

Detail Engineering Guide

Design Reviews That Block Projects



How to Resolve Critical Technical Conflicts

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The Invisible Bottleneck

Why Projects Stall When Technical Knowledge Is Not the Problem

In any industrial project, design reviews are an essential mechanism to verify that the proposed solutions comply with the technical, regulatory, operational, and safety requirements established for the facility. However, in numerous projects, reviews ultimately become one of the primary bottlenecks in engineering.

It is common to observe deliverables that remain for weeks or even months in repetitive cycles of comments, meetings, and revisions without reaching a definitive decision. As a consequence, downstream activities such as procurement, fabrication, construction, or commissioning begin to be affected.

Contrary to what is usually thought, these blocks rarely occur due to a lack of technical knowledge. In most cases, they are related to unresolved discrepancies between disciplines, late changes in design conditions, or inefficient management of technical risks.

Understanding how these conflicts originate and having a methodology to resolve them is fundamental to maintaining the progress of industrial projects.

Warning Signs in Design Reviews

How to Identify the Exact Point Where Technical Analysis Turns Into a Destructive Loop

Design reviews aim to improve the technical quality of engineering. However, there is a point beyond which a review ceases to generate value and begins to consume resources unproductively.

Some common warning signs are:

- The same comments appear in several consecutive reviews.
- There is no agreement on which document should be considered the primary reference.
- Different disciplines utilize different hypotheses for the same system.
- Decisions are systematically postponed to future meetings.
- Additional analyses are requested without previously defining the acceptance criteria.
- Comments focus on secondary aspects while critical risks remain open.

When these symptoms appear, the problem is no longer technical. The problem is the lack of an effective mechanism to finalize decisions.

The Four Critical Fronts of Technical Friction

Inconsistent Design Conditions

One of the most frequent conflicts in industrial projects is the existence of discrepancies between documents that should share the same design criteria. For example: differing pressures between data sheets and P&IDs, different design temperatures between process and mechanical disciplines, and operating cases not considered during initial calculations.

These inconsistencies may seem minor during the early stages of the project, but they have a significant impact when detail engineering is advanced.

An increase in design temperature can simultaneously affect:

- Allowable stresses of materials.
- Calculated thicknesses.
- Gasket selection.
- Support design.

For this reason, design conditions must be frozen as early as possible, and any subsequent modification must be managed through formal change control procedures.

The Four Critical Fronts of Technical Friction

Material Selection and Degradation Mechanisms

Material selection frequently becomes a major source of technical disagreement. The root cause is that different disciplines evaluate the problem from distinct perspectives. While process engineering typically focuses on fluid characteristics, mechanical engineering evaluates strength and fabrication, maintenance analyzes future availability, and procurement considers costs and lead times.

Common situations include:

- Discussions on corrosion allowance.
- Selection between carbon steel and stainless steel.
- Compatibility regarding corrosion under insulation (CUI).
- Risk of erosion in high-velocity lines.
- Need for specialty materials for severe service.

When there is no clear selection methodology based on objective technical criteria, reviews can be prolonged unnecessarily. The final decision must be based on identified risks, required service life, operating experience, and total cost of ownership (TCO), not solely on the initial cost of the material.

The Four Critical Fronts of Technical Friction

Interdiscipline Interfaces

A large portion of the problems detected during advanced reviews occurs at the interfaces between disciplines. Each specialty optimizes its part of the design, but the overall behavior of the system depends on the integration of all of them.

Frequent examples include:

- Nozzles correctly designed from a mechanical standpoint but inaccessible for maintenance.
- Piping supports incompatible with the available structural steel.
- Instrumentation located in positions with difficult access.
- Valves impossible to dismantle due to interferences.
- Equipment layouts that hinder future inspection operations.

The majority of these conflicts could be detected through early interdisciplinary reviews and sufficiently developed three-dimensional models.

The Four Critical Fronts of Technical Friction

Interpretation of Codes, Standards, and Specifications

Another common source of project stalls arises when there are discrepancies in the interpretation of regulatory and code requirements. In international projects, it is frequent to work simultaneously with: ASME, API, EN, ISO, corporate client specifications, and local statutory requirements.

Although these documents generally pursue similar objectives, they do not always establish identical criteria. For example, differences may appear regarding:

- Design factors.
- Inspection criteria.
- Testing requirements.
- Permitted materials.

When a discrepancy arises, it is essential to identify which document holds contractual precedence before initiating prolonged technical debates.

The "Domino Effect" of a Minor Modification

Real Lessons on How a Temperature Adjustment Impacts Fabrication and Schedules

During the final review of a pressure vessel designed in accordance with ASME VIII Division 1, the process department requests an increase in the design temperature due to a new operating condition identified during the plant analysis.

The modification seems simple. However, the change requires reviewing the selected material, allowable stresses, minimum required thicknesses, nozzle reinforcements, insulation compatibility, and the loads transmitted to the supports. Furthermore, the vendor has already initiated certain fabrication activities.

A seemingly minor decision ends up generating:

- Complete revision of calculations.
- Documentation update.
- Procurement delays.
- Schedule impact.

This type of situation demonstrates that the cost of modifying a technical decision increases significantly as the project progresses.

The 5-Step Action Plan for Closing Decisions

A Structured Process to Isolate Variables, Define Priorities, and Move Forward Without Hesitation

Step 1: Identify the Variable Truly Generating the Conflict

In many meetings, entire documents are discussed when, in reality, the discrepancy is limited to a single variable. The critical variables are typically:

- Pressure.
- Temperature.
- Material.
- Flow rate.
- Thickness.
- Load.
- Regulatory requirement.

Isolating the variable allows the analysis to be focused.

The 5-Step Action Plan for Closing Decisions

A Structured Process to Isolate Variables, Define Priorities, and Move Forward Without Hesitation

Step 2: Determine the Governing Document

Before debating alternatives, it is essential to identify the primary reference.

Typically, this will be:

- Basis of Design.
- Design Criteria.
- Contractual specification.
- Applicable regulatory or code requirement.

Without a clear reference, discussions tend to prolong indefinitely.

The 5-Step Action Plan for Closing Decisions

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Step 3: Evaluate the Real Technical Impact

Not all changes have the same relevance.

It is recommended to evaluate:

- Impact on safety.
- Impact on mechanical integrity.
- Impact on operability.
- Impact on maintenance.
- Impact on regulatory compliance.

This evaluation allows for the proper prioritization of efforts.

The 5-Step Action Plan for Closing Decisions

A Structured Process to Isolate Variables, Define Priorities, and Move Forward Without Hesitation

Step 4: Quantify the Consequences

Every proposal must be analyzed considering:

- Cost.
- Schedule.
- Risk.
- Material availability.
- Constructability complexity.

Technical decisions must not be made in isolation from the rest of the project.

Step 5: Formally Record the Decision

Once an agreement is reached, the decision must be documented.

Traceability is fundamental to prevent the same conflict from reappearing weeks later.

High-Efficiency Practices for Complex Projects

Operational Shielding, Change Control, and Guidelines for Maintaining Technical Flow

Projects that succeed in maintaining efficient reviews typically share several practices:

- Freezing design conditions early.
- Formally managing changes.
- Conducting periodic interdisciplinary reviews.
- Defining clear owners for each decision.
- Basing discussions on verifiable data.
- Prioritizing critical risks over secondary aspects.

These measures do not eliminate technical conflicts, but they significantly reduce the time required to resolve them.

Your Technical Judgment as the Project Engine

Turning the Capacity to Close Decisions into Your Most Valuable Professional Competence

Design reviews are an essential tool to guarantee the technical quality of an industrial project. However, when discrepancies are not properly managed, they can become one of the primary sources of delays and cost overruns.

Experience shows that most bottlenecks do not originate from a lack of technical capability, but rather from issues related to change management, interdisciplinary coordination, and decision-making.

Rapidly identifying critical variables, relying on documented criteria, and maintaining rigorous traceability allows for the acceleration of reviews without compromising engineering quality.

In complex projects, the ability to close technical decisions in a structured manner is just as important as the design capability itself.

Do You Want to Lead Projects Without Bottlenecks? **Design Demands Sound Technical Judgment to Unblock Any Conflict**

Complex decisions require the proper training to back them up

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