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Establishing Project Engineering Office
in Construction Projects

Session 3

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18 Steps to setup a DBB Contract Base PEO using ISO 9011:2015

1. Understand Requirements and Context

2. Define the PEO Organizational Structure

3. Identify and Map PEO Processes

4. Write the Quality Manual

5. Develop Procedures

6. Prepare Work Instructions (WIs)

7. Create QMS Forms and Templates

8. Develop a Project Quality Plan (PQP)

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Definition

A **Quality Manual (QM)** is the cornerstone document of a **Quality Management System (QMS)** that defines how an organization meets quality standards like **ISO 9001:2015**. For your **Project Engineering Office (PEO)** in high-rise construction.

Definition

1. Core Definition

- **What it is:** A structured document outlining your PEO's **quality policies, processes, and responsibilities** to ensure consistent, compliant project delivery.
- **What it's not:** A detailed work instruction (WI) or procedure (PRC). Instead, it **references** them.

Example:

- Your QM states *"Designs must be clash-free per Process 7"* but refers to **WI-007-01** for Navisworks steps.

QM Structure

2. Key Components for Your PEO

Section	Your PEO's Content	ISO 9001 Link
Scope	Covers 22 processes (e.g., Process 0–21) for DBB high-rise projects.	Clause 4.4
Process Map	Visual flow of how Process 7 (Design) feeds Process 10 (Shop Drawings).	Clause 4.4
Roles	BIM Manager owns clash detection (Process 7), QC Engineer approves ITPs (Process 11).	Clause 5.3
ISO Alignment	Links Process 14 (Field Support) to Clause 8.5.1 (Production control).	Clause 6.1
Continuous Improvement	Mandates lessons learned (Process 21) to update WIs annually.	Clause 10.3

QM Structure

2. Key Components for Your PEO

- **Standardization:** Ensures all teams follow the same 22 processes (e.g., no ad-hoc design reviews).
- **Audit Readiness:** Provides auditors a single document to trace compliance (e.g., "Show me your design controls" → QM points to Process 7).
- **Risk Reduction:** Embeds DBB-critical rules (e.g., *"No post-bid design changes without CEO approval"*).

QM Benefits

3. How It Benefits PEO

- **Standardization:** Ensures all teams follow the same 22 processes (e.g., no ad-hoc design reviews).
- **Audit Readiness:** Provides auditors a **single document** to trace compliance (e.g., "Show me your design controls" → QM points to Process 7).
- **Risk Reduction:** Embeds DBB-critical rules (e.g., *"No post-bid design changes without CEO approval"*).

QM Sample

4. Real-World Example

- **Scenario:** A subcontractor submits non-compliant shop drawings.

QM's Role:

1. **Process 10 (Shop Drawing Review)** in the QM defines approval steps.
2. References **WI-010-01** for AISC 360 code checks.
3. Ties to **FRM-010-01** (Approval Log) for record-keeping.

QM Structure

5. Template Snippet

- **Quality Policy (Section 1.2 of Your QM):**

"We deliver defect-free high-rise projects through ISO 9001-compliant processes, risk-based decisions, and continuous improvement across all 22 PEO workflows."

QM Structure

5. Template Snippet

Process Integration (Section 5):

Process	Owner	Key Control	ISO Clause
7	BIM Manager	Navisworks clash detection	8.3.2
14	Superintendent	Daily welding inspections	8.5.1

Level of Detail

6. Difference from Other Documents

Document	Purpose	Example in Your PEO
Quality Manual	Top-level QMS framework	Links Process 7 to ISO 8.3.2
Procedure (PRC)	How to execute a process	PRC-007: Design Review steps
Work Instruction (WI)	Task-level details	WI-007-01: Navisworks settings

ISO Clauses

7. Key ISO 9001 Clauses Supported

- **Clause 4.4:** QMS scope/processes.
- **Clause 5.1:** Leadership commitment.
- **Clause 7.5:** Documented information (your QM is a *controlled document*).

Why Procedures?

Objective: Create detailed, actionable procedures for all 22 PEO processes, ensuring ISO compliance and seamless DBB execution.

1. Extract Requirements from Quality Manual

Source	What to Extract	Example (Process 10: Shop Drawing Review)
Quality Manual	Process scope, objectives, ISO clauses	"Ensure shop drawings comply with AISC 360"
RACI Matrix	Roles (Who does what)	QC Engineer: Approves drawings
Risk Register	Controls needed	Clash detection before approval

How to structure a procedure?

2. Use This Template for Each Procedure

- **Header:**
- **Procedure ID:** PRC-010 (Shop Drawing Review)
- **ISO Clause:** 8.5.1 (Production Control)
- **Owner:** QC Engineer

How to structure a procedure?

Body:

Section	Content	Data Source
Purpose	Ensure error-free shop drawings for fabrication	Quality Manual
Scope	Applies to structural/architectural drawings	Process Map
Inputs	Approved design drawings (Process 7)	Process 10
Steps	1. Receive drawing 2. Check AISC 360 compliance 3. Resolve clashes 4. Approve/reject	Work Instructions
Outputs	Approved drawings (BIM 360), Rejection log	Process 12
Controls	BIM Manager verifies clashes before QC sign-off	Risk Register
Records	Signed approval sheets (Retain: 10 years)	Document Control

How to structure a procedure?

3. Link to Supporting Documents

Procedure	Linked Documents	Owner
Shop Drawing Review	- WI-005: Clash Resolution Steps - F-010: Approval Form	BIM Manager

How to structure a procedure?

4. Validate with Process Owners

1. Draft Review:

- BIM Manager verifies technical steps (Process 10).
- DCC Specialist checks record-keeping (Process 3).

2. Final Sign-off: QA Manager (ISO compliance).

How to structure a procedure?

5. Integrate into QMS

- Store: PDM system (BIM 360/Aconex) under folder *Procedures*.
- Train: Use Step 10 (Training Program) to roll out.

What is the difference bet processes and procedures?

a. Definition & Scope

Aspect	Process	Procedure
What it is	A series of interconnected activities that transform inputs into outputs (e.g., "Design Review").	A detailed set of instructions for executing a specific task within a process (e.g., "How to Perform Clash Detection").
Scope	Broad, cross-functional (e.g., Process 7 involves BIM, engineering, QC).	Narrow, role-specific (e.g., Only the BIM team follows clash detection steps).

What is the difference bet processes and procedures?

Example:

- **Process 7 (Design Review)** = End-to-end flow from contract docs to approved design.
- **Procedure PRC-007** = Step-by-step clash detection using Navisworks.

What is the difference bet processes and procedures?

b.ISO 9001 Alignment

Process	Procedure
Addresses clauses (e.g., 8.3 Design Control). Mapped to your 22 PEO processes .	Addresses how to comply with clauses (e.g., "Validate designs per AISC 360"). Derived from processes (e.g., PRC-007 for Process 7).

Example:

- Process 7 ensures compliance with **ISO 9001:2015 Clause 8.3**.
- Procedure PRC-007 specifies **which software** to use for compliance.

What is the difference bet processes and procedures?

c. Content & Structure

Process	Procedure
- Inputs/Outputs - Roles (RACI) - Risks/KPIs - Integration with other processes.	- Step-by-step instructions - Tools/forms - Approval criteria - Records to retain.

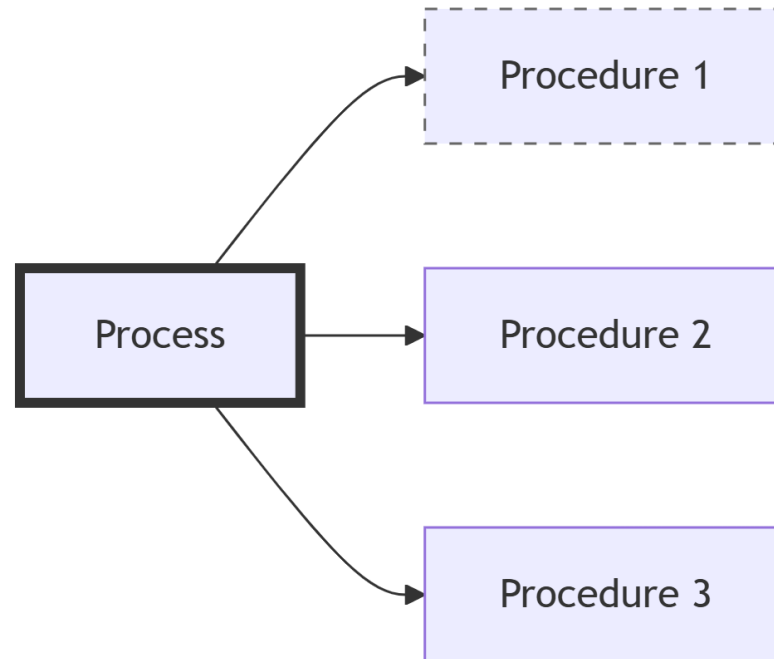
What is the difference bet processes and procedures?

d. Purpose in Your QMS

Process	Procedure
Ensures what needs to be done (strategic).	Ensures how it's done consistently (tactical).
Audited for effectiveness (e.g., "Are designs reviewed?").	Audited for compliance (e.g., "Is Navisworks used correctly?").

What is the difference bet processes and procedures?

e. Visual Comparison



What is the difference bet processes and procedures?

f. How They Work Together in Your PEO

- **Start with Processes** (Your 22 tables define the "what").
- **Derive Procedures** (Specify "how" for critical tasks).
- **Link to Work Instructions** (Even more granular, e.g., "How to tag clashes in Navisworks").

What is the difference bet processes and procedures?

g. When to Use Each

- **Update a Process:** When adding a new phase (e.g., "Sustainability Review").
- **Update a Procedure:** When changing tools (e.g., Switching from Navisworks to Revizto).

h. Key Characteristics:

- **Processes = Bones** (Structure of your QMS).
- **Procedures = Muscles** (Make the structure function)

How to structure a work instruction?

1. Identify WI Needs

Source	What to Extract	Example (Process 10: Shop Drawing Review)
Procedures (PRC-XXX)	Tasks needing detailed steps	"Verify AISC 360 compliance" → WI for code-checking
Audit Findings	Gaps in execution	Field team skips weld symbols → WI for symbol standards
Risk Register	High-risk tasks	Incorrect material stamps → WI for stamp verification

How to structure a work instruction?

2. Use This WI Template

- **Header:**
- **WI ID:** WI-010-01 (Shop Drawing Code Check)
- **Linked to:** PRC-010 (Shop Drawing Procedure)
- **Owner:** QC Engineer
- **Tools:** AutoCAD, AISC Manual

How to structure a work instruction?

Body:

Section	Content	Example
Purpose	Explain why the task matters	"Ensure fabrication accuracy"
Frequency	How often it's done	"Per each shop drawing submission"
Steps	Numbered, verb-driven actions	1. Open AutoCAD → 2. Select layer "Structural" → 3. Check Section 2.5 of AISC 360...
Visual Aids	Screenshots, diagrams	
Common Errors	Mistakes to avoid	"Ignoring tolerance thresholds"
Sign-off	Who approves completion	"QC Engineer initials"



Footer:

- **Revision History:** WI-010-01-Rev01 (2024-06-15)
- **Retention:** 7 years (per Process 3)

How to structure a work instruction?

3. Link to Existing Documents

WI ID	Supports Procedure	Connects to Process	ISO Clause
WI-007-01	PRC-007 (Clash Detect)	Process 7 (Design Rev.)	8.3.2
WI-014-01	PRC-014 (Field Support)	Process 14 (Const. Sup.)	8.5.1

How to structure a work instruction?

4. Validate with Frontline Teams

1. Draft Review:

1. BIM Team validates WI-007-01 (Navisworks steps).
2. Welders test WI-014-01 (Field inspection checklist).

2. Final Approval: QA Manager (ISO compliance).

How to structure a work instruction?

5. Implement & Train

- Storage: BIM 360 folder Work Instructions.
- Training: Add to Step 10 (Training Program).
- Use screenshots in PowerPoint for field crews.

How to structure a work instruction?

6. Continuous Improvement

- **Update When:**
 - New software (e.g., switch to Revizto).
 - Regulatory changes (e.g., AISC 360 updates).
- **Audit Check:** Verify WI usage during **Step 11 (Internal Audits)**.

How to structure a QMS Form/Report?

1. Identify Required Forms

Source	Form Type	Linked Process	Example
Procedures (PRC-XXX)	Activity-specific forms	Process 7 (Design Review)	Clash Report Form
Work Instructions (WI-XXX)	Step-by-step checklists	Process 14 (Field Support)	Welding Inspection Checklist
Legal/Contractual	Compliance trackers	Process 1 (Contract Review)	Regulatory Compliance Matrix

How to structure a QMS Form/Report?

2. Form Design Principles

Principle	Application	ISO 9001 Alignment
Clarity	Simple language, avoid jargon	7.5.1 (Understandable docs)
Traceability	Auto-generate unique IDs (e.g., FRM-007-001)	8.5.1 (Unique identification)
Version Control	Footer with revision history	7.5.3 (Document updates)
DBB Compliance	Include contract clause references	8.2.1 (Customer requirements)

How to structure a QMS Form/Report or

3. Template Library (Examples)

- A. Design Phase Forms**

Form ID	Purpose	Linked Process
FRM-007-01	Navisworks Clash Report	Process 7
FRM-010-01	Shop Drawing Approval Log	Process 10

How to structure a QMS Form/Report?

Sample Fields for FRM-007-01:

- Project Name/ID
- Clash Location (Grid Coordinates)
- Severity (Critical/Major/Minor)
- Assigned To (BIM 360 auto-populate)
- Resolution Deadline
- Verification Signature

How to structure a QMS Form/Report ?

B. Construction Phase Forms

Form ID	Purpose	Linked Process
FRM-014-01	Daily Inspection Checklist	Process 14
FRM-011-01	ITP Sign-off Sheet	Process 11

How to structure a QMS Form/Report?

Sample Fields for FRM-014-01:

- Date/Shift
- Welding Inspector Name
- AWS D1.1 Compliance (✓/✗)
- Non-Conformance Notes
- Superintendent Approval

How to structure a QMS Form/Report?

C. Administrative Forms

Form ID	Purpose	Linked Process
FRM-003-01	Document Control Register	Process 3
FRM-021-01	Lessons Learned Template	Process 21

How to structure a QMS Form/Report?

4. Digital Integration

Tool	Usage	Benefit
BIM 360	Auto-fill project data in forms	Eliminates manual entry errors
Power Apps	Mobile-friendly inspection forms	Real-time field data capture
Excel Online	Shared NCR trackers	Live updates for all teams

How to structure a QMS Form/Report?

5. Validation & Approval

1. Pilot Testing:

1. Field teams test FRM-014-01 for 1 week.
2. BIM team validates FRM-007-01 with Navisworks outputs.

2. Final Approval: QA Manager signs off (ISO compliance).

How to structure a QMS Form/Report?

6. Implementation:

- Storage: Central folder in PDM system (e.g., BIM 360 > QMS Forms).
- Access Control:
 - Editable by: Process Owners
 - View-only by: Contractors

How to structure a QMS Form/Report?

7. Continuous Improvement

- **Annual Review:** Update forms based on:
 - Audit findings (Step 11).
 - Regulatory changes (e.g., AISC 360 updates).
- **Version History:** Track changes in FRM-003-01 (Document Register).

Step-by-Step Process to Prepare a Project Quality Plan (QP)

Phase 1: Preparation

1. Define Scope & Objectives

1. Identify project boundaries (e.g., DBB delivery, 22 PEO processes).
2. Align with ISO 9001:2015 requirements (Clauses 4–10).

2. Gather Inputs

1. **Contract Documents:** DBB agreements, client specifications.
2. **Standards:** List all applicable standards (e.g., AISC 360, ISO 19650, AWS D1.1).
3. **Process Map:** 22 PEO processes with roles (Core/Supporting).

Step-by-Step Process to Prepare a Project Quality Plan (QP)

Phase 2: Drafting the QP

3. Structure the Document

- Use ISO 9001:2015 clauses as the framework:
Scope → Context → Leadership → Planning → Support → Operation → Evaluation → Improvement.
- Add a **cover page, table of contents, and appendices.**

4. Map Processes to ISO 9001 & Standards

For each of your 22 processes:

- **Link to ISO 9001 clauses** (e.g., Process 10 "Shop Drawing Review" → Clause 8.5.1 "Production Control").
- **Assign relevant standards** (e.g., AISC 360 for steel shop drawings).

Step-by-Step Process to Prepare a Project Quality Plan (QP)

Example

Process	ISO Clause	Standard	Control Measure
6: Subcontractor Mgmt.	8.4 (External Providers)	ISO 3834 (Welding)	Supplier audits for welding certs

5. Define Roles & Responsibilities

Assign accountability per process (e.g., BIM Manager for ISO 19650 compliance in Process 7).

6. Risk Management & Quality Objectives

- Identify risks per process (e.g., "Design errors in Process 8").
- Set **SMART objectives** (e.g., "Zero clashes in BIM models per ISO 19650").

Step-by-Step Process to Prepare a Project Quality Plan (QP)

Phase 3: Operational Controls

7. Develop Process-Specific Procedures

- **Design Phase:**
 - Process 0 (Pre-Bid Audit): BIM validation per ISO 19650.
 - Process 10 (Shop Drawing Review): AISC 360 dimensional checks.
- **Construction Phase:**
 - Process 11 (ITP Preparation): ACI 318 concrete testing protocols.

8. Document Control Plan

- Specify how documents are managed (e.g., PDM system for revision control, BS 1192 for as-builts).

Step-by-Step Process to Prepare a Project Quality Plan (QP)

9. Non-Conformance Handling

- Define steps:

Report NCR (e.g., welding defect per AWS D1.1).

Root Cause Analysis (5 Whys/Fishbone).

Corrective Action (e.g., retraining welders).

Step-by-Step Process to Prepare a Project Quality Plan (QP)

Phase 4: Review & Approval

10. Stakeholder Review

- Circulate draft to:
- **PEO Leads** (Verify process accuracy).
- **Legal/PMO** (Check contract alignment).

11. Finalize & Approve

- Incorporate feedback, then sign off by:
 - **PEO Manager** (Technical compliance).
 - **QA/QC Manager** (ISO 9001 adherence).

Step-by-Step Process to Prepare a Project Quality Plan (QP)

Phase 5: Implementation & Monitoring

12. Training & Rollout

- Train teams on:
- Process workflows (e.g., ISO 19650 for BIM staff).
- Standard-specific checks (e.g., ACI 318 for QC Engineers).

Performance Tracking

- Monitor KPIs:
 - **Design:** % clash-free models (ISO 19650).
 - **Construction:** % ITPs approved before work (ACI 318).

Step-by-Step Process to Prepare a Project Quality Plan (QP)

Phase 5: Implementation & Monitoring

14. Continuous Improvement

- **Lessons Learned (Process 21):** Update QP based on NCR trends.

How to Prepare a Document Control Implementation Plan

1. Define Objectives & Scope

- **Purpose:**

- Ensure **version control, traceability, and accessibility** of all project documents.
- Comply with **ISO 9001:2015 Clause 7.5** (Documented Information).

- **Scope:**

- Covers **all 22 PEO processes** (e.g., shop drawings, ITPs, contracts).
- Applies to **all project phases** (Design, Bid, Construction).

How to Prepare a Document Control Implementation Plan

2. Assign Roles & Responsibilities

Role	Responsibility	Relevant Process
DCC Specialist	Oversees document control system (PDM).	2, 3
BIM Manager	Manages BIM model revisions (ISO 19650).	7, 12
QC Engineer	Approves/archives ITPs and inspection records.	11, 14

How to Prepare a Document Control Implementation Plan

3. Classify Document Types

- Categorize documents based on **processes** and **ISO requirements**:

Document Type	Examples	Process Link	ISO 9001 Clause
Design Documents	Shop drawings, BIM models	7, 8, 10	8.3 (Design)
Quality Records	ITPs, NCRs, material test reports	9, 11, 14	8.5.1 (Control)
Contracts	DBB agreements, subcontracts	1, 6	8.4 (External Providers)

How to Prepare a Document Control Implementation Plan

4. Establish Document Naming & Revision Rules

Naming Convention:

[ProjectID]_[DocType]_[Rev#]_[Date]

Example: PRJ-001_SDR_Rev02_20231015 (Shop Drawing Review, Revision 2).

Revision Control:

Use **status tags**: Draft → Under Review → Approved → Obsolete.

Mandatory **revision table** in all documents.

How to Prepare a Document Control Implementation Plan

5. Select a Document Control System

Choose a **PDM (Project Document Management)** system (e.g., BIM 360, Aconex, Procore) with:

- **Version control** (prevent overwrites).
- **Role-based access** (restrict edits/approvals).
- **Audit trails** (track changes per ISO 9001:2015 **7.5.3**).

How to Prepare a Document Control Implementation Plan

6. Define Access & Distribution Rules

Access Levels:

Role	Permissions
BIM Manager	Edit/approve design docs.
QC Engineer	View/approve ITPs.
Contractors	Read-only access to approved docs.

Distribution Logs:

- Record all document issuances (prevent unauthorized use).

How to Prepare a Document Control Implementation Plan

7. Set Retention & Archiving Policies

Document Type	Retention Period
Design drawings	10 years post-handover
Inspection records	7 years
Contracts	15 years (legal requirement)

Storage:

- **Cloud-based PDM**(Project Document Management system) (ISO 27001-compliant backup).
- **Physical copies** (if required) in fireproof cabinets.

How to Prepare a Document Control Implementation Plan

8. Integrate with PEO Processes

Map document control to **specific processes**:

Process	Document Control Requirement	ISO Standard
Process 3 (Doc Control)	Ensure latest revisions are accessible.	ISO 9001:2015 (7.5)
Process 10 (Shop Drawings)	Enforce AISC 360 compliance before approval.	AISC 360
Process 11 (ITPs)	Lock ITPs until client approval.	ACI 318

How to Prepare a Document Control Implementation Plan

9. Training & Compliance

a. Training:

- **DCC Specialists:** PDM(Project Document Management system) workflows, ISO 9001:2015 7.5.
- **BIM Team:** ISO 19650 (BIM document management).

b. Compliance Checks:

- Monthly audits for **unapproved/obsolete documents**.

How to Prepare a Document Control Implementation Plan

10. Non-Conformance Handling

Steps for Document-Related NCRs:

- a. **Identify:** Unapproved revision in use (e.g., old shop drawing).
- b. **Contain:** Recall document via PDM(Project Document Management system) .
- c. **Corrective Action:** Retrain staff on naming conventions

Training program plan ISO Based

1. Define Training Objectives

- Ensure compliance with **ISO 9001:2015** (Clauses 7.2, 7.3).
- Align teams with **process-specific standards** (e.g., AISC 360, ISO 19650).
- Reduce **non-conformities** (NCRs) through competency development.

2. Define Training Scope

- Covers all **22 PEO processes**, with ISO-focused modules for:
- **Core Processes:** Design, procurement, construction.
- **Supporting Processes:** Documentation, handover.

Training program plan ISO Based

3. Training Matrix (Roles & Topics)

Role	Required Training	Linked Process	ISO 9001 Clause
BIM Manager	ISO 19650 (BIM documentation)	0, 7, 12	7.5 (Documentation)
QC Engineer	ACI 318 (Concrete), AWS D1.1 (Welding)	10, 11, 14	8.5.1 (Control)
DCC Specialist	ISO 9001:2015 Doc Control (Clause 7.5)	2, 3	7.5.3
Lead Engineers	Shop drawing review (AISC 360)	8, 10	8.3 (Design)
All Members	ISO 9001:2015 Awareness	All	All

Training program plan ISO Based

4. Training Modules

4.1 ISO 9001:2015 Awareness (All Staff)

- **Content:**
 - Overview of ISO 9001 requirements.
 - How the QP applies to daily work.
- **Format:** 1-hour e-learning module + quiz.

Training program plan ISO Based

4.2 Process-Specific Standards (Role-Based)

Process	Training Topic	Standard	Duration
0, 7	BIM Clash Detection	ISO 19650	2 hours
6, 15	Subcontractor Qualification	ISO 3834	1.5 hours
11, 14	Concrete/Welding Inspections	ACI 318, AWS D1.1	3 hours

Training program plan ISO Based

4.3 Document Control (PDM System)

Content:

- How to use **BIM 360/Aconex** for:
Version control.
Approval workflows.
- Naming conventions (e.g., PRJ-001_SDR_Rev02_20231015).

Hands-on practice: Simulate RFI submission (Process 13).

Training program plan ISO Based

5. Training Methods

- **Classroom:** For complex standards (e.g., AWS D1.1 welding).
- **E-Learning:** ISO awareness, document control basics.
- **On-the-Job Coaching:** Supervisors verify competency (e.g., QC checks)

Training program plan ISO Based

6. Competency Assessment

- a. **Quizzes:** Pass/fail tests after e-learning (80% minimum score).
- b. **Practical Demos:**
 - BIM Manager: Resolve a clash in Revit (ISO 19650).
 - QC Engineer: Perform a slump test (ACI 318).
- c. **Records:** Track attendance/scores in **PDM system**.

Training program plan ISO Based

7. Training Schedule

Phase	Training Topic	Audience	Timing
Pre-Construction	ISO 9001 Awareness	All	Month 1
Design	BIM Standards (ISO 19650)	BIM Team	Month 2
Construction	Welding Inspections (AWS D1.1)	QC Engineers	Month 3

Training program plan ISO Based

8. Continuous Improvement

- **Feedback Surveys:** After each session.
- **Lessons Learned (Process 21):** Update training annually.
- **Refresher Courses:** Mandatory after major NCRs.

How to Establish an Audit Plan

1. Define Audit Objectives

- Verify adherence to **ISO 9001:2015** (Clause 9.2).
- Ensure **22 PEO processes** meet defined quality standards.
- Identify **non-conformities (NCRs)** for corrective action.

How to Establish an Audit Plan

2. Audit Scope

- Covers all **22 PEO processes**, with focus on:
- **High-risk processes** (e.g., welding inspections, shop drawing reviews).
- **ISO 9001 critical clauses** (e.g., 8.5.1 Control of Production).

How to Establish an Audit Plan

3. Plan Audit Frequency

Process Risk Level	Audit Frequency	Example Processes
High Risk	Quarterly	10 (Shop Drawing Review), 14 (Field Support)
Medium Risk	Biannually	6 (Subcontractor Mgmt.), 11 (ITP Prep.)
Low Risk	Annually	5 (Progress Reporting), 21 (Lessons Learned)

How to Establish an Audit Plan

4. Audit Team & Roles

Role	Responsibility
Lead Auditor	Plans audits, reports findings (ISO 9001-trained).
Process Owners	Provide evidence (e.g., QC Engineers for ITPs).
QA Manager	Approves audit schedule and corrective actions.

How to Establish an Audit Plan

5. Audit Preparation

5.1 Audit Schedule

Sample Annual Plan:

Month	Process Audited	ISO Clause	Auditor
March	7 (Design Review)	8.3	Lead Auditor
June	11 (ITP Preparation)	8.5.1	QA Engineer
September	14 (Field Support)	7.1.5	BIM Manager

How to Establish an Audit Plan

5.2 Audit Checklists

- Customize per process using:
 - **ISO 9001 requirements** (e.g., Clause 8.5.1 for ITPs).
 - **Industry standards** (e.g., AWS D1.1 for welding audits).

Example Checklist for Process 10 (Shop Drawing Review):

Check	ISO/Standard Reference	Compliance (Y/N)
Are shop drawings AISC 360-compliant?	AISC 360 Sec. 2.5	☐ Yes ☐ No
Are revisions controlled in PDM?	ISO 9001:2015 (7.5.3)	☐ Yes ☐ No

How to Establish an Audit Plan

6. Conducting Audits

6.1 Audit Steps

1. **Opening Meeting:** Explain scope to process owners.
2. **Document Review:** Check records (e.g., approved ITPs, NCR logs).
3. **Field Verification:** Observe processes (e.g., weld inspections).
4. **Closing Meeting:** Present findings.

How to Establish an Audit Plan

6.2 Evidence Collection

- **Records:** Approved drawings, material certs, training logs.
- **Interviews:** Staff competency verification

How to Establish an Audit Plan

7. Reporting & NCR Handling

7.1 Audit Report Template

Finding	Process	ISO Clause	Severity (Major/Minor)
Unapproved shop drawing in use	10	8.5.1	Major

7.2 Corrective Actions

1. **Containment:** Remove non-compliant documents.
2. **Root Cause:** Why was unapproved drawing used?
3. **Prevention:** Update document control training.

How to Establish an Audit Plan

8. Performance Metrics

KPI	Target
% of audits completed on schedule	100%
% of NCRs closed within 30 days	≥90%

How to Establish an Audit Plan

9. Continuous Improvement

Lessons Learned (Process 21): Update audit checklists annually.

Management Review: Present audit trends to leadership.

How to Handle Risks and Opportunities

1. Define Objectives

- Prevent quality failures (e.g., design errors, delays).
- Leverage opportunities (e.g., cost savings, process efficiency).
- Align with ISO 9001:2015 (Risk-Based Thinking).

2. Scope

- Covers all **22 PEO processes**, with focus on:
- **High-risk processes** (e.g., welding, structural design).
- **Critical project phases** (Design, Procurement, Construction).

How to Handle Risks and Opportunities

3. Risk Management Framework

3.1 Risk Identification



Method	Example Output
Process Audits	Unapproved drawings in use (Process 10).
Lessons Learned	Recurring NCRs in welding (Process 14).
Brainstorming	Supplier delays (Process 6).

How to Handle Risks and Opportunities

3.2 Risk Assessment

Use a **5x5 Risk Matrix** to prioritize:

Likelihood \ Impact	Minor (1)	Moderate (3)	Major (5)
Very Likely (5)	5 (Medium)	15 (High)	25 (Extreme)
Possible (3)	3 (Low)	9 (Medium)	15 (High)
Unlikely (1)	1 (Low)	3 (Low)	5 (Medium)

How to Handle Risks and Opportunities

3.3 Risk Response

Risk Level	Response	Example Action
Extreme (20-25)	Avoid/Mitigate	Hire third-party welding inspectors (AWS D1.1).
High (10-16)	Mitigate/Transfer	Penalty clauses for subcontractor delays.
Medium (5-9)	Accept/Monitor	Weekly QC checks for minor defects.

How to Handle Risks and Opportunities

3.4 Opportunity Identification

Source	Example Opportunity
Process Efficiency	Automate shop drawing reviews (AI clash detection).
Cost Savings	Bulk procurement of steel (Process 6).

How to Handle Risks and Opportunities

4. Integration with PEO Processes

4.1 Process-Specific Risks & Mitigations

Process	Risk	Mitigation	ISO Clause
7 (Design Review)	Clashes in BIM models	Weekly coordination meetings (ISO 19650).	8.3
11 (ITP Prep.)	Unapproved concrete pours	PDM system locks ITPs until signed.	8.5.1

How to Handle Risks and Opportunities

4.2 Document Control

- **Risk Register:** Live document in **PDM system** (e.g., BIM 360).
- **Updates:** Reviewed monthly (Process 5: Progress Reporting)

How to Handle Risks and Opportunities

5. Roles & Responsibilities

Role	Duty
Project Manager	Approves risk responses.
QA Manager	Oversees risk register updates.
Process Owners	Implement mitigations (e.g., QC Engineers for ITPs).

How to Handle Risks and Opportunities

6. Tools & Templates

6.1 Risk Register Template (Excel)

Risk ID	Process	Risk Description	Likelihood	Impact	Score	Mitigation	Owner
R-001	10	Shop drawing errors	4	5	20	3-tier review (Draft → PEO → Client)	QC Engineer

6.2 Opportunity Log

Opportunity ID	Process	Description	Benefit	Action Plan
O-001	7	AI-powered clash detection	30% faster design reviews	Pilot with BIM Manager.

How to Handle Risks and Opportunities

7. Performance Monitoring

KPI	Target
% of high/extreme risks mitigated	≥90%
Opportunities implemented/year	≥5

8. Continuous Improvement

- **Lessons Learned (Process 21):** Update risk register annually.
- **Management Reviews:** Report risk trends to leadership.

NCRs

1. Objectives

- **Identify, document, and resolve** nonconformities (e.g., design errors, material defects).
- **Prevent recurrence** through root cause analysis (RCA).
- **Maintain ISO 9001 compliance** with auditable records.

NCRs

2. Scope

- Covers all 22 PEO processes, including:
- **Design:** Unapproved drawings (Process 10).
- **Construction:** Failed inspections (Process 14).
- **Procurement:** Non-compliant materials (Process 9).

NCRs

3. Nonconformance Workflow

.1 Identification & Documentation

- **Sources of NCRs:**
 - Audits (Process 11).
 - Client complaints.
 - Field inspections (Process 14).

NCRs

- NCR Form (Digital/Paper):

Field	Example Entry
NCR ID	NCR-2024-001
Process Affected	Process 10 (Shop Drawing Review)
ISO Clause	8.5.1 (Control of Production)
Description	Unapproved shop drawing used in fabrication.
Severity	Major

NCRs

3.2 Containment & Immediate Action

- **Stop work** on nonconforming activity (e.g., halt welding if defects found).
- **Quarantine materials** (e.g., non-compliant steel batches).

3.3 Root Cause Analysis (RCA)

Method	Application
5 Whys	Why was unapproved drawing used? → PDM permissions not set.
Fishbone Diagram	Categorize causes (People, Process, Tools).

NCRs

3.4 Corrective & Preventive Actions (CAPA)

- **Corrective Action:** Fix the immediate issue (e.g., retrain DCC Specialist).
- **Preventive Action:** Avoid recurrence (e.g., update PDM access controls).

3.5 Verification & Closure

- **Re-inspect** corrected work.
- **Sign-off** by QA Manager (Process 4: Change Management)

NCRs

4. Roles & Responsibilities

Role	Responsibility
QC Engineer	Initiate NCRs (Process 10, 11, 14).
QA Manager	Approve CAPA and closure.
Process Owners	Implement corrective actions (e.g., BIM Manager for design NCRs).

NCRs

5. Integration with PEO Processes

Process	NCR Trigger Example	Linked ISO Clause
6	Subcontractor delivers non-compliant welds.	8.4 (External Providers)
10	Shop drawing deviations found.	8.5.1 (Production Control)
14	Field inspection fails (ACI 318).	9.1.1 (Monitoring)

NCRs

6. Tools & Templates

- **6.1 NCR Form Template**

Section	Details
NCR Details	ID, Date, Process Affected, Severity.
Containment	Immediate actions taken.
Root Cause	5 Whys/Fishbone output.
CAPA	Corrective/Preventive actions with deadlines.
Closure	Verification evidence + approver signature.

NCRs

6.2 NCR Tracking Log (Excel)

NCR ID	Status	Open Date	Due Date	Days Open
NCR-2024-001	Closed	01-Mar-2024	15-Mar-2024	14

Steps to Implement Supplier Evaluation

1. Objectives

- Ensure suppliers comply with **ISO 9001**, **project specifications**, and **industry standards** (e.g., AISC 360, AWS D1.1).
- Minimize risks from **substandard materials/services**.
- Maintain auditable records for **ISO compliance**.

Steps to Implement Supplier Evaluation

2. Scope

- Covers all **suppliers/subcontractors** for:
- **Materials:** Steel, concrete, welding (Process 9, 16).
- **Services:** Design, fabrication, testing (Process 6, 15).

Steps to Implement Supplier Evaluation

3. Supplier Evaluation Workflow

3.1 Pre-Qualification (Process 6, 15)

Criteria	Verification Method
ISO 9001 Certification	Valid certificate (or equivalent QMS).
Technical Competence	Review past projects (similar scope).
Financial Stability	Audited financial statements.



Output: Approved Supplier List (ASL) in **PDM** system

Steps to Implement Supplier Evaluation

3.2 Ongoing Performance Monitoring

Metric	Frequency	Tool
On-Time Delivery	Per Order	Procurement Tracker (Process 6).
Material Compliance	Per Batch	Inspection Reports (Process 9).
NCR Rate	Quarterly	NCR Log (Process 4).

Steps to Implement Supplier Evaluation

3.3 Corrective Actions for Poor Performance

- **Warning Letter:** For minor delays/non-compliance.
- **Suspension:** Repeat NCRs (e.g., 3+ failures in welding).
- **Blacklisting:** Fraudulent/fatal non-conformities.

Steps to Implement Supplier Evaluation

4. Roles & Responsibilities

Role	Responsibility
Procurement Team	Pre-qualify suppliers (Process 6, 15).
QC Engineer	Inspect materials (Process 9, 16).
QA Manager	Approve ASL updates.

Steps to Implement Supplier Evaluation

5. Integration with PEO Processes

Process	Supplier Link	ISO Clause
6	Subcontractor qualification.	8.4.1
9	Material inspection (ACI 318/AISC).	8.4.3
16	Vendor data review.	8.4.2

Steps to Implement Supplier Evaluation

6. Tools & Templates

6.1 Supplier Scorecard (Excel)

Supplier	On-Time Delivery (%)	Defect Rate (%)	NCRs	Rating (1-5)
ABC Steel	95%	2%	1	★★★★

Steps to Implement Supplier Evaluation

6.2 Supplier Audit Checklist

Check Item	Compliance (Y/N)	Notes
Valid ISO 9001 certification?	☐ Yes ☐ No	Expires 2025
Welding procedures (AWS D1.1)?	☐ Yes ☐ No	

Steps to Implement Supplier Evaluation

7. Performance Metrics

KPI	Target
% suppliers with ≥ 4 -star rating	$\geq 80\%$
Material rejection rate	$\leq 2\%$

Steps to Implement Supplier Evaluation

8. Continuous Improvement

- **Lessons Learned (Process 21):** Update evaluation criteria annually.
- **Supplier Workshops:** Train key vendors on project standards.

Steps to Implement Supplier Evaluation

Example Scenario

- **Supplier:** XYZ Welding
- **Issue:** Failed AWS D1.1 inspection (Process 9).
- **Action:**
 - **Corrective Action:** Retrain welders + third-party audit.
 - **Preventive Action:** Add weld-test frequency in contracts.

Management Reviews

1. Objectives

- Evaluate QMS **performance** against ISO 9001 and project goals.
- Identify **improvement opportunities** (e.g., process inefficiencies).
- Ensure **resource allocation** for quality objectives.

Management Reviews

2. Scope

- Covers all **22 PEO processes**, with focus on:
- **Quality KPIs** (e.g., NCR rates, audit results).
- **Resource needs** (e.g., training, technology).
- **Strategic updates** (e.g., new industry standards).

Management Reviews

3. Management Review Workflow

3.1 Input Preparation (Before Meeting)

Input	Data Source	Responsible Role
Quality KPIs	NCR logs, audit reports (Steps 11-14)	QA Manager
Customer Feedback	Client surveys, RFIs (Process 13)	Project Manager
Process Performance	Progress reports (Process 5)	Planning Team
Supplier Performance	Scorecards (Step 14)	Procurement

Management Reviews

3.2 Review Meeting (Quarterly/Annual)

Agenda Template:

1. Opening

- Approval of previous minutes.

2. Performance Review

- KPI trends (e.g., NCR closure rate, on-time delivery).
- Major nonconformities (Process 4).

3. Improvement Opportunities

- Lessons learned (Process 21).
- New standards (e.g., ISO 19650 updates).

Management Reviews

3.2 Review Meeting (Quarterly/Annual)

Agenda Template:

4. Decisions & Actions

- Resource allocations (e.g., BIM software upgrade).
- Process changes (e.g., revised ITP templates).

3.3 Output Documentation

Output	Example
Action Items	"Train welders on AWS D1.1 by 30-Nov-2024."
Updated Quality Policy	Revised objectives for next quarter.

Management Reviews

4. Roles & Responsibilities

Role	Responsibility
Top Management	CEO, Project Director (chair meeting, approve actions).
QA Manager	Present QMS performance data.
Process Owners	Report on their processes (e.g., BIM Manager for Process 7).

Management Reviews

5. Integration with PEO Processes

Process	Link to Management Review
4	NCR trends → Corrective action updates.
5	Schedule adherence → Resource needs.
21	Lessons learned → Improvement plans.

Management Reviews

6. Tools & Templates

6.1 Management Review Minutes Template

Topic	Discussion Points	Actions	Owner	Deadline
NCR Recurrence	30% welding defects (Process 14)	Hire third-party inspector	QA Manager	15-Dec-2024

6.2 KPI Dashboard (Excel/Power BI)

PI	Target	Actual	Status
NCR Closure Rate	≥90%	85%	⚠

Management Reviews

7. Performance Metrics

KPI	Target
% of review actions completed on time	100%
Reduction in recurring NCRs	≥10% YoY

Management Reviews

8. Continuous Improvement

- **Follow-Up Audits:** Verify action implementation (Step 11).
- **Policy Updates:** Reflect changes in QMS documentation.

Records Archiving

1. Objectives

- Maintain **audit-ready records** for ISO 9001 compliance.
- Ensure **legal/contractual compliance** (e.g., 10-year retention for design docs).
- Facilitate **knowledge transfer** for future projects.

Records Archiving

2. Scope

- Covers all **22 PEO processes**, including:
- **Design Records:** BIM models, shop drawings (Process 7, 10, 12).
- **Quality Records:** ITPs, NCRs, inspection reports (Process 9, 11, 14).
- **Administrative Records:** Contracts, permits (Process 1, 20).

Records Archiving

3. Records Retention Schedule

Record Type	Retention Period	Responsible Role	Storage Method
Design Drawings (As-Built)	10 years post-handover	BIM Manager	Cloud (BIM 360) + Hardcopy
Inspection Reports (ACI 318)	7 years	QC Engineer	Digital (PDM)
Contracts & Permits	15 years	Legal Team	Secure Server
NCRs & Corrective Actions	5 years	QA Manager	PDM System

Records Archiving

4. Archival Workflow

4.1 Identification & Classification

- Tag records in PDM system (e.g., Retention: 10Y).
- **Classify by process** (e.g., Process 10 records = Shop drawings).

4.2 Secure Storage

- **Digital:** Cloud-based PDM (e.g., BIM 360) with **access controls**.
- **Physical:** Fireproof cabinets for hardcopies (e.g., signed contracts).

Records Archiving

4.3 Disposal

- **Automated Alerts:** Notify DCC Specialist 30 days before disposal date.
- **Disposal Method:**
 - **Digital:** Secure deletion (per ISO 27001).
 - **Physical:** Shredding/certified destruction.

Records Archiving

5. Roles & Responsibilities

Role	Responsibility
DCC Specialist	Maintain retention schedule, oversee disposal.
Process Owners	Ensure records are archived post-activity.
IT Team	Secure digital storage/backups.

Records Archiving

6. Integration with PEO Processes

Process	Record Type	ISO 9001 Clause
3	Document control logs	7.5.3
12	As-built drawings	8.5.1
14	Field inspection reports	9.1.1

Records Archiving

7. Tools & Templates

7.1 Records Retention Policy Template

- Lists all record types, retention periods, and disposal methods.

7.2 Archival Checklist

Step	Completed (Y/N)	Verified By
Records tagged in PDM	☐ Yes ☐ No	DCC Specialist
Backup performed	☐ Yes ☐ No	IT Team

Records Archiving

8. Performance Metrics

KPI	Target
% records archived on time	100%
% disposal actions audited	≥20%

Records Archiving

9. Continuous Improvement

- **Annual Review:** Update retention periods based on legal changes.
- **Audits:** Verify compliance during internal audits (Step 11).

Implementation Workflow

Classify → 2. Store → 3. Retain → 4. Dispose.

Example Scenario

- **Record:** As-built drawings (Process 12).
- **Retention:** 10 years (per client contract).
- **Storage:** BIM 360 + 1 hardcopy in fireproof cabinet.
- **Disposal:** Shred hardcopy; delete digital files after 10 years.

ISO Certification

1. Objectives

- **Verify compliance** with ISO 9001:2015 requirements.
- **Identify and close gaps** before the official audit.
- **Train staff** on audit protocols and responses.

ISO Certification

2. Scope

- Covers all **22 PEO processes**, with focus on:
- **High-risk areas** (e.g., design control, subcontractor management).
- **Documented evidence** (e.g., records, procedures, training logs).

ISO Certification

3. Certification Readiness Workflow

3.1 Gap Analysis & Compliance Check

Task	Method	Responsible Role
Review QMS documentation	Compare processes to ISO 9001 clauses.	QA Manager
Verify record completeness	Check NCR logs, training records, audit reports.	DCC Specialist
Assess implementation	Interview staff; observe workflows.	Lead Auditor

Output: Gap report with corrective actions.

ISO Certification

3.2 Mock Audit (Internal)

- **Conduct a full-scope internal audit** (Step 11) covering:
 - **Documentation:** Are all procedures documented and followed?
 - **Records:** Are NCRs, training logs, and inspection reports complete?
 - **Process Effectiveness:** Are risks managed (Step 12)? Are suppliers evaluated (Step 14)?

Example Findings:

- **Minor:** Missing revision history on a shop drawing (Process 10).
- **Major:** No evidence of subcontractor evaluations (Process 6).

ISO Certification

3.3 Corrective Actions

- **Prioritize gaps** (e.g., fix major nonconformities first).
- **Assign actions** with deadlines (use NCR forms from Step 13).

3.4 Staff Training for Audit

- **Training Topics:**
 - How to answer auditor questions (stick to facts, provide evidence).
 - Where to locate records (e.g., PDM system paths).
- **Mock Interviews:** Role-play with process owners (e.g., BIM Manager for Process 7).

ISO Certification

3.5 Final Documentation Review

- Checklist for Certification Auditor:**

Document	Location	Owner
Quality Manual	PDM > QMS Folder	QA Manager
NCR Logs (Last 12 months)	PDM > Quality Records	DCC Specialist
Training Certificates	HR Drive	HR Manager

ISO Certification

4. Roles & Responsibilities

Role	Task
QA Manager	Lead gap analysis, coordinate mock audit.
Process Owners	Provide evidence for their processes.
Top Management	Approve resources for corrective actions.

ISO Certification

5. Integration with PEO Processes

Process	Audit Focus Area	ISO Clause
6	Subcontractor evaluation records.	8.4
10	Shop drawing approval workflows.	8.5.1
14	Field inspection compliance.	9.1.1

ISO Certification

6. Tools & Templates

6.1 Certification Readiness Checklist

Requirement	Compliant? (Y/N)	Evidence Location
Documented QMS manual	☐ Yes ☐ No	PDM/QMS/Manual.docx
Complete internal audits	☐ Yes ☐ No	Audit_Reports_2024

ISO Certification

6.2 Mock Audit Report Template

Finding	Process	Severity	Corrective Action
No supplier evaluation records	6	Major	Update procurement logs by [date].

ISO Certification

7. Performance Metrics

KPI	Target
% gaps closed before audit	100%
Staff trained on audit readiness	≥95%

ISO Certification

8. Continuous Improvement

- **Post-Audit Review:** Document lessons learned (Process 21).
- **Update QMS:** Refine procedures based on audit feedback.

Implementation Workflow

1. Gap Analysis → 2. Mock Audit → 3. Corrective Actions → 4. Staff Training → 5. Final Review.

PDCA : ACT

1. Objectives

- **Proactively enhance** process efficiency, quality, and compliance.
- **Leverage data** (audits, NCRs, KPIs) to drive decisions.
- **Foster a culture** of innovation and accountability.

PDCA : ACT

2. Scope

- Covers **all 22 PEO processes**, with focus on:
- **Recurring issues** (e.g., welding defects in Process 14).
- **Opportunities** (e.g., BIM automation in Process 7).
- **Regulatory/standard updates** (e.g., new AISC 360 edition).

PDCA : ACT

3. Continuous Improvement Workflow

3.1 Identify Improvement Opportunities

Source	Example	Linked Process
NCR Trends	30% welding defects (Process 14).	4, 13
Audit Findings	Slow RFI responses (Process 13).	11
Lessons Learned	Design clashes in BIM (Process 7).	21
Customer Feedback	Client requests faster approvals.	20

PDCA : ACT

3.2 Prioritize & Plan

- **Impact vs. Effort Matrix:**

- | **High Impact** | Low Effort → **Do Now** (e.g., update a checklist).

- | **High Impact** | High Effort → **Plan Project** (e.g., implement AI clash detection).

3.3 Implement Improvements

- **Small Changes:** Update procedures/work instructions (e.g., revise ITP template).
- **Large Projects:** PDCA (Plan-Do-Check-Act) cycles (e.g., PDM system upgrade)

PDCA : ACT

3.4 Monitor & Validate

- **KPIs:** Track pre/post-improvement metrics (e.g., NCR rate reduced by 15%).
- **Audits:** Verify effectiveness in next internal audit (Step 11).

PDCA : ACT

4. Roles & Responsibilities

Role	Responsibility
QA Manager	Lead improvement initiatives, report to management.
Process Owners	Propose/implement process-specific improvements.
Top Management	Allocate resources, review annual progress.

PDCA : ACT

5. Integration with PEO Processes

Process	Improvement Example	ISO Clause
7	Implement AI clash detection (ISO 19650).	8.3
10	Automate shop drawing review checklist.	8.5.1
14	Predictive analytics for weld inspections.	9.1.1

PDCA : ACT

6. Tools & Templates

- 6.1 Improvement Register (Excel)

ID	Improvement	Process	Priority	Status
IMP-01	BIM automation for clash checks	7	High	In Progress

PDCA : ACT

6.2 PDCA Template

- **Plan:** Define goal (e.g., reduce NCRs by 20%).
- **Do:** Pilot new welding inspection protocol.
- **Check:** Compare defect rates pre/post.
- **Act:** Standardize if successful.

PDCA : ACT

7. Performance Metrics

KPI	Target
% annual improvement targets met	≥80%
Employee suggestions implemented/year	≥10

PDCA : ACT

8. Continuous Improvement Culture

- **Monthly Improvement Meetings:** Cross-functional team reviews opportunities.
- **Reward System:** Recognize staff for successful improvements.
- **Training:** Teach problem-solving (e.g., Six Sigma, 5 Whys).

Implementation Workflow

1. Identify → 2. Prioritize → 3. Implement → 4. Monitor → 5. Standardize.

PDCA : ACT

- **Example Scenario**
- **Issue:** Recurring design errors (Process 8).
Improvement:
- **Solution:** Mandate peer reviews before submission.
- **Result:** 40% reduction in design NCRs.

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