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موسسه مهندسی و مدیریت ساخت

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Alavipour Construction Engineering and Management Institute

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Establishing Project Engineering Office in Construction Projects

Session 2

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Definition

- The owner's initial plan on **how to deliver** the project is called the project delivery method (PDM).
- A *project delivery method defines the **relationships**, **roles**, and **responsibilities** of project team members and the **sequence of activities** required to complete a project(Gibson and Walewski)*
- *At the onset of any project, an owner has two options to provide services to the project, **self-performing** them or **contracting them out.***
- The higher the number of contracts used to deliver a project, the higher the need for coordination to keep everyone aligned to the same project objectives.

Definition

- When a service is contracted out, the owner will need to **clearly convey** their **expectations** through a **written contractual agreement** that will describe the **contract's scope of work** and may **package** more than **one service**.
- Contracting out may occur in different ways, but it usually involves **procuring external expertise** for the project, which can be represented **as a cycle** that is **repeated** as many times as needed to ***deliver the whole project***.
- The selected PDM will **dictate** if each **iteration** will occur **sequentially** or **concurrently** to other iterations. **Concurrency** increases the need for **coordination** among contracted providers.

Definition

- Consequently, the owner's decision to go with a **specific PDM *strongly affects*** the **role** and **responsibilities** of **all project team members** and **how** they will work together.
- This decision will also affect what portion of the life cycle will be affected, **how many external entities will be involved** in **delivering** this portion, and **when** they will be selected and perform their services under a contractual agreement.
- For instance, if an owner decides to have **two separate** firms delivering **design** and **construction** services, each firm will enter into **a separate contract** with the **owner** to deliver their scope of work.

Definition

A **Project Delivery Method (PDM)** defines how a project is:

- ☑ Planned
- ☑ Designed
- ☑ Procured
- ☑ Constructed
- ☑ Sometimes operated and maintained

It governs the **contractual relationships** among the Owner, Designer, Contractor, and other stakeholders.

Multiple(Separate) vs. Single Contracting

Does the owner sign one contract (single contracting) or multiple contracts (separate contracting)?

This has huge implications for:

- *Risk allocation*
- *Cost certainty*
- *Project speed*
- *Level of Owner involvement*
- *Complexity of coordination*

Definition

The owner **signs separate contracts** for **design**, **construction**, and sometimes **specialty trades** or **suppliers**. The owner acts as the **project integrator**.

☑ Core Principle: Owner Retains Control

- Owner directly manages the relationships(interfaces) between:
  - Designer
  - Contractor(s)
  - Consultants

Advantages

☑ **Greater Owner Control**

- More influence over design details and decisions

☑ **Transparency**

- Competitive bidding for each contract

☑ **Flexibility**

- Owner can choose different specialists for each part of the project

☑ **Cost Savings**

- No single-entity markups for risk transfer

Disadvantages

❌ **Longer Schedules**

- Sequential processes (design fully completed before bidding)

❌ **Higher Coordination Burden**

- Owner must manage communication between designer and contractors

❌ **Increased Owner Risk**

- Gaps or overlaps in scope may cause disputes or cost overruns

❌ **Complex Claims Management**

- Designer and contractor may blame each other for issue

Design–Bid–Build (DBB)

The **most traditional** method worldwide.

- **Linear sequence**:
  1. Complete design
  2. Bid out to contractors
  3. Award construction contract to lowest qualified bidder

Features:

a. Clear separation of responsibilities

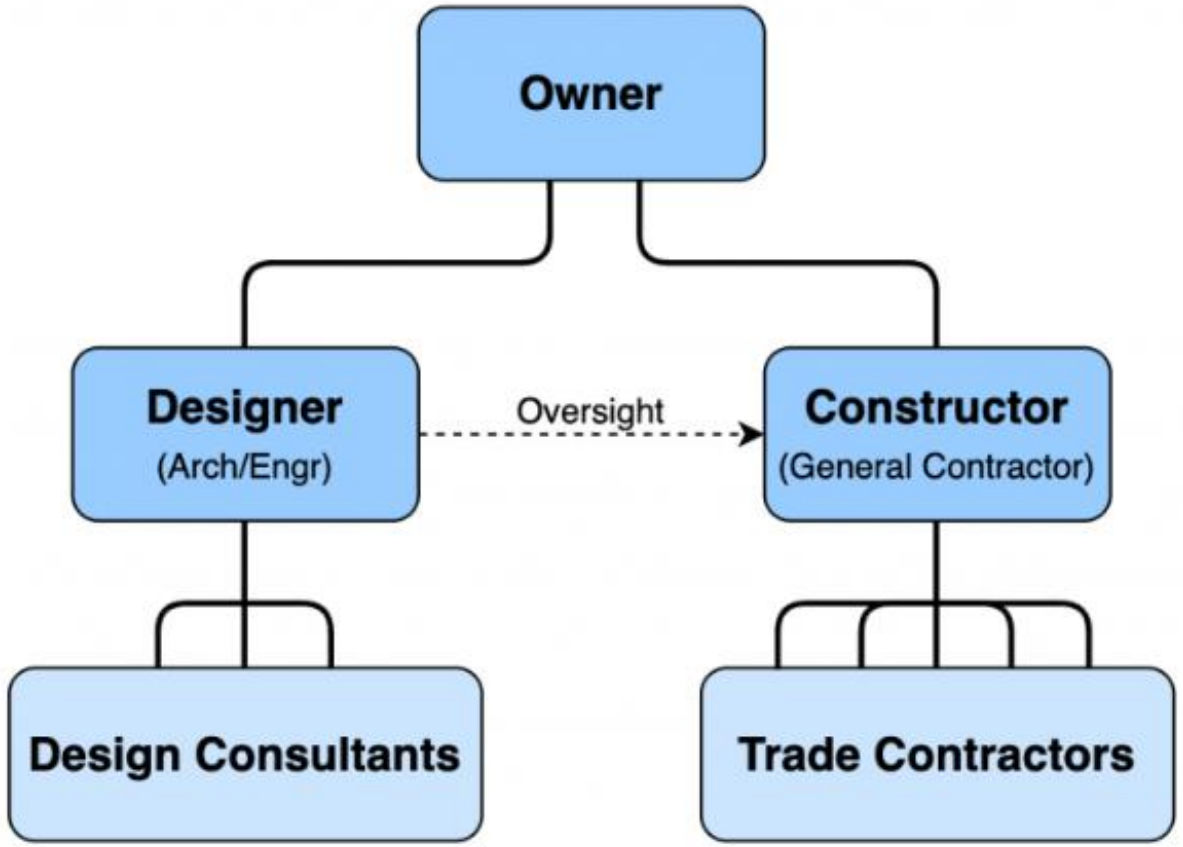
b. Well-established legal precedents

c. Predictable process

Typical Sectors:

→ Public sector buildings, roads, municipal works

Design–Bid–Build (DBB)



Construction Management as Agent (CMA)

- Owner hires a Construction Manager (CM) as a **professional advisor** during design and construction.
- CM **does not hold trade contracts**—the **owner does**.

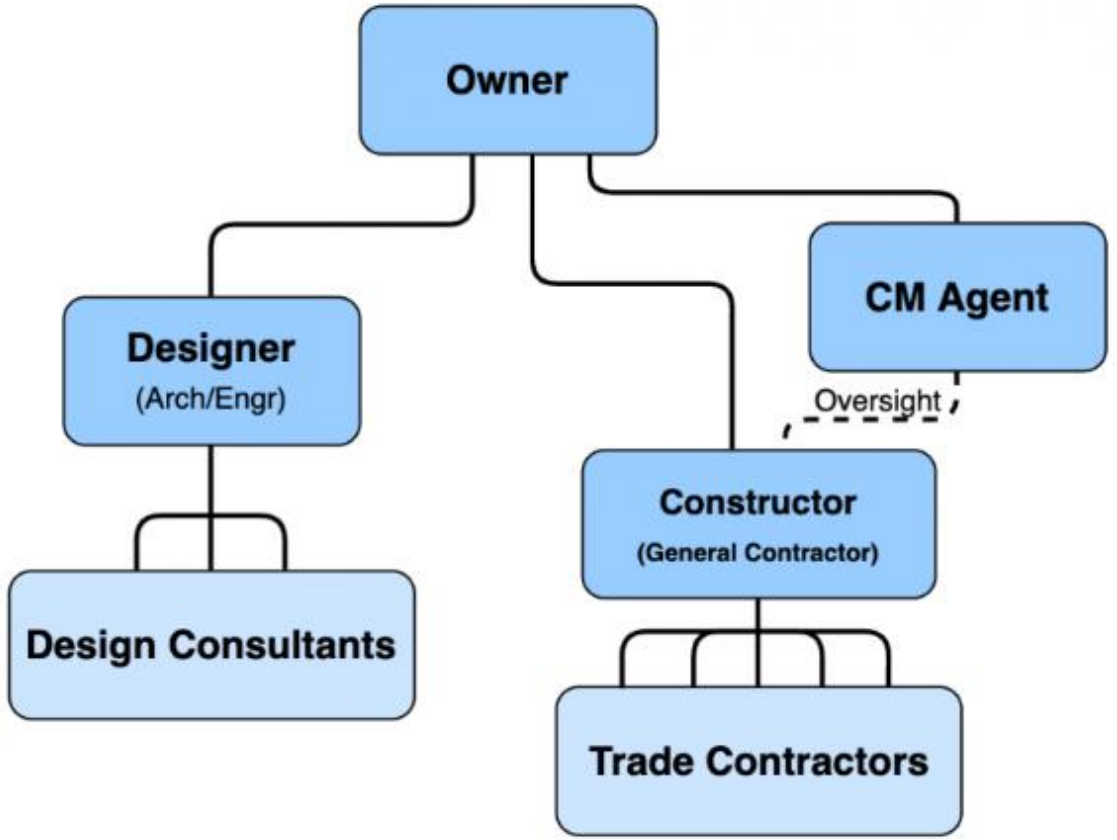
Features:

a. No financial risk for CM regarding cost overruns.
b. CM is paid a professional services fee (no markup on construction costs).
c. Owner carries all construction cost risk.
d. High Owner control over trades and contracts.

Typical Sectors:

→ Public sector buildings (schools, government buildings), Higher education campuses, Healthcare projects (hospitals, labs), Cultural facilities (museums, performing arts), Large renovations or additions where early design flexibility is needed, Projects with multiple phases or fast-tracking

Construction Management as Agent (CMA)



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Construction Manager at Risk (CMR)

- Owner hires a Construction Manager (CM) who **provides preconstruction services** (like CMA) **and also becomes the General Contractor** during construction.
- CM **holds trade contracts** and **manages** construction directly.
- The CM typically offers a **Guaranteed Maximum Price (GMP).**

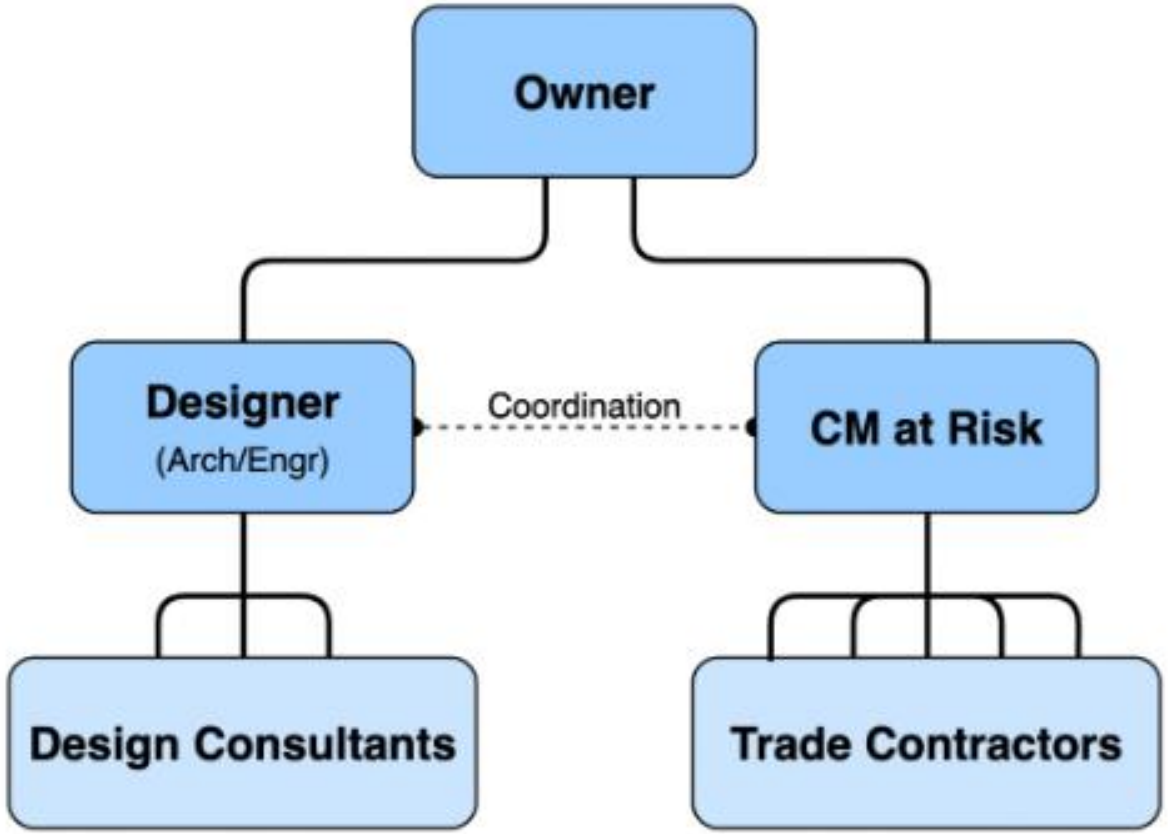
Features: The CM takes on:

- Cost risk
- Schedule commitments
- Performance risk

Typical Sectors:

→ **Healthcare** (hospitals, specialized facilities), Higher education (universities, dorms)Commercial buildings (offices, mixed-use), Sports facilities (stadiums, arenas), Government buildings where laws permit CMR, Industrial projects needing tight schedules and cost certainty

Construction Manager at Risk (CMR)



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Multiple Prime Contracting

- Owner contracts **directly** with **several specialty contractors** (e.g., mechanical, electrical, structural).
- Often used in **public works** to control costs and **avoid general contractor markups**.

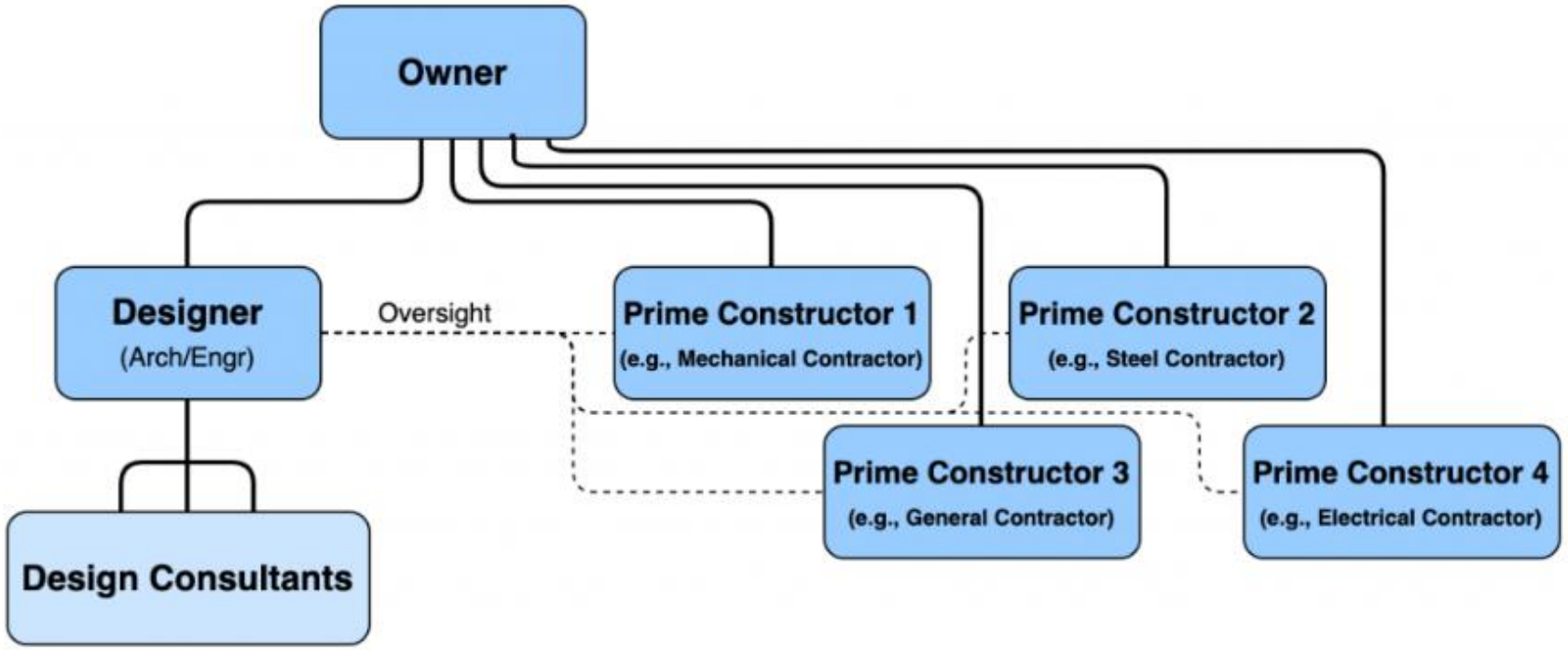
Features:

a. Cost savings on general contractor fees
b. Higher owner involvement
c. Owner assumes coordination role

Typical Sectors:

→ Institutional projects, public projects needing complex phasing

DBB-Multiple Prime Contracting



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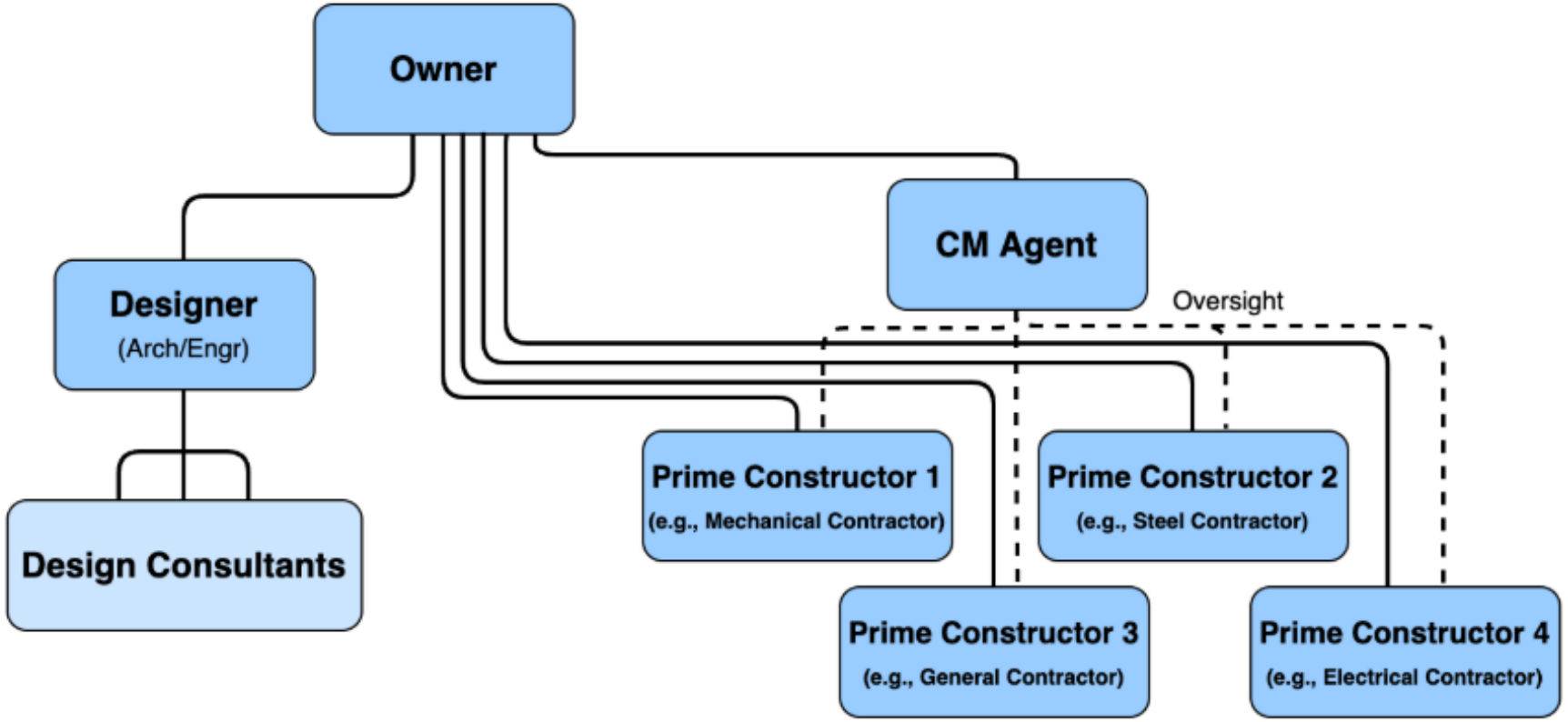
CMA-Multiple Prime Contracting



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Definition

The Owner signs **ONE contract** with a **single entity** responsible for **delivering the entire project** (or most of it). The single entity either **self-performs** the work or **manages subcontractors but holds the ultimate responsibility.**

☑ Core Principle: Single Point of Responsibility

The single entity is **accountable** for **design**, **procurement**, **construction**, **commissioning**, and sometimes **operations**.

Advantages

☑ **Speed & Efficiency**

- Overlapping design and construction phases
- Faster project completion

☑ **Reduced Owner Risk**

- Single point of accountability
- Fewer disputes between design and construction

☑ **Cost Certainty**

- Lump sum, GMP, or fixed-price contracts
- Better cost predictability once scope is defined

Advantages

☑ **Improved Coordination**

- Integrated teams reduce gaps between design and construction
- *Fewer surprises during construction*

☑ **Innovation**

- Contractors may propose more efficient designs and method

Disadvantages

❌ **Less Owner Control**

- Owner relinquishes direct control over detailed design decisions

❌ **Higher Costs**

- Contractors include risk premiums for lump-sum guarantees

❌ **Scope Disputes**

- Poorly defined owner requirements can lead to conflicts

❌ **Potential for Contractor Dominance**

- Contractor may prioritize cost savings over owner's preferences

Design–Build (DB)

- Owner contracts with a single firm for both design and construction.
- Contractor may hire an **in-house design** team or **subcontract the design**.
- Suitable for many types of buildings and infrastructure.

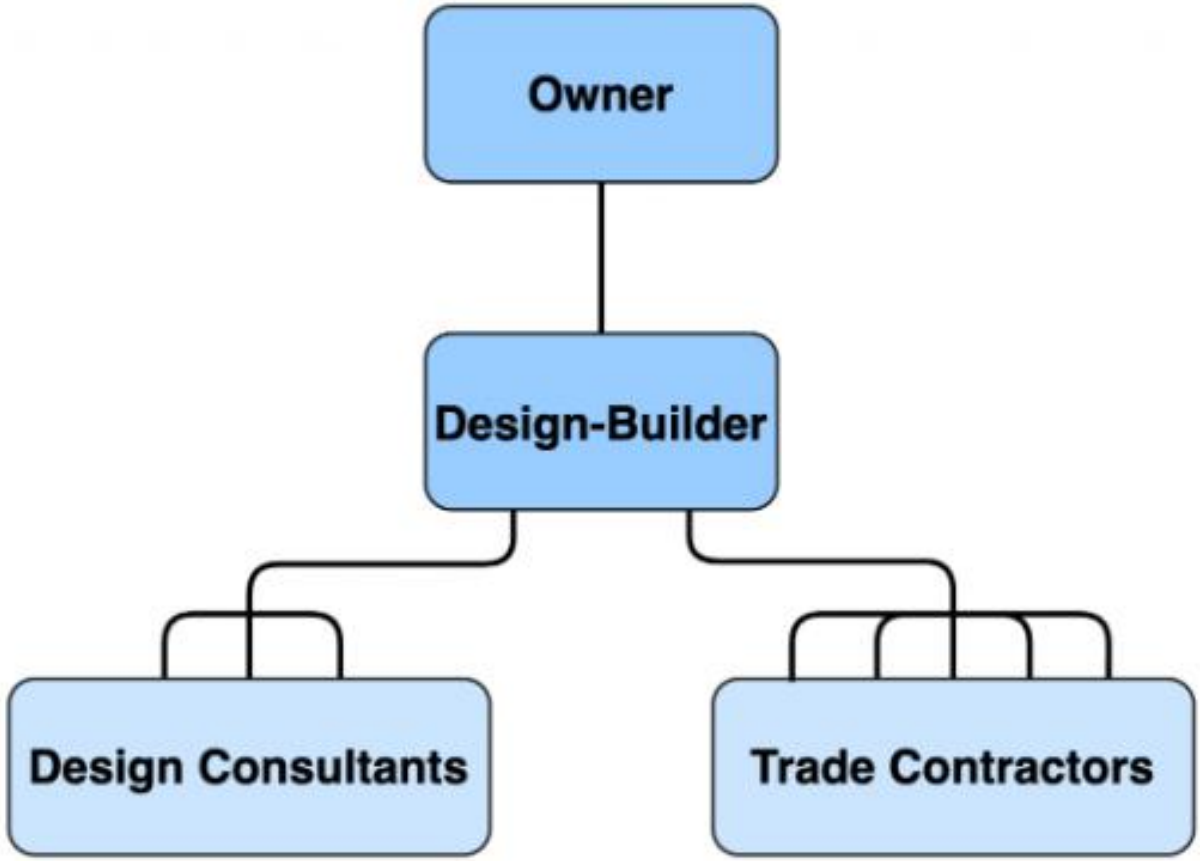
Features:

- Single contract for design and construction
- Early cost certainty
- Allows for fast-track delivery

Typical Sectors:

→ Commercial buildings, schools, hospitals, light industrial facilities

Design–Build (DB)



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Progressive/Competitive/Bridging Design–Build | (PDB) (CDB) (BDB)

- Hybrid of traditional DB.
- Contractor is selected based on **qualifications** before a **final price is determined**.
- Design and pricing developed collaboratively with the owner.

Features:

- Flexible approach
- Promotes trust and transparency
- Often used for complex projects where scope is evolving

Typical Sectors:
→ Commercial buildings, schools, hospitals, light industrial facilities

☑ Comparison Table: Progressive DB vs. Competitive DB vs. Bridging DB

Aspect	Progressive DB	Competitive DB	Bridging DB
Selection Method	Qualifications-Based Selection (QBS), possibly with prelim cost factors	Competitive RFP—technical + price scoring	Competitive RFP based on bridging documents
Design at Time of DB Award	Minimal or conceptual design	Partial (10%–30%) or conceptual design included in RFP	(60%-90%) design prepared by bridging architect
Price Certainty at Award	No → price negotiated later	Yes → fixed price or GMP proposed	Yes → fixed price or GMP bid based on bridging docs
Collaboration Level	High collaboration between owner & DB team during design	Limited collaboration; more traditional procurement	Medium; owner sets design early, less DB collaboration post-award
Owner Design Control	Medium-High via collaboration	Low-Medium; scope fixed at RFP	High; bridging architect defines design intent upfront
Speed to Start Construction	Fastest → early start before design fully complete	Fast → but requires defined RFP scope	Medium → needs bridging documents first
Risk Distribution	Shared initially; shifts to DB after price set	Mostly shifted to DB once awarded	Mostly shifted to DB after award
Flexibility During Design	Very flexible; changes managed collaboratively	Low flexibility once contract awarded	Medium flexibility via bridging docs; less once DB awarded
Best For	Complex, undefined or evolving projects	Well-defined projects needing price competition	Owners needing design control plus competitive pricing

Design–Build–Operate–Maintain (DBOM)

- Contractor designs, builds, operates, and maintains the facility for a specified period (often 10–30 years).
- Transfers long-term performance risk to the private sector.

Features:

- Life-cycle cost focus
- Good for public infrastructure
- Complex contracts

Typical Sectors:
→ Toll roads, water treatment plants, public transit systems

Engineering–Procurement–Construction (EPC)

- Common in industrial, power, oil & gas, and infrastructure projects.
- Contractor responsible for design, procurement of materials/equipment, and construction.
- Delivers a turnkey facility, ready for operation.

Features:

- Typically lump-sum or fixed-price
- Strong performance guarantees (e.g. output, efficiency)
- Heavy contractor risk

Typical Sectors:
→ Power plants, refineries, chemical plants, large infrastructure projects

Integrated Project Delivery (IPD)

- All major parties (owner, designer, contractor) enter a **single multiparty contract.**
- Shared risks, shared rewards.
- **Extreme collaboration** with shared project goals.
- based on **lean construction principles**

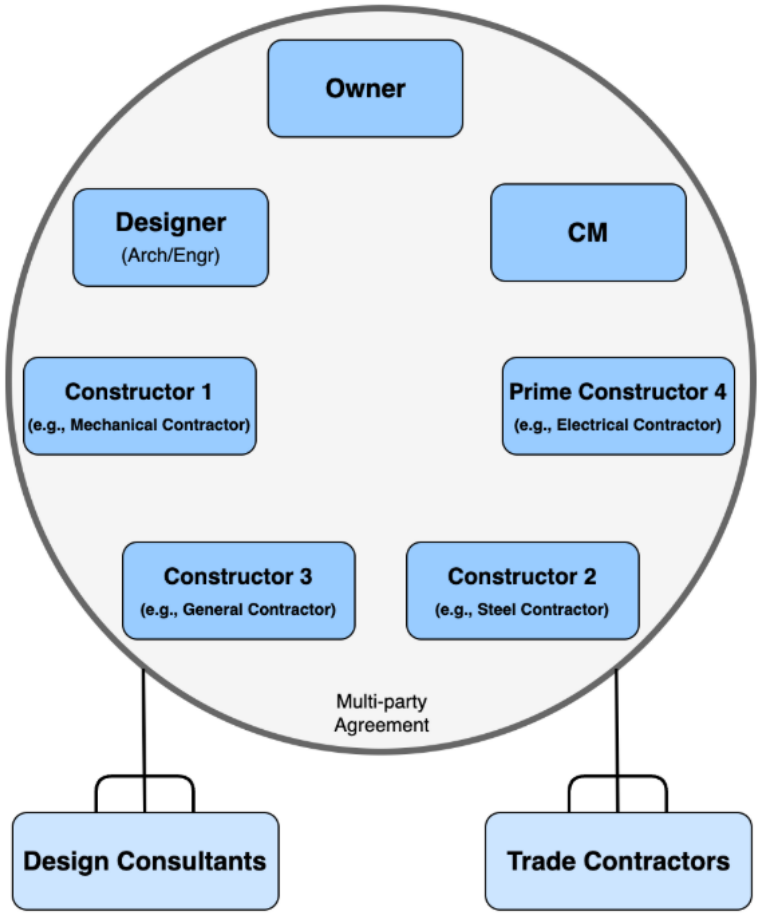
Features:

- Open-book financials
- **Joint decision-making**
- Aligns **incentives** across all stakeholders

Typical Sectors:

→ Hospitals, complex institutional projects

Integrated Project Delivery (IPD)



Integrated Project Delivery (IPD)

Aspect	IPD as Delivery Method	IPD as Philosophy
Multi-Party Agreement	Single contract binding all key participants	Traditional contracts with collaborative principles
Target Cost Approach	Open-book with shared savings/losses	Traditional payment with incentives
Collaborative Environment	Co-located team in Big Room setting	Periodic meetings and virtual collaboration
Early Involvement	All key participants from project start	Progressive involvement as needed
Decision Making	Unanimous core team decisions	Traditional hierarchy with team input
Lean Management	Integrated Last Planner System and continuous improvement	Selected lean tools based on project needs
Risk/Reward Sharing	Full sharing among all parties	Limited risk-sharing within traditional bounds

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IDP and Lean Construction

IPD and lean construction principles naturally complement each other. While IPD provides the collaborative framework, lean practices enhance each phase to reduce waste and maximize efficiency.

Common lean tools in IPD projects include:

- Value stream mapping during conceptualization phase
- Pull planning in criteria design process
- Last Planner System during design and construction
- Continuous improvement throughout the project life-cycle

IDP and Lean Construction

Aspect	Pros	Cons
Collaboration	Early involvement enables integrated problem-solving from design through construction	Demands continuous commitment to collaboration and transparency
Team Structure	Shared risk and reward structure aligns team incentives with project outcomes	Requires cultural shift from traditional project delivery mindset
Cost Management	Target cost approach with open-book financial management prevents overruns	Initial administrative costs higher than traditional delivery methods
Project Framework	Multi-party agreements enhance accountability and clear responsibilities	Multi-party agreements require significant legal expertise and setup time
Applicability	Integrated teams reduce design-related changes by addressing issues early	Implementation challenges may limit adoption in smaller projects
Efficiency	Lean practices integration maximizes efficiency throughout project lifecycle	Success depends on all participants' readiness to adopt new processes

Public–Private Partnerships (P3/PPP)

- Public-private partnerships involve **collaboration** between a **government agency** and a **private-sector** company that can be used to **finance**, **build**, and **operate** projects, such as *public transportation networks, parks, and convention centers*.
- Financing a project through a public-private partnership can allow a project to be completed **sooner** or make it a possibility in the first place.

Public–Private Partnerships (P3/PPP)

- Public-private partnerships allow large-scale government projects, such as roads, bridges, or hospitals, to be completed with private funding.
- These partnerships work well when private-sector technology and innovation combine with public-sector incentives to complete work on time and within budget.
- Risks for private enterprise include cost overruns, technical defects, and an inability to meet quality standards, while for public partners, agreed-upon usage fees may not be supported by demand—for example, for a toll road or a bridge.

Public–Private Partnerships (P3/PPP)

- Despite their advantages, public-private partnerships are often criticized for blurring the lines between legitimate public purposes and private for-profit activity, and for perceived exploitation of the public due to self-dealing and rent-seeking that may occur.

Public–Private Partnerships (P3/PPP)

- Private entity **finances**, **designs**, **builds**, **operates**, and **maintains** public assets.
- Long-term agreements (20-50 years).
- Private partner recovers investment through **availability payments** or **user fees**.

Features:

- Shifts financial and operational risk to private sector
- Encourages innovation and efficiency
- Requires strong legal/regulatory framework

Typical Sectors:

→ Highways, bridges, public transit, schools, hospitals

Public–Private Partnerships (P3/PPP)

The Sydney Desalination Plant located in New South Wales is an example of a PPP project.

Modular / Offsite Single-Entity Delivery

- Off-site construction involves the process of **planning**, **designing**, **fabricating**, **transporting** and **assembling** building elements for **rapid site assembly** to a **greater degree of finish** *than* in traditional piecemeal *on-site construction*.
- Off-site building includes a range of materials, scales and systems, digital software, methods of manufacture and fabrication, and innovations in social and technological integration.
- Off-site outputs include **componentized, panelized,** and **modularized** elements deployed in the service of structural, enclosure, service and interior partition systems.
- An optimizing strategy of off-site is to **integrate these systems** and **supply chain through research**, **design**, **testing**, and **prototyping**.

Modular / Offsite Single-Entity Delivery

- One modular firm designs, manufactures, delivers, and sometimes installs modular units.
- Single contract for offsite and onsite work.

Features:

- Faster schedule
- Factory-controlled quality
- Ideal for repetitive structures

Modular / Offsite Single-Entity Delivery

Comparison Table – Single vs. Separate Contracting

Aspect	Single Contracting	Separate Contracting
Contracts	One contract with a single entity	Multiple contracts with separate parties
Risk Transfer	High to contractor	Retained by owner
Speed	Faster (overlapping phases)	Slower (sequential)
Owner Control	Lower	Higher
Cost Certainty	Higher, lump sum possible	Variable, dependent on bids
Complexity	Simplified for owner	Owner must coordinate
Typical Methods	DB, EPC, IPD, P3	DBB, CMA,CMR, Multiple Prime
Sectors	Industrial, large infrastructure, fast-track projects	Public buildings, simple commercial, municipal works

Which Method Should Owners Choose?

Consider Single Contracting if:

- Speed is crucial
- Single point of accountability desired
- Owner prefers less direct involvement
- Complex industrial/infrastructure project

Consider Separate Contracting if:

- Budget flexibility is critical
- Owner can handle coordination risks
- Owner wants maximum control
- Project has simple or well-understood scope

How PDM Affects PEO Structure?

LEGEND

Symbol	Meaning
⬆	Large team / intensive involvement
➤	Medium-sized team / moderate involvement
⬇	Small team / minimal involvement

SEPARATE CONTRACTING PDMs

PDM	Office PEO	Site PEO	Special Notes
DBB	⬆ Full design responsibility before construction; large front-loaded design team	➤ Medium site team; RFI/submittal reviewers	Clear separation of design and build phases
CMA	⬆ Owner's engineering arm; involved in predesign, design review, bid support	➤ Limited to oversight and response to CM queries	PEO mainly interfaces with Owner and CM
CMR	⬆ Independent designer; supports constructability reviews with CM input	➤ Small reactive team; responds to CM's needs	Coordination with CM is key; less direct execution
Multiple Prime	⬆ Strong office coordination roles; interfaces with multiple contractors	⬆ Site team must manage fragmented contractor responsibilities	Requires dedicated interface engineers & scheduler

How PDM Affects PEO Structure?

SINGLE CONTRACTING PDMs

PDM	Office PEO	Site PEO	Special Notes
Design-Build (DB)	➤ Mid-sized team, active across design & construction phases; manages rolling design releases, coordinates closely with construction.	➤ Strong site team, active from early stage; resolves fast-track design issues, supports direct execution.	Office and Site teams highly collaborative.
Progressive DB	↑ Larger team early for concept/criteria development; evolves with project	↑ Strong technical support from start, involved in validating design packages	Phased design involvement; both teams grow together
Competitive DB	↑ Large upfront design team to compete; may downsize post-award	➤ Medium, support bid compliance, site support if awarded	PEO may shift roles quickly after selection
Bridging DB	↑ Heavy early design input to prepare bridging docs; not fully responsible for detail design	➤ Medium site staff; oversight & coordination	Site PEO ensures DB contractor's compliance with bridging design intent

How PDM Affects PEO Structure?

SINGLE CONTRACTING PDMs

PDM	Office PEO	Site PEO	Special Notes
DBOM	⬆ Office team must address O&M and lifecycle performance; design includes durability, access, maintenance	➤ Smaller but engaged longer; supports handover & O&M phase	Requires Facilities Engineering roles in PEO
EPC	⬆ Very large, multidisciplinary; tightly integrated with procurement & vendor engineering	⬆ Equally strong site team; manages vendor data, inspections, interface control	Office & Site PEO both operate with high authority and speed
IPD	➤ Medium, co-located with other parties; highly collaborative roles	➤ Medium, integrated into shared planning & decisions	Roles blur — PEO shares tasks with contractor, owner
PPP	⬆ Office PEO handles design + financial compliance, value-for-money reviews	➤ Smaller but extended through lifecycle (e.g. for FM handover)	Must integrate finance, lifecycle costing, and risk roles
Modular/Offsite SED	➤ Mid-sized team focused on offsite integration, module connection, and pre-planning	➤ Strong early involvement in site readiness, module placement	Site PEO must align civil/foundation with modular specs

Question

Now that we become familiar wit ISO9001:2015 and PDMs …

By Which Roadmap, Our PEO will have a **fully functional**, **ISO 9001:2015-compliant QMS tailored** to **DBB projects(Example)** and capable of delivering **consistent engineering quality** and **client satisfaction?**

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)	9. Implement Document Control System	10. Develop Training Programs	11. Establish Internal Audit Program	12. Manage Risks and Opportunities
13. Establish Nonconformance Management	14. Implement Supplier Evaluation	15. Perform Management Reviews	16. Archive and Retain Records	17. Prepare for Certification	18. Continuous Improvement

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1. Understand Requirements and Context

1.1. Study ISO 9001:2015

1.2. Identify:

- Client requirements
- Legal/regulatory requirements
- Company strategic goals

1.3. Define PEO's role in the DBB environment.

1. Identification of Interested Parties

1- PEO Undestanding Requirements and Context – English
1- PEO Undestanding Requirements and Context – Persian

2. Define the PEO Organizational Structure

2.1. Develop an organizational chart:

Office PEO

Site PEO

2.2. Assign roles and responsibilities.

2.3. Write Job Descriptions (JDs) for each role.

Iso Clause 5.3. Organizational roles, responsibilities and authorities

Clause 5.3 of ISO standards (like ISO 9001, ISO 27001, and ISO 45001) **mandates that *organizations clearly define and communicate roles, responsibilities, and authorities related to their management systems*** (such as quality, information security, or occupational health and safety). This **ensures** that everyone **understands** their **duties**, can **effectively** carry them out, and that there is **accountability** for **achieving** the **system's objectives**.

Iso Clause 5.3. Organizational roles, responsibilities and authorities

In essence, ISO 9001 Clause 5.3 ensures that:

- There **is no ambiguity** about **who** is **responsible** for **which aspects** of the **QMS**.
- Processes are **efficient** and **effective**.
- Customer expectations are **met**.
- The QMS is **properly maintained** and **improved**.
- Everyone **understands** their **role** and can **contribute** to the overall **success** of the **system**.

OBS

- Organization Breakdown Structure (OBS) can be defined as a **framework** or **hierarchical representation** of **different roles** within an organization, their **responsibilities**, and **accountability**.
- OBS can be implemented as a tool to manage the authorized work defined within the scope **statement** of the **project**.

How Should the best OBS be Choose for PEO?

A. *Understand Project Delivery Methods (PDMs)*

B. *Define Key Work Functions*

C. *Consider Project Scale & Complexity*

D. *Align with WBS and Cost Breakdown Structures*

E. *Balance Centralization vs. Project-based Teams*

F. *Plan for Flexibility and Scalability*

G. *Reflect Stakeholder Needs*

H. *Standardization vs. Customization*

A. Understand Your Project Delivery Methods (PDMs)

Different PDMs shape how a PEO should be structured:

Design-Bid-Build (DBB)

- OBS often aligned with disciplines (civil, electrical, mechanical)
- Clear separation between design and construction teams

Engineering, Procurement, Construction (EPC)

- OBS often aligned with project phases (engineering, procurement, construction)
- Integration across disciplines is critical

A. Understand Your Project Delivery Methods (PDMs)

Design-Build (DB) / Progressive DB / Bridging DB

- OBS may be more integrated across functions for collaboration
- Less siloed discipline structure

Construction Management (CMAR, CMA)

- OBS may include specialized roles for constructability reviews, cost control, or fast-tracking

→ **Tip:** Your OBS should reflect how projects are executed under your chosen PDM.

B. Define Key Work Functions

Map out the core functions your PEO performs, such as:

- Engineering Design (Civil, Structural, MEP, Process, etc.)
- Document Control
- BIM / CAD Management
- Procurement Engineering
- Planning & Scheduling
- Cost Control / Estimating
- Quality Assurance
- HSE Engineering
- Technical Coordination / Interface Management

The OBS should mirror these functions if they're distinct departments or teams.

C. Consider Project Scale & Complexity

- Small projects → simpler OBS, possibly discipline-based
- Large/complex projects → matrix or multi-dimensional OBS (discipline, phase, project, region)

D. Align with WBS and Cost Breakdown Structures

A good OBS aligns neatly with your:

- **Work Breakdown Structure (WBS)**
- **Cost breakdown structure (CBS)**

This makes it easier to:

- Assign responsibilities
- Track costs
- Report progress
- Manage resources

E. Balance Centralization vs. Project-based Teams

Centralized OBS

- Functional departments serve multiple projects
- Better resource optimization

Projectized OBS

- Dedicated teams per project
- Faster response, higher ownership

→ **Hybrid is common:** e.g. centralized expertise but dedicated project managers and leads.

F. Plan for Flexibility and Scalability

Good OBS designs allow:

- Scaling up/down with workload
- Adding new disciplines
- Handling diverse project types
- Rigid structures hurt adaptability in dynamic industries like EPC

G. Reflect Stakeholder Needs

OBS should be clear for:

- Internal staff
- Clients
- Partners
- Auditors (e.g. for ISO 9001)

E.g. client wants single point of contact → OBS should include roles like Project Engineering Manager (PEM) or Engineering Coordinator.

H. Standardization vs. Customization

Many companies have a **standard OBS template** but customize it per project. The “best” OBS often combines:

- Company standards (consistency)
- Project-specific tailoring (fit for purpose)

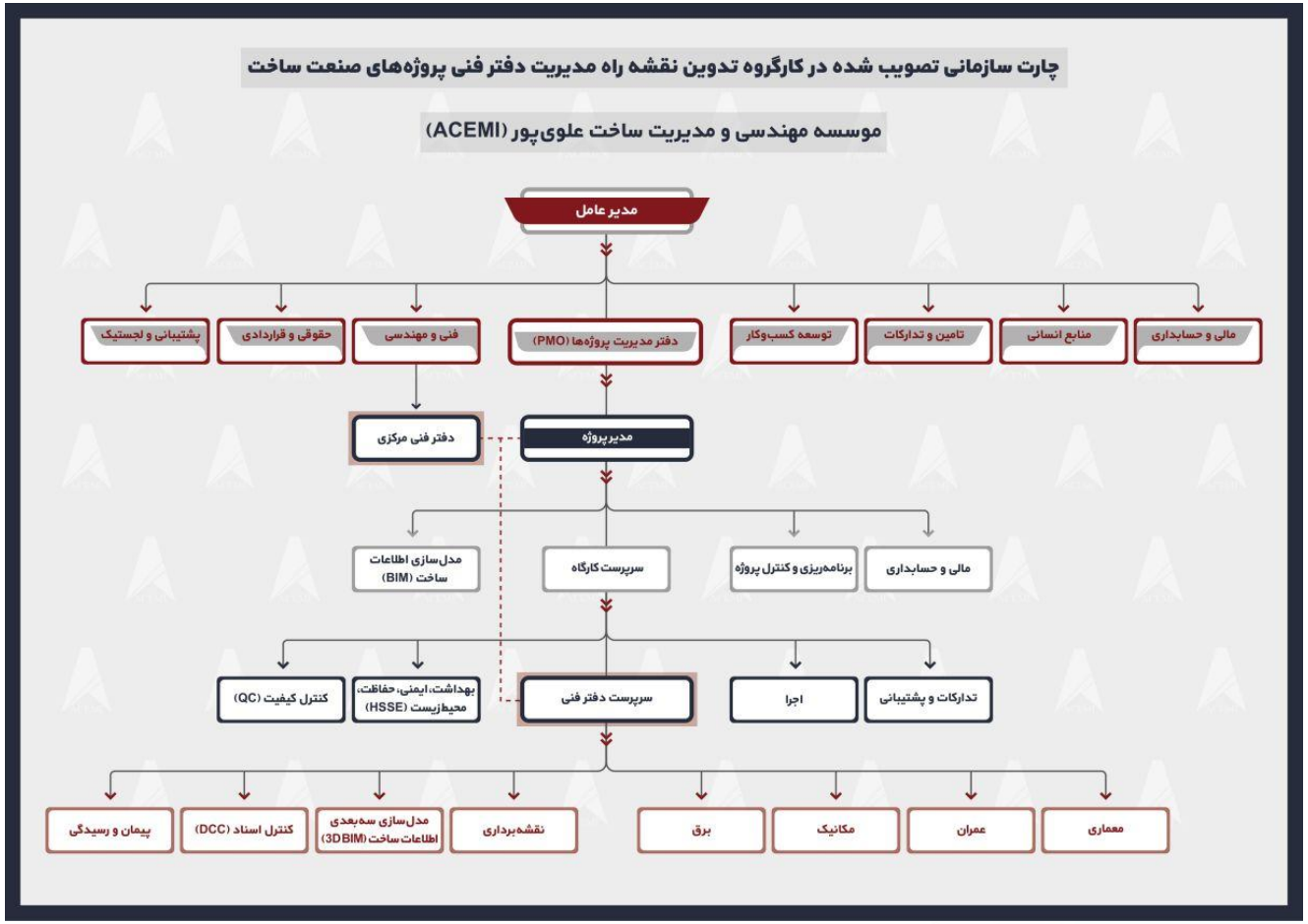
Org Charts and Job Descriptions(Approved By Alavipour PEO Workgroup)

- بعد از یکسال همفکری و تلاش مستمر **چارت سازمانی مصوب پیشنهادی** و همچنین **شرح خدمات و مسئولیت های مصوب پیشنهادی** نیروهای دفتر فنی توسط **کارگروه دفتر فنی موسسه علوی پور** تدوین گردید.
- فایل چارت سازمانی و شرح خدمات بر اساس **Context** عمومی پروژه های ساخت در کشور تهیه شده است و میتواند بعنوان راهنمائی جهت ساختاردهی و همچنین تدوین شرح خدمات مبنای عمل قرار گیرد.
- سپس بر اساس نیازمندی های دانشی مطرح شده در شرح خدمات مصوب ، نقشه راه آموزشی جهت استقرار دفتر فنی تدوین شد تا در مرحله اول نحوه نگرش به ساختار دفتر فنی و متد پیاده سازی آن و سپس تکنیک های پایه ای مانند نقشه خوانی، متره و برآورد و ... بصورت اصولی آموزش داده شود.
- این موسسه قصد دارد در آینده با توسعه آموزش های مرتبط با نیازمندی های دانشی دفاتر فنی گام های جدیدی در نحوه نگرش به دفتر فنی، استقرار آن و بهبود مستمر عملکرد این واحد بردارد.

Roadmap – Step2 - Define the PEO OBS - Selecting Best PEO OBS

Session 2

OBS(Approved By Alavipour PEO Workgroup)



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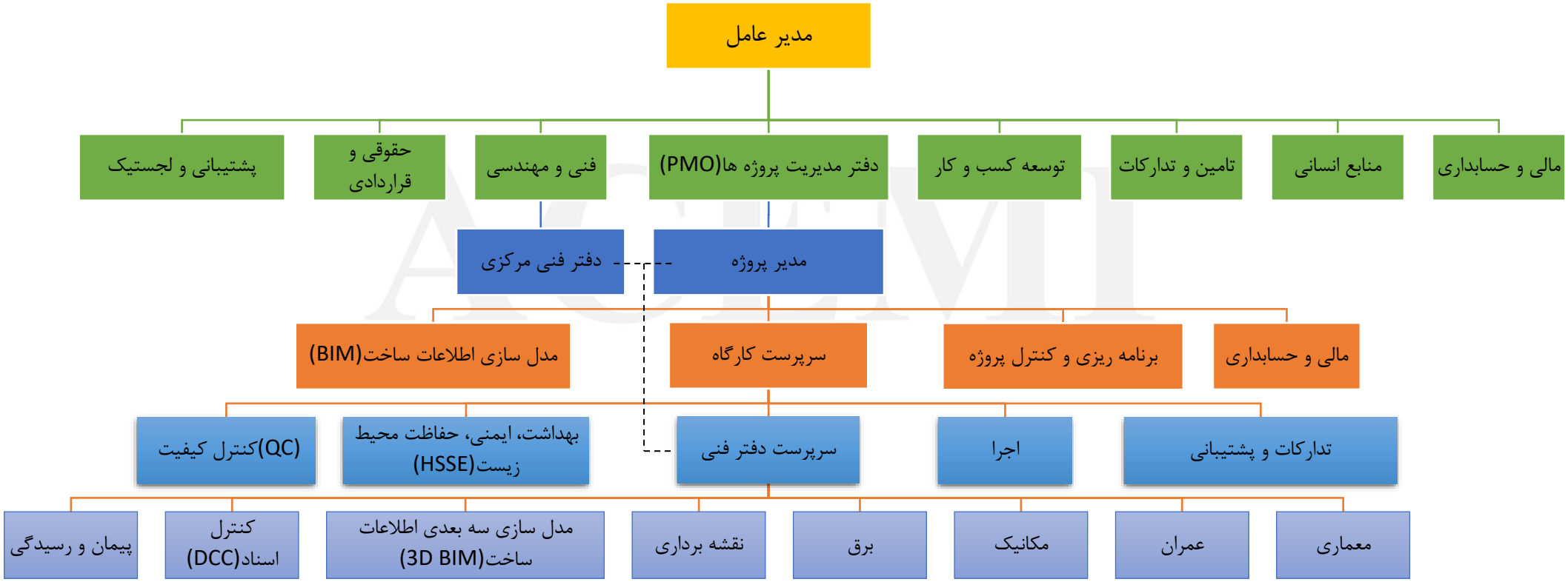
2.1.Develop an organizational chart



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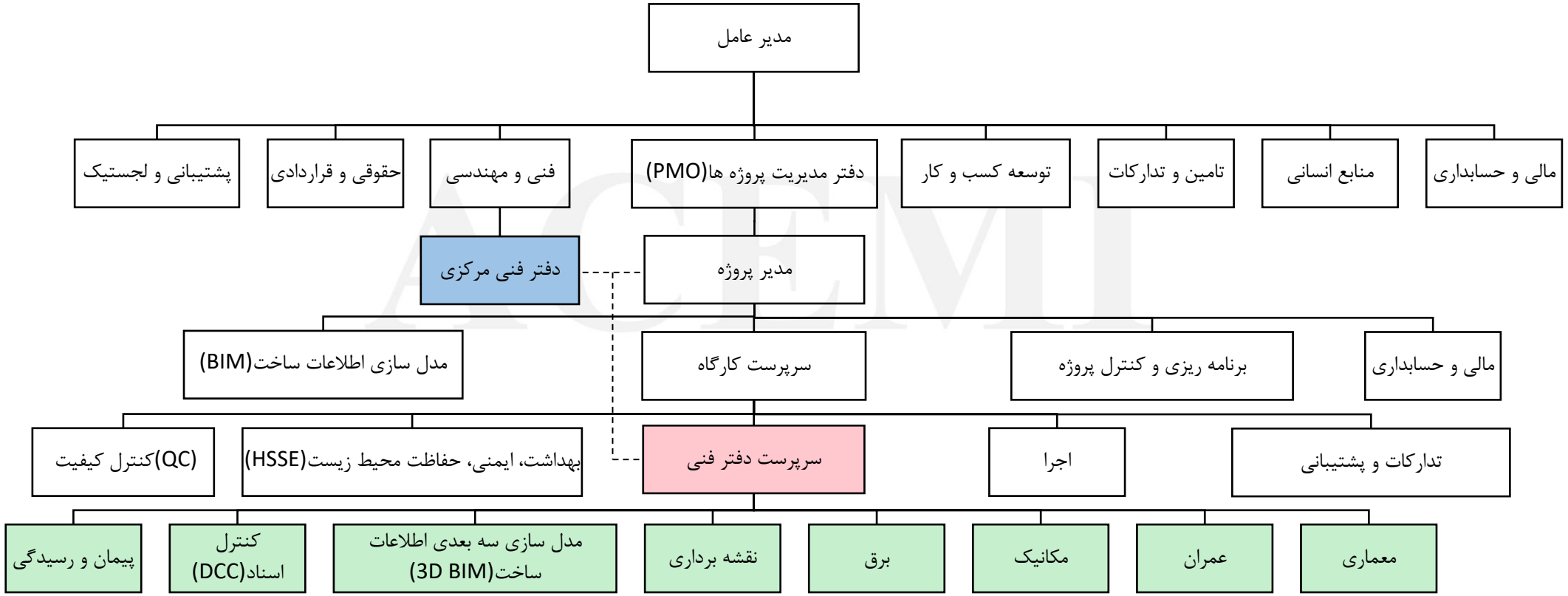

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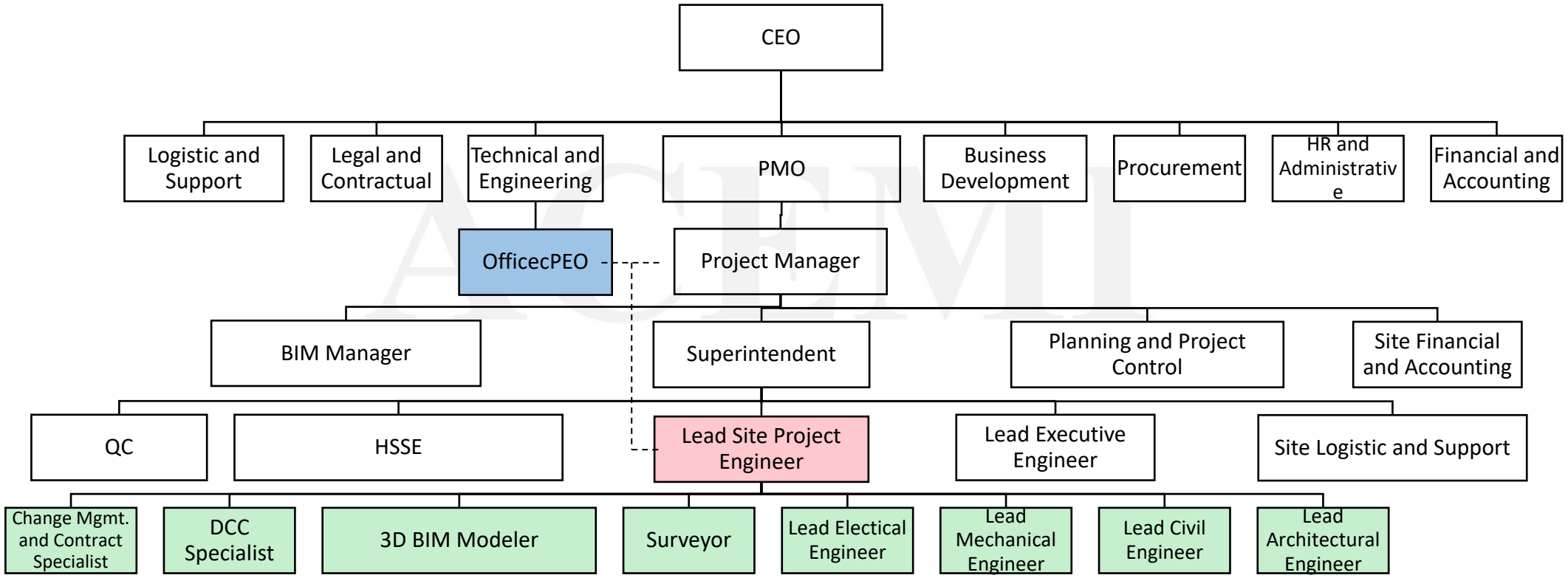

Job Descriptions(Approved By Alavipour PEO Workgroup)

نمونه شرح خدمات : مدیریت دفتر فنی

۱	مدیریت دفترفنی	
۱-۱	تعریف	
	فردی با مهارت‌های فنی و مهندسی، مدیریتی و رهبری و دارای تجربه فعالیت در پروژه‌های صنعت ساخت، که وظیفه‌ی هماهنگی و مدیریت واحدهای دفتر فنی شرکت و پروژه را برعهده دارد و بر وظایف و مسئولیت‌های سرپرست‌ها و کارشناسان دفتر فنی اشراف کاملی دارد. مدیر دفتر فنی باید حداقل دارای مدرک کارشناسی در یکی از زمینه‌های عمران، مکانیک، برق و یا معماری باشد یا در صورت نداشتن مدرک در این زمینه‌ها، از تجربه اجرایی کافی به جای مدرک، در بخش‌های کارشناسی و سرپرستی دفتر فنی برخوردار باشد.	
۱-۲	وظیفه و مسئولیت	محدوده دانشی
	مدیریت و هماهنگی بین دیسیپلینهای دفتر فنی	فرایند طراحی و پیاده‌سازی دفتر فنی
	تبیین شرح وظایف و مسئولیت های تیپ جهت ارکان دفاتر فنی پروژه ها اعم از سرپرست و کارشناسان	فرایند طراحی و پیاده‌سازی دفتر فنی
	تبیین دستورالعمل‌ها و روش‌های اجرایی دفتر فنی مرکزی و دفاتر فنی مستقر در کارگاه پروژه‌ها شامل: ۱- رویه تهیه و تنظیم صورت وضعیت دوره‌ای و صورت وضعیت‌های تعدیل ۲- رویه آنالیز بها ۳- رویه متره و برآورد پروژه ۴- رویه اعمال مفاد بخشنامه‌های منضم به قراردادها در اسناد فنی تهیه شده توسط دفاتر فنی ۵- رویه استخدام نیروهای دفاتر فنی ۶- دستورالعمل تهیه گزارشات دوره‌ای دفاتر فنی مستقر در کارگاه‌ها و ارائه آن‌ها به دفتر فنی مرکزی ۷- رویه پایش عملکرد دفاتر فنی مستقر در کارگاه و امتیازدهی به ایشان ۸- رویه تهیه و تنظیم پروپوزال‌های فنی/ مالی جهت شرکت در مناقصات ۹- رویه اجرای متره و برآورد و پیشنهاد قیمت پس از شرکت در مناقصات	فرایند طراحی و پیاده‌سازی دفتر فنی
	همکاری در انتخاب روش اجرا و تحویل پروژه (PDM) و قرارداد مناسب	قراردادها، آیین‌نامه‌ها، بخشنامه‌ها و نشریات فنی نظام فنی و اجرایی
	همکاری در تدوین قرارداد	
	کمک به تفسیر صحیح قراردادها، آیین‌نامه‌ها، بخشنامه‌ها و نشریات فنی نظام فنی و اجرایی	
	همکاری در نگهداری آرشیو اسناد و مدارک	
	مدیریت فرایند تهیه اسناد و مدارک مناقصه	
	تهیه/تجمیع/کنترل اسناد فنی - متره و برآورد و مشخصات فنی جهت عقد قراردادهای پیمانکاران جزء	
	کنترل متره و برآورد انجام شده و پروپوزال فنی/مالی تهیه شده توسط کارشناسان دفتر فنی مرکزی جهت شرکت در مناقصات	متره و برآورد، صورت وضعیت، فهارس بها
	بررسی و تأیید صورت وضعیت شرکت	
	بررسی و نهایی‌سازی صورت وضعیت‌های پیمانکاران و روند رسیدگی به آن‌ها	
	بررسی و تأیید تعدیل‌های موقت و قطعی	
	بررسی و تأیید جداول تغییر مقادیر قراردادها	
	بررسی و تایید محاسبات در نرم‌افزارهای مربوطه (مانند تکسا و تدبیر و تدکار و اکسل و ...)	
	اطمینان از دانش، تسلط و درک اعضای تیم دفتر فنی درباره نقشه‌خوانی و روش‌های ساخت	نقشه‌خوانی و روش‌های ساخت
	بررسی جزئیات ادعای طرح‌شده از سوی شرکت علیه کارفرما و از سوی پیمانکاران جزء علیه شرکت از منظر استحقاق، اثر و خسارت	تحلیل تأخیرات و مدیریت ادعا برای مدیر و سرپرست دفتر فنی و کارشناس پیمان و رسیدگی
	بررسی جزئیات ادعای طرح‌شده از سوی شرکت علیه کارفرما و از سوی پیمانکاران جزء علیه شرکت از منظر اسناد و مستندات	
	اخذ گزارش از عملکرد دفاتر فنی مستقر در شرکت‌ها و گزارش‌گیری از نیروهای واحد دفتر فنی	گزارش‌دهی و مکاتبات
	بررسی و تأیید گزارش‌های دفتر فنی	
	نظارت و کنترل مکاتبات پیمان در دفتر فنی	
	ممیزی دوره ای دفاتر فنی مستقر در پروژه ها و اسناد تهیه شده توسط ایشان اعم از صورت وضعیت ها، صورت جلسات، پرمیت ها و ...	
	تهیه گزارش عملکرد دفاتر فنی پروژه ها و ارائه آن به ذینفعان مربوطه	
	ارتباط مؤثر با سایر اعضای تیم و استفاده از مهارت‌های نرم برای مدیریت	توسعه فردی
	همکاری با اعضای تیم پروژه در زمینه‌های مدیریت برنامه‌ریزی و زمان‌بندی، مدیریت مالی و هزینه، مدیریت قرارداد، مدیریت ریسک، مدیریت کیفیت، مدیریت ایمنی، مدل‌سازی BIM، مدیریت پایداری و مهارت نرم	مدیریت ساخت برای مدیر و سرپرست دفتر فنی

Knowledge Areas of PEO Staff (Approved By Alavipour PEO Workgroup)

محـدوده‌های دانشـی	کـارشناسان / مـدیران									
	مدیر دفترفنی	سرپرست دفترفنی	کارشناس معماری	کارشناس عمران	کارشناس مکانیک	کارشناس برق	کارشناس پیمان و رسیدگی	کارشناس کنترل اسناد (DCC)	کارشناس مدل‌سازی سه‌بعدی اطلاعات ساخت (3D BIM)	کارشناس نقشه‌برداری
فرایند طراحی و پیاده‌سازی دفتر فنی	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
قراردادها، آیین‌نامه‌ها، بخشنامه‌ها و نشریات فنی نظام فنی و اجرایی	✓	✓	✓	✓	✓	✓	✓			
متره و برآورد، صورت وضعیت، فهارس بها	✓	✓	✓	✓	✓	✓	✓			
نقشه‌خوانی و روش‌های ساخت	✓	✓	✓	✓	✓	✓			✓	
تحلیل تأخیرات و مدیریت ادعا برای مدیر و سرپرست دفتر فنی و کارشناس پیمان و رسیدگی	✓	✓					✓			
تحلیل تأخیرات و مدیریت ادعا برای کارشناس دفتر فنی			✓	✓	✓	✓				
گزارش‌دهی و مکاتبات	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
مدیریت اسناد و مدارک پروژه و تدوین گزارش‌ها به همراه پیاده‌سازی نرم‌افزاری								✓		
نرم‌افزارهای مدل‌سازی									✓	
نقشه‌برداری و تسلط بر کار با دوربین و نرم‌افزار										✓
توسعه فردی	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
مدیریت ساخت برای مدیر و سرپرست دفتر فنی	✓	✓								
مدیریت ساخت برای کارشناس دفتر فنی			✓	✓	✓	✓	✓			

2.2.Define Roles and Responsibilities

Office PEO

Role	Key Responsibilities
Head of PEO (Office)	Leads all engineering design and technical processes. Reports to Project Manager and Technical Director. Manages team coordination and resource allocation.
Discipline Design Engineers	Prepare technical designs, calculations, specifications, and drawings. Coordinate technical documents across disciplines. Respond to technical queries from Site PEO.
BIM Manager / Coordinator	Develops, manages, and coordinates BIM models. Supports clash detection, quantity takeoffs, and coordination meetings.
Document Controller (Office)	Manages all controlled documents in the PEO. Maintains registers, revisions, and transmittals for designs and submittals.
Technical Review Team	Performs technical reviews of documents before issue. Ensures designs comply with codes and project requirements.

2.2.Define Roles and Responsibilities

Site PEO

Role	Key Responsibilities
Superintendent	Oversees all site operations. Coordinates Lead PEO Engineering, HSSE, QC, Execution, and Logistics. Reports daily to PMO. Chairs daily site coordination meetings.
Lead PEO Engineer	Acts as technical liaison between office and site. Handles RFIs, site clarifications, and design coordination. Oversees technical site staff.
→ Change Management & Claims Engineer	Tracks changes and claims. Prepares technical documentation for variations. Coordinates with Project Controls for cost/time impacts.
→ Document Controller	Manages all site technical documentation. Controls RFIs, shop drawings, as-built records. Maintains registers.
→ 3D BIM Technician	Maintains site BIM updates. Coordinates as-built conditions. Supports clash resolution during construction.
→ Surveyor	Carries out layout, staking, and as-built surveys. Provides progress measurements. Supports dimensional control.
→ Electrical Site Engineer	Reviews electrical installations. Handles electrical shop drawing reviews. Coordinates inspections and testing.
→ Mechanical Site Engineer	Manages mechanical installations. Reviews mechanical drawings. Coordinates site inspections and commissioning.
→ Structural Site Engineer	Oversees structural works. Reviews structural shop drawings. Provides technical assistance for structural site activities.
→ Architectural Site Engineer	Monitors architectural finishes and fit-out. Reviews shop drawings and material submissions. Assists in site problem solving.
HSSE	Ensures health, safety, and environmental compliance. Conducts safety audits, trainings, and reporting.
Quality Control (QC)	Manages inspections, test plans, NCRs, and quality records. Implements ITPs (Inspection & Test Plans).Coordinates with Client QC.
Lead Execution Engineer	Directs construction execution. Manages daily work activities. Ensures work sequence efficiency. Reports daily progress.
Logistics and Support	Oversees site logistics. Manages material delivery, handling, and storage. Coordinates temporary facilities and equipment.

2.3. Write Job Descriptions (JDs) for each role.

Field	Description
Job Title	Lead Project Engineering Office (PEO) Engineer
Department	Project Engineering Office (PEO) – Office
Reports To	Project Manager
Purpose of Position	To lead and coordinate all engineering activities within the PEO, ensuring technical quality, compliance with project specifications, and integration of design across disciplines.
Key Responsibilities	- Lead the office-based PEO engineering team. - Develop and monitor project engineering schedules. - Review and approve design documents from discipline engineers. - Interface with the client for technical issues. - Oversee change management and engineering claims. - Manage document control processes related to engineering deliverables. - Ensure compliance with ISO 9001 requirements in engineering activities. - Provide guidance on technical risk management - Support value engineering processes.
Authorities	- Approve engineering deliverables before submission. - Request additional resources or support for engineering work. - Coordinate with external consultants if needed - Stop work in case of major technical non-conformities.

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2.3. Write Job Descriptions (JDs) for each role.

Field	Description
Key Performance Indicators (KPIs)	- Timely issuance of engineering deliverables.- Number of engineering errors found during construction.- Client satisfaction regarding technical support.- Compliance rate with ISO 9001 processes.- Effectiveness in resolving technical issues and claims.
Reports Prepared	- Weekly Engineering Progress Report.- Technical Risk Register.- Design Change Log.- Engineering Coordination Minutes of Meeting.- Monthly Engineering Status Report.Frequency: weekly/monthly/as requiredRecipients: Project Manager, PMO, Client (where required)
Documents Produced/Used	- Engineering schedules.- Engineering drawings and specifications.- Technical reports.- Change request forms.- Design review checklists.- Engineering portion of Project Quality Plan.
Internal Interfaces	- Project Manager- Change Management & Claims Engineer- Document Controller- 3D BIM Technician- BIM Manager- Other discipline engineers- Planning & Cost Control
External Interfaces	- Client technical representatives- Subcontractors' engineering teams- Authorities (if required for approvals)- Consultants or design verification bodies
Process Ownership	- PEO Detailed Design & Engineering Process- Change Management Process (engineering side)- Design Coordination Process
Required Qualifications	- Bachelor's Degree in Civil, Mechanical, Electrical, or Architectural Engineering.- Minimum 10 years of experience in engineering design and coordination in construction projects.- Strong understanding of multidisciplinary coordination and ISO 9001 QMS.
Preferred Training & Competencies	- ISO 9001 Internal Auditor Training.- Primavera P6 or equivalent for engineering schedule monitoring.- Advanced knowledge of BIM processes.- Good communication and leadership skills.- Experience in claims and technical disputes.
Working Conditions	Office-based with periodic visits to site as required.
Revision & Control Details	Document No.: PEO-JD-001 , Rev.: 01 , Date: [Will be inserted] , Prepared by: [Name] , Reviewed by: [Name] , Approved by: [Name]

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3. Identify and Map PEO Processes

3.1. Identify all processes needed in the PEO:

- Core processes (engineering, design review, etc.)
- Supporting processes (document control, QA/QC, HR)

3.2. Prepare a Process Interaction Map showing how processes link.

3.1. Identify all processes needed in the PEO:

No.	Process Name	Core/Supporting	Main Inputs	Main Outputs	Office/Site
1	Contract Review & Kick-off	Core	Awarded Contract, Clarifications	Project Execution Plan, Risk Register	Office
2	Engineering Deliverables Management	Core	Contract Scope, Specs, PEP	Deliverables Register, Progress Reports	Office
3	Document Control	Core	Engineering Documents, Vendor Docs	Document Registers, Transmittals	Office
4	Engineering Change Management	Core	Change Requests, Site Queries	Approved Change Notices, Revised Docs	Office/Site
5	Engineering Progress Measurement & Reporting	Core	Deliverable Register, Schedule	Progress Reports, Earned Value Data	Office
6	Subcontractor/Subconsultant Mgmt.	Core	Subcontract Agreements, Submittals	Review Comments, Progress Status	Office
7	Design Review & Technical Coordination	Core	Design Documents, Coordination Notes	Consolidated Review Comments	Office
8	Engineering Design Development	Core	Contract, Codes, Design Basis	IFC Drawings, Specs, Reports	Office
9	Material & Equipment Technical Review	Core	Vendor Datasheets, Specs	Technical Approval Sheets	Office
10	Shop Drawing Review & Approval	Core	IFC Drawings, Shop Drawings	Approved Shop Drawings, Comments	Office/Site
11	ITP Preparation	Core	Design Docs, Specs	Inspection & Test Plans	Office
12	As-Built Documentation	Core	Marked-up Drawings, Site Redlines	As-Built Drawings, Records	Site/Office
13	TQ/RFI Management	Core	Site Queries, RFIs	TQ Responses, Clarifications	Site/Office
14	Engineering Support to Construction	Core	Site Requests, Field Conditions	Field Change Notices, Clarifications	Site
15	Technical Bid Evaluation	Supporting	Vendor Bids, RFQ, Specs	TBE Reports, Recommendations	Office
16	Vendor Data Review & Approval	Supporting	Vendor Submittals, Specs	Approved Vendor Docs, Comments	Office
17	Cost Estimation & QTO	Supporting	Drawings, Specs	BOQs, Cost Estimates	Office
18	Progress Calculation & Invoicing	Supporting	Progress Data, Contract Terms	Progress Curves, Invoices	Office
19	Interface Management	Supporting	Contract, PEP, Stakeholder Inputs	Interface Matrix, Records	Office/Site
20	Project Engineering Handover	Supporting	As-Built Docs, Records	Handover Documentation	Office

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PEO-PROC-01: Contract Review & Project Kick-off

Field	Description
Process Name	Contract Review & Project Kick-off
Purpose	Ensure clarity on scope, risks, and project execution requirements before commencing detailed engineering activities.
Inputs (Source)	- Awarded Contract Documents - Commercial Clarifications & Agreements
Key Activities	- Conduct internal contract review - Prepare Project Execution Plan (PEP) - Conduct Project Kick-off Meeting
Outputs (Used By)	- Project Execution Plan (PEP) → used in downstream processes - Contract Risk Register - Inputs for Planning, Cost Management, Engineering
Controls / Records	- Kick-off Meeting Minutes - Contract Review Log
KPI	% of contracts reviewed without major gaps identified post-kickoff
Procedure	Contract Review & Kick-off Procedure
Work Instructions	Preparing Project Execution Plan (PEP)
Forms / Records	- Contract Review Checklist - Kick-off Meeting Agenda Template
ISO References	ISO 9001:2015 (5.1, 6.1, 7.5, 8.2, 8.5.1)

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PEO-PROC-02: Engineering Deliverables Management

Field	Description
Process Name	Engineering Deliverables Management
Purpose	Plan, track, and control engineering deliverables to ensure compliance with client requirements, codes, and schedule.
Inputs (Source)	- Contract Scope - Client specifications - Project Execution Plan (PEP)
Key Activities	- Prepare deliverables list - Define document numbering - Monitor deliverable progress - Coordinate multidisciplinary inputs
Outputs (Used By)	- Deliverable Submission Schedule - Deliverable Progress Reports - Inputs to Planning & Cost Control
Controls / Records	- Deliverables Register - Progress Tracking Logs
KPI	% on-time submission of deliverables
Procedure	Engineering Deliverables Management Procedure
Work Instructions	Creating Deliverable Register
Forms / Records	- Deliverable Register Template - Progress Tracking Sheet
ISO References	ISO 9001:2015 (8.5.1, 8.5.2, 8.2.4)

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PEO-PROC-03: Document Control

Field	Description
Process Name	Document Control
Purpose	Ensure all documents are registered, tracked, and distributed to authorized recipients, preserving document integrity.
Inputs (Source)	- Engineering Documents - Client Specifications - Vendor Documents
Key Activities	- Register incoming/outgoing documents - Assign document numbers - Control revisions - Manage transmittals
Outputs (Used By)	- Document Registers - Transmittal Logs
Controls / Records	- Master Document Register - Transmittal Files
KPI	% documents controlled without error
Procedure	Document Control Procedure
Work Instructions	Registering Documents in EDMS
Forms / Records	- Transmittal Form - Document Register Template
ISO References	ISO 9001:2015 (7.5)

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PEO-PROC-04: Engineering Change Management

Field	Description
Process Name	Engineering Change Management
Purpose	Control design changes to avoid cost/schedule impacts and ensure proper approval and traceability.
Inputs (Source)	- Client Requests - Site Queries - Engineering Coordination Meetings
Key Activities	- Register change requests - Analyze impact on cost, schedule, and quality - Obtain approvals - Update documents accordingly
Outputs (Used By)	- Change Logs - Revised Engineering Documents
Controls / Records	- Engineering Change Log - Approved Change Notices
KPI	% Changes implemented without rework
Procedure	Engineering Change Management Procedure
Work Instructions	Issuing Engineering Change Notices
Forms / Records	- DCN/ECN Form - Change Impact Analysis Sheet
ISO References	ISO 9001:2015 (8.5.6)

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PEO-PROC-05: Engineering Progress Measurement & Reporting

Field	Description
Process Name	Engineering Progress Measurement & Reporting
Purpose	Monitor and report actual progress of engineering deliverables against plan.
Inputs (Source)	- Deliverable Register - Engineering Schedule
Key Activities	- Update progress data - Calculate earned value - Prepare engineering progress reports
Outputs (Used By)	- Progress Reports - Earned Value Data
Controls / Records	- Progress Measurement Sheets - Monthly Reports
KPI	Variance between planned and actual progress
Procedure	Engineering Progress Measurement & Reporting Procedure
Work Instructions	Updating Progress Measurement Sheet
Forms / Records	- Progress Curve Template - S-Curve Graphs
ISO References	ISO 9001:2015 (9.1)

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PEO-PROC-06: Subcontractor / Subconsultant Engineering Management

Field	Description
Process Name	Subcontractor / Subconsultant Engineering Management
Purpose	Ensure subconsultant engineering work complies with project requirements and schedules.
Inputs (Source)	- Subcontract Agreements - Subconsultant Deliverables
Key Activities	- Review and approve subconsultant documents - Monitor subconsultant progress - Coordinate technical issues
Outputs (Used By)	- Subconsultant Review Comments - Progress Status Reports
Controls / Records	- Subconsultant Deliverable Tracker
KPI	% subconsultant deliverables approved first time
Procedure	Subconsultant Engineering Management Procedure
Work Instructions	Reviewing Subconsultant Deliverables
Forms / Records	- Review Comment Sheets - Progress Tracker Template
ISO References	ISO 9001:2015 (8.4)

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PEO-PROC-07: Design Review and Technical Coordination

Field	Description
Process Name	Design Review and Technical Coordination
Purpose	Ensure technical consistency and quality across all disciplines and compliance with codes and client requirements.
Inputs (Source)	- Engineering Design Documents - Client Specifications - Interdisciplinary Coordination Notes
Key Activities	- Conduct discipline-specific design reviews - Coordinate technical issues across disciplines - Issue design review comments and resolutions
Outputs (Used By)	- Consolidated Review Comments - Revised Design Documents
Controls / Records	- Design Review Logs - Coordination Meeting Minutes
KPI	% design packages with zero major interdisciplinary clashes at IFC stage
Procedure	Design Review and Technical Coordination Procedure
Work Instructions	Conducting Design Review Meetings
Forms / Records	- Review Comment Sheets - Interdisciplinary Coordination Log
ISO References	ISO 9001:2015 (8.5.1, 8.5.2)

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PEO-PROC-08: Engineering Design Development

Field	Description
Process Name	Engineering Design Development
Purpose	Produce engineering drawings, specifications, and calculations meeting contractual and regulatory requirements.
Inputs (Source)	- Contract Requirements - Codes and Standards - Client Design Basis
Key Activities	- Prepare discipline-specific designs - Perform calculations - Develop specifications and reports
Outputs (Used By)	- IFC Drawings - Technical Specifications - Engineering Reports
Controls / Records	- Calculation Sheets - Revision Records
KPI	% of design documents approved at first submission
Procedure	Engineering Design Development Procedure
Work Instructions	Preparing Discipline-Specific Designs
Forms / Records	- Calculation Templates - Drawing Templates
ISO References	ISO 9001:2015 (8.3, 8.5)

PEO-PROC-09: Material & Equipment Technical Review

Field	Description
Process Name	Material & Equipment Technical Review
Purpose	Confirm technical compliance of materials and equipment with design requirements and specifications.
Inputs (Source)	- Vendor Datasheets - Material Specifications - Codes and Standards
Key Activities	- Review vendor datasheets and technical submissions - Check compliance with specifications - Issue technical clarifications
Outputs (Used By)	- Material/Equipment Approval Sheets
Controls / Records	- Vendor Review Logs - Technical Clarification Records
KPI	% vendor submittals approved without resubmission
Procedure	Material & Equipment Technical Review Procedure
Work Instructions	Reviewing Vendor Datasheets
Forms / Records	- Technical Review Sheets - Clarification Log Template
ISO References	ISO 9001:2015 (8.4.2, 8.5)

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PEO-PROC-10: Shop Drawing Review & Approval

Field	Description
Process Name	Shop Drawing Review & Approval
Purpose	Ensure shop drawings conform to IFC documents, codes, and client requirements before release for fabrication or construction.
Inputs (Source)	- IFC Drawings - Vendor Shop Drawings - Subcontractor Submittals
Key Activities	- Review shop drawings for compliance - Issue approvals or comments - Track revisions and resubmissions
Outputs (Used By)	- Approved Shop Drawings - Shop Drawing Comment Sheets
Controls / Records	- Shop Drawing Register
KPI	% shop drawings approved without resubmission
Procedure	Shop Drawing Review & Approval Procedure
Work Instructions	Reviewing Shop Drawings
Forms / Records	- Shop Drawing Review Form - Comment Sheet Template
ISO References	ISO 9001:2015 (8.5.1, 8.5.2)

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PEO-PROC-11: Inspection & Test Plan (ITP) Preparation

Field	Description
Process Name	Inspection & Test Plan (ITP) Preparation
Purpose	Define inspection and testing requirements, frequencies, and responsibilities to ensure construction quality.
Inputs (Source)	- Design Documents - Client Specifications - Codes and Standards
Key Activities	- Identify inspection hold points - Define inspection activities and frequencies - Prepare ITP documents
Outputs (Used By)	- Approved ITPs - Quality Control Inspections
Controls / Records	- ITP Log - Approved ITP Copies
KPI	% ITPs prepared before start of relevant construction activity
Procedure	ITP Preparation Procedure
Work Instructions	Developing ITPs for Disciplines
Forms / Records	- ITP Template - Inspection Checklists
ISO References	ISO 9001:2015 (8.5.1, 8.6)

PEO-PROC-12: As-Built Documentation

Field	Description
Process Name	As-Built Documentation
Purpose	Produce accurate records reflecting the actual constructed conditions for handover to client.
Inputs (Source)	- Marked-up Construction Drawings - Site Redlines - Construction Records
Key Activities	- Collect and review as-built markups - Revise drawings and documents - Issue final as-built packages
Outputs (Used By)	- As-Built Drawings - Final Documentation Sets
Controls / Records	- As-Built Register - Revision Logs
KPI	% as-built drawings completed and handed over on time
Procedure	As-Built Documentation Procedure
Work Instructions	Preparing As-Built Drawings
Forms / Records	- As-Built Drawing Log - Redline Tracking Sheets
ISO References	ISO 9001:2015 (8.5.1, 8.5.6)

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PEO-PROC-13: Technical Query (TQ) and RFI Management

Field	Description
Process Name	Technical Query (TQ) and RFI Management
Purpose	Provide timely technical responses to queries raised by site or subcontractors to prevent delays.
Inputs (Source)	- Site Queries - Subcontractor RFIs - Client Clarifications
Key Activities	- Receive and log TQs/RFIs - Distribute to relevant disciplines - Prepare responses - Issue official replies
Outputs (Used By)	- TQ/RFI Responses - Clarifications Issued
Controls / Records	- TQ/RFI Register - Response Log
KPI	% TQs/RFIs closed within agreed timeframe
Procedure	TQ and RFI Management Procedure
Work Instructions	Logging and responding to TQs/RFIs
Forms / Records	- TQ/RFI Log Template - Response Sheet
ISO References	ISO 9001:2015 (8.2.2, 8.5.1)

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PEO-PROC-14: Engineering Support to Construction

Field	Description
Process Name	Engineering Support to Construction
Purpose	Provide ongoing technical support to resolve site issues and ensure work complies with design intent.
Inputs (Source)	- Site Requests - Field Conditions - Design Documents
Key Activities	- Analyze field issues - Recommend technical solutions - Approve field design changes if required
Outputs (Used By)	- Field Change Notices - Technical Clarifications
Controls / Records	- Field Support Logs - Response Records
KPI	% site issues resolved without schedule impact
Procedure	Engineering Support to Construction Procedure
Work Instructions	Responding to Site Technical Issues
Forms / Records	- Field Support Log Template - Change Notice Form
ISO References	ISO 9001:2015 (8.5.1)

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PEO-PROC-15: Technical Bid Evaluation (TBE)

Field	Description
Process Name	Technical Bid Evaluation (TBE)
Purpose	Ensure vendors and subcontractors comply technically with project requirements before award.
Inputs (Source)	- Vendor Bids - Technical Specifications - RFQ Documents
Key Activities	- Review technical compliance of bids - Compare vendor offerings - Prepare TBE reports and recommendations
Outputs (Used By)	- TBE Reports - Recommendations to Procurement
Controls / Records	- TBE Logs - Evaluation Files
KPI	% packages evaluated within required timeframe
Procedure	Technical Bid Evaluation Procedure
Work Instructions	Preparing TBE Reports
Forms / Records	- TBE Template - Comparison Sheets
ISO References	ISO 9001:2015 (8.4.1, 8.4.2)

PEO-PROC-16: Vendor Data Review & Approval

Field	Description
Process Name	Vendor Data Review & Approval
Purpose	Ensure vendor documents meet design and contractual requirements before procurement, fabrication, or installation.
Inputs (Source)	- Vendor Data Submittals - Specifications - Purchase Orders
Key Activities	- Review vendor documents - Issue approvals or comments - Track resubmissions if required
Outputs (Used By)	- Approved Vendor Documents - Comment Sheets
Controls / Records	- Vendor Data Log - Review Comments Register
KPI	% vendor documents approved first time
Procedure	Vendor Data Review & Approval Procedure
Work Instructions	Reviewing Vendor Submittals
Forms / Records	- Vendor Data Review Sheet - Comments Log
ISO References	ISO 9001:2015 (8.4.2, 8.5.1)

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PEO-PROC-17: Engineering Cost Estimation and Quantity Take-off

Field	Description
Process Name	Engineering Cost Estimation and Quantity Take-off
Purpose	Provide reliable quantities and technical inputs to support accurate cost estimation and budgeting.
Inputs (Source)	- Engineering Drawings - Specifications - Design Reports
Key Activities	- Extract quantities from drawings - Prepare Bill of Quantities (BOQ) - Support commercial estimations
Outputs (Used By)	- BOQs - Cost Estimates
Controls / Records	- Quantity Take-off Sheets - BOQ Files
KPI	Accuracy of quantities vs. as-built quantities
Procedure	Engineering Cost Estimation and Quantity Take-off Procedure
Work Instructions	Performing Quantity Take-offs
Forms / Records	- QTO Sheet Template - BOQ Formats
ISO References	ISO 9001:2015 (8.5.1, 8.5.2)

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PEO-PROC-18: Progress Calculation & Engineering Invoicing

Field	Description
Process Name	Progress Calculation & Engineering Invoicing
Purpose	Calculate engineering progress for cost control and prepare supporting documents for invoicing.
Inputs (Source)	- Deliverable Register - Progress Reports - Contract Payment Terms
Key Activities	- Measure progress on deliverables - Calculate earned value - Prepare invoices or progress claims
Outputs (Used By)	- Progress Curves - Engineering Invoices
Controls / Records	- Progress Logs - Invoicing Records
KPI	Accuracy of invoiced vs. verified progress
Procedure	Progress Calculation & Engineering Invoicing Procedure
Work Instructions	Generating Progress Reports
Forms / Records	- Progress Calculation Sheets - Invoice Support Forms
ISO References	ISO 9001:2015 (8.5.1, 9.1)

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PEO-PROC-19: Interface Management

Field	Description
Process Name	Interface Management
Purpose	Ensure clear boundaries and responsibilities between engineering, procurement, construction, and other stakeholders.
Inputs (Source)	- Contract Requirements - Project Execution Plan (PEP) - Stakeholder Inputs
Key Activities	- Identify interface points - Develop interface matrix - Coordinate solutions for interface issues
Outputs (Used By)	- Interface Matrix - Interface Meeting Records
Controls / Records	- Interface Register - Meeting Minutes
KPI	% of interface issues resolved on time
Procedure	Interface Management Procedure
Work Instructions	Preparing Interface Matrices
Forms / Records	- Interface Log Template - Issue Resolution Tracker
ISO References	ISO 9001:2015 (8.5.1, 8.2.2)

PEO-PROC-20: Project Engineering Handover

Field	Description
Process Name	Project Engineering Handover
Purpose	Deliver complete, accurate, and organized project engineering documentation to the client at project closeout.
Inputs (Source)	- As-Built Documentation - Project Records - Client Requirements
Key Activities	- Prepare engineering close-out documents - Verify completeness of records - Submit handover packages to client
Outputs (Used By)	- Handover Documentation Packages
Controls / Records	- Handover Checklist - Submission Receipts
KPI	% of handover documents accepted without remarks
Procedure	Project Engineering Handover Procedure
Work Instructions	Compiling Handover Documentation
Forms / Records	- Handover Checklist Template - Document Index
ISO References	ISO 9001:2015 (8.5.1, 8.5.6, 8.6)

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Process Ownership table

No.	Process Name	Core/Supporting	Owner
1	Contract Review & Kick-off	Core	Project Manager / Contract Manager
2	Engineering Deliverables Management	Core	Engineering Manager
3	Document Control	Core	Document Control Manager
4	Engineering Change Management	Core	Engineering Manager / Change Control Manager
5	Engineering Progress Measurement & Reporting	Core	Project Controls Manager
6	Subcontractor/Subconsultant Mgmt.	Core	Procurement Manager
7	Design Review & Technical Coordination	Core	Lead Engineer / Design Manager
8	Engineering Design Development	Core	Discipline Lead Engineer
9	Material & Equipment Technical Review	Core	Procurement Manager / Engineering Manager
10	Shop Drawing Review & Approval	Core	Lead Engineer / Construction Manager
11	ITP Preparation	Core	Quality Control Manager / Engineering Manager
12	As-Built Documentation	Core	Site Manager / Document Control Manager
13	TQ/RFI Management	Core	Engineering Manager / Site Manager
14	Engineering Support to Construction	Core	Lead Engineer / Site Manager
15	Technical Bid Evaluation	Supporting	Procurement Manager
16	Vendor Data Review & Approval	Supporting	Procurement Manager / Engineering Manager
17	Cost Estimation & QTO	Supporting	Estimation Manager / Cost Manager
18	Progress Calculation & Invoicing	Supporting	Project Controls Manager / Finance Manager
19	Interface Management	Supporting	Project Manager / Engineering Manager
20	Project Engineering Handover	Supporting	Handover Manager / Engineering Manager

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PEO QMS Process Interaction Matrix

From \ To →	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
01 Contract Review & Kick-off		X	X	X	X	X	X	X	X					X	X	X	X	X	X	X
02 Eng. Deliverables Mgmt.			X	X	X	X	X	X	X	X			X	X			X	X	X	X
03 Document Control		X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
04 Eng. Change Mgmt.		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
05 Eng. Progress Meas.		X				X											X	X		X
06 Subcontractor Mgmt.		X	X	X	X		X	X	X	X			X	X	X	X	X	X	X	X
07 Design Review & Coord.		X		X		X		X	X	X	X		X	X		X	X	X	X	X
08 Eng. Design Development		X		X		X	X		X	X	X		X	X		X	X		X	X
09 Material & Equipment Review		X		X		X		X							X	X	X	X	X	X
10 Shop Drawing Review		X		X		X		X	X		X		X	X		X	X	X	X	X
11 ITP Preparation		X								X				X					X	X
12 As-Built Documentation		X								X				X				X	X	X
13 TQ/RFI Mgmt.		X		X		X	X	X	X	X	X	X		X		X	X	X	X	X
14 Eng. Support to Const.		X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
15 Technical Bid Evaluation		X				X			X							X	X		X	X
16 Vendor Data Review		X		X		X	X	X	X	X					X		X		X	X
17 Eng. Cost Estim. & QTO		X			X				X						X	X		X		X
18 Progress Calc. & Invoicing		X			X	X											X			X
19 Interface Management		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	
20 Eng. Deliverables Handover		X				X				X	X	X		X			X	X	X	

Roadmap – Step3 - Identify and Map PEO Processes

RACI Matrix

No.	Process Name	Project Manager	Lead Executive Engineer	Lead Site Project Engineer	Change Management and Contract Specialist	Document Control Specialist	BIM Manager	Quality Control Engineer	Planning and Project Control	Procurement Manager	Surveyor	Discipline Lead Engineers (Civil, Mech, Elec, Arch)	Site Logistic and Support
1	Contract Review & Kick-off	A/R	R	I	R	C	I	C	C	C	I	I	I
2	Engineering Deliverables Management	I	A/R	I	I	C	R	I	R	I	I	A/R	I
3	Document Control	I	C	I	I	A/R	I	I	I	I	I	I	I
4	Engineering Change Management	A	R	R	A/R	C	I	C	I	I	I	R	I
5	Engineering Progress Measurement & Reporting	A	R	I	I	C	I	I	A/R	I	I	R	I
6	Subcontractor/Subconsultant Management	R	I	I	A/R	C	I	I	C	A/R	I	I	I
7	Design Review & Technical Coordination	I	A/R	I	I	C	R	C	I	I	I	A/R	I
8	Engineering Design Development	I	A/R	I	I	C	R	I	I	I	I	A/R	I
9	Material & Equipment Technical Review	I	A/R	I	I	C	I	C	I	A/R	I	R	I
10	Shop Drawing Review & Approval	I	R	A/R	I	C	R	C	I	I	I	A/R	I

How to Interpret This Table

- **A = Accountable:** Ultimately responsible.
- **C = Consulted:** Provides input and reviews.

R = Responsible: Executes the work.

I = Informed: Needs updates but not directly involved.

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Roadmap – Step3 - Identify and Map PEO Processes

RACI Matrix

No.	Process Name	Project Manager	Lead Executive Engineer	Lead Site Project Engineer	Change Management and Contract Specialist	Document Control Specialist	BIM Manager	Quality Control Engineer	Planning and Project Control	Procurement Manager	Surveyor	Discipline Lead Engineers (Civil, Mech, Elec, Arch)	Site Logistic and Support
11	ITP Preparation	I	A/R	I	I	I	I	A/R	I	I	I	R	I
12	As-Built Documentation	I	R	A/R	I	A/R	I	I	I	I	R	R	R
13	TQ/RFI Management	I	R	A/R	I	C	I	C	I	I	I	A/R	I
14	Engineering Support to Construction	I	R	A/R	I	I	I	R	I	I	I	A/R	A/R
15	Technical Bid Evaluation	I	R	I	I	I	I	I	I	A/R	I	I	I
16	Vendor Data Review & Approval	I	A/R	I	I	C	I	I	I	A/R	I	R	I
17	Cost Estimation & Quantity Take-Off	I	R	I	I	I	I	I	A/R	I	I	R	I
18	Progress Calculation & Invoicing	A/R	R	I	I	I	I	I	A/R	I	I	I	I
19	Interface Management	A/R	A/R	R	C	C	I	I	I	I	I	R	I
20	Project Engineering Handover	I	R										

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