaces and boundary transitions; or
- illustrating how regulatory requirements align with infrastructure-level quality concepts.

Such references do **not** create compliance obligations within the IQI framework and do not imply certification, conformity, or regulatory approval.

A.2.3 Use of Regulatory Examples Within IQI Documents

References to regulatory frameworks in this Annex or elsewhere in the IQI document set are intended to:

- support **illustrative mapping** between regulatory requirements and infrastructure-level quality vocabulary;
- assist users in recognizing common regulatory touchpoints across infrastructure segments; and
- demonstrate how a shared vocabulary can improve clarity when engaging with diverse regulatory environments.

Such references do **not**:

- incorporate regulatory requirements by reference;
- establish compliance criteria or evaluation thresholds;
- imply endorsement, approval, or certification; or
- limit the applicability of the IQI vocabulary to any specific jurisdiction.

Equivalent regulatory, statutory, or code-based frameworks may exist in other jurisdictions and may be used **analogously** within IQI applications.

A.3 Interpretation and Use (Informative Only)

This Annex is **informative** and does not form a normative part of this Vocabulary Standard.

It shall not be interpreted as:

- defining regulatory scope, jurisdiction, or applicability;
- providing a checklist or summary of regulatory requirements;
- establishing compliance criteria, performance thresholds, or evaluation methods;
- incorporating any law, regulation, code, or standard by reference; or
- implying endorsement, approval, certification, or conformity assessment.

The role of this Annex is to demonstrate how the IQI vocabulary may be used **in parallel with** existing legal and regulatory frameworks to support clearer communication, documentation, and understanding of infrastructure-level quality concepts.

Where this Annex is used in conjunction with IQI Context Guides or other IQI documents, any regulatory references shall remain **illustrative and contextual**, supporting understanding of dominant risk mechanisms, lifecycle stages, asset

boundaries, and interfaces without altering the legal status or interpretation of external instruments.

Annex B (informative) – Asset / Subsystem Reference Framework for Context Guides

B.1 Purpose, Scope, and Role of This Annex

This Annex provides an **informative reference framework** for identifying and describing **infrastructure assets, subsystems, boundaries, and interfaces** for the purpose of selecting and applying IQI Context Guides.

The purpose of this Annex is to:

- support **consistent scoping** of infrastructure assets for infrastructure-level quality evaluation;
- illustrate **typical asset boundary concepts** across selected infrastructure segments; and
- assist users in understanding how **Context Guides are selected and applied** without altering the Core Quality Factors and Indicators.

This Annex does **not** define mandatory asset boundaries, system decompositions, ownership scopes, or regulatory classifications. It does not prescribe how infrastructure must be engineered, regulated, financed, or managed. Instead, it provides **illustrative reference concepts** intended to support clarity, transparency, and consistency when applying IQI documents.

The scope of this Annex is limited to **asset- and subsystem-level framing** for infrastructure quality discussion. It does not replace engineering definitions, regulatory asset classifications, accounting structures, or organizational responsibility boundaries.

Within the IQI document set, this Annex:

- bridges the **Vocabulary Standard** and the practical use of **Context Guides**;
- supports **invariant application of the Core Standard** across different infrastructure configurations; and
- reduces ambiguity when transitioning between **system-level evaluation** and **context-specific guidance**.

This Annex is **informative only**. It does not establish requirements, performance criteria, compliance obligations, or certification rules.

B.2 Asset Boundary Examples (Illustrative; Liquid and Natural Gas Hydrocarbons)

This clause provides **illustrative examples** of how infrastructure assets and subsystems may be delineated for the purpose of infrastructure-level quality evaluation and Context Guide selection, using liquid hydrocarbon and natural gas systems as reference cases.

These examples are:

- **non-exhaustive,**
- **non-prescriptive,** and
- **not jurisdiction-specific.**

They are intended to illustrate how asset boundaries may be defined where system-level behavior, risk, and consequence arise from the **integrated performance of multiple elements and interfaces**, rather than from individual components alone.

B.2.1 Production / Field Facilities and Preliminary Preparation

(Illustrative; Liquid Hydrocarbons and Natural Gas; Onshore and Offshore)

A production or field infrastructure system—covering extraction and preliminary preparation of hydrocarbons for transportation via main pipelines—may be treated as an infrastructure asset where quality outcomes arise from the **combined behavior of field-level facilities and interfaces**.

Illustrative elements within such an asset boundary may include:

- wells and wellsite facilities (as applicable to the defined scope);
- gathering lines and manifolds connecting producing sources to central facilities;
- preliminary separation, treatment, and conditioning systems;
- produced-water handling interfaces (where within scope);
- metering and custody-transfer preparation systems (where applicable);
- power supply, control, and communications systems supporting field operations; and
- interfaces to downstream processing plants, storage facilities, terminals, or transmission pipelines.

Such assets may be **onshore or offshore**. Boundary definition may reflect differences in physical regime, access constraints, environmental exposure, and dominant risk mechanisms. Subsystem delineation may be appropriate where these differences are material to quality outcomes.

B.2.2 Liquid Hydrocarbon Pipeline System (Illustrative)

A liquid hydrocarbon pipeline system (e.g., crude oil, refined products, NGLs) may be treated as a single infrastructure asset where primary quality outcomes depend on the **integrated operation of the pipeline system as a whole**.

Illustrative elements within such a boundary may include:

- line pipe, fittings, and associated appurtenances;
- valves, isolation devices, and pressure-control elements;
- pump stations and associated auxiliary systems;
- instrumentation, measurement, leak detection, and control systems;
- corrosion protection and physical protection systems;
- rights-of-way (ROW), access controls, and encroachment management; and
- interfaces to upstream supply, terminals, storage facilities, and downstream delivery points.

Subsystem delineation may be appropriate where physical regime, topology, operating mode, or dominant risk mechanisms change materially (e.g., pump stations, river crossings, terminal interfaces, high-consequence segments).

B.2.3 Natural Gas Pipeline System (Illustrative)

A natural gas pipeline system (e.g., gathering, transmission, or distribution) may be treated as an infrastructure asset where system-level quality outcomes arise from the **combined behavior of pipeline segments, stations, and interfaces**.

Illustrative elements within such a boundary may include:

- pipe, fittings, and above-ground installations;
- valves, regulator stations, and pressure-control facilities;
- compressor stations and associated auxiliary systems;
- odorization (where applicable), measurement, and control systems;
- corrosion protection and mechanical protection systems;
- ROW management and third-party interaction controls; and
- interfaces to processing plants, storage facilities, LNG facilities, distribution networks, or end-user delivery points.

Subsystem delineation may be appropriate where topology or operating conditions change substantially (e.g., transmission–distribution transitions, compressor station zones, densely populated interface areas).

B.2.4 LNG Facility

(Illustrative; Natural Gas Gaseous-to-Liquid Interface)

An LNG facility may be defined as an infrastructure asset encompassing the **integrated installations required to liquefy, store, transfer, regasify, or otherwise handle liquefied natural gas.**

Illustrative elements within such an asset boundary may include:

- liquefaction or regasification process units;
- storage tanks and containment systems;
- boil-off gas handling systems;
- loading and unloading systems (marine or land-based);
- utilities and power systems supporting critical functions;
- safety, protection, and emergency response systems; and
- interfaces to upstream or downstream pipelines, shipping systems, or distribution networks.

Subsystem delineation may be appropriate where differences in physical regime, hazard profile, or operating mode materially affect quality outcomes.

B.2.5 Terminals and Storage Facilities

(Illustrative; Liquid Hydrocarbons)

A terminal or storage facility may be treated as a discrete infrastructure asset where it operates as an **integrated system** for receiving, storing, transferring, and delivering liquid hydrocarbons.

Illustrative elements may include:

- storage tanks and secondary containment systems;
- transfer piping, manifolds, and loading facilities;
- pumps and associated utilities and controls;
- vapor control or emissions-control systems (where applicable); and
- interfaces to pipelines, marine facilities, rail, truck, or downstream distribution systems.

Subsystem delineation may be appropriate at interfaces where operating regimes, responsibility, or dominant risk mechanisms change.

B.2.6 Compressor or Pump Station

(Illustrative; System Node Asset)

A compressor station (natural gas) or pump station (liquid hydrocarbons) may be treated as a discrete infrastructure asset where it represents a **concentrated locus of operational, mechanical, and safety risk**.

Illustrative elements may include:

- rotating equipment and drivers;
- auxiliary systems (cooling, lubrication, fuel, ventilation);
- instrumentation, control, protection, and shutdown systems; and
- interfaces to connected pipeline segments and station piping.

Such stations may alternatively be treated as subsystems within a larger pipeline asset, depending on the purpose and scope of the quality evaluation.

B.2.7 Distribution Network

(Illustrative; Natural Gas)

A natural gas distribution network may be treated as an infrastructure asset characterized by:

- branching topology and numerous customer interfaces;
- operation under different pressure regimes and risk profiles than transmission systems; and
- increased interaction with public spaces and third-party activities.

Subsystem delineation may be appropriate based on pressure zones, geographic areas, or interfaces with upstream transmission systems.

B.2.8 Interfaces and Boundary Considerations

Across all examples, **interfaces** between assets or subsystems are critical to boundary definition. Interfaces may be physical, functional, operational, organizational, or

regulatory in nature and often represent locations of elevated risk or transition of responsibility.

Asset boundaries used for IQI purposes should be:

- **explicitly stated;**
- appropriate to the intended quality evaluation; and
- transparent with respect to included and excluded elements and interfaces.

Different boundary definitions may be equally valid for different evaluation purposes. This Annex does not prescribe a single correct boundary, but illustrates how boundary clarity supports meaningful and comparable infrastructure quality discussions.

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