# MANUAL 1:
## How we Begin

# Design & Construction

AORN | TOOL KIT

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# Introduction

## HOW WE BEGIN

In a collaborative team approach to operating room construction or renovation projects, the emphasis extends beyond individual responsibilities to create a dynamic and synergistic environment. Team members, representing diverse expertise, contribute collectively to the design process, ensuring a holistic understanding of project requirements. This approach fosters an exchange of ideas, harnessing the unique perspectives of architects, healthcare professionals, technologists, administrators, and building systems experts.

The collaborative model encourages open communication channels, enabling effective sharing of insights and feedback throughout the project's lifecycle. Flexibility becomes a guiding principle, acknowledging that project dynamics may evolve, requiring adaptive strategies. Team members are not just contributors but active participants in a shared vision, aligning their efforts toward a common goal of creating an optimal and patient-centric operating room environment.

This collaborative ethos extends to decision-making processes, emphasizing consensus-building and a commitment to collective success. In such a dynamic and interdependent setting, follow-through becomes pivotal. Each team member is responsible not only for their designated tasks but for actively supporting the overall project trajectory.

This collaborative team approach recognizes the interconnectedness of various aspects — from architectural design and healthcare functionality to technological integration and building systems efficiency. The result is a seamless integration of expertise, resources, and creativity, culminating in an operating room that not only meets but exceeds the highest standards of functionality, safety, and innovation in healthcare facility design.

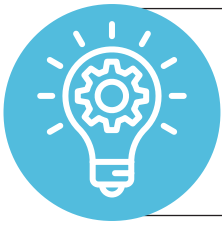
## MANUALS IN TOOL KIT:

1. **How we begin - Developing the Team**
2. Design in Depth - building codes, room types, terminology.
3. Construction Projects Steps
4. Reading construction Documents
5. Design Guide for SPD
6. Infection control and prevention


***"Alone we can do so little; together we can do so much."***

– Helen Keller

# Phases of a Project



## VALIDATION

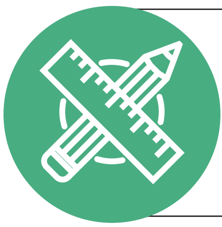
**Big Picture**

- Define high-level space program
- Review future state process maps
- Detail space planning
- Align needs/wants with schedule and budget

## CRITERIA DESIGN

**Key Adjacencies and Critical Flows**

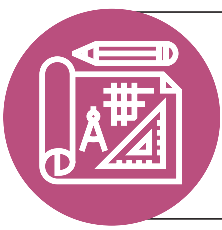
- Department adjacencies and locations
- Critical flows (review and improve)
- Site plan layout
- Building footprint/massing
- Capture future space needs
- Confirm scope and costs
- Opportunities for innovation



## DETAIL DESIGN

**Focus on Details**

- Room-specific requirements
- Furniture, fixtures, and equipment (FF&E)
- Review mechanical, electrical, IT, security
- Coordinate code requirements
- Discuss site details and landscape
- Reconfirm scope and cost
- Finalize and sign off interior/exterior design & signage



## CONSTRUCTION DOCUMENTS

**Prepare Documents**

- Final coordination with each discipline
- Confirm constructability with Construction Manager (CM)
- Final documentation and coordination ("blueprints")
- Final review with regulatory agencies

## CONSTRUCTION ADMINISTRATION

**Break Ground**

- City and State Reviews
- Shop drawing Reviews
- On-site observations
- Review and Process change orders

## OCCUPANCY

**Grand Opening**

- Change Management
- Transition Planning
- Supply/stage space
- Trial/practice runs
- Open Doors!

**Post Occupancy Evaluation**

- Evaluate performance to the original design intent

The icons on this page are distributed throughout the manuals and provide a quick reference to the phase of the project. Each icon will provide the reader with a quick reference and understanding of the current phase of the project and what decisions should be made or should have been made leading up to that moment.

The six phases of a construction project begin with **Initiation and Concept**, where initial planning and stakeholder discussions define the project's purpose and feasibility. This is followed by **Planning and Design**, involving the development of detailed plans and blueprints, and securing necessary permits. **Pre-Construction** includes site analysis and finalizing contracts, setting the stage for **Procurement**, where materials and labor are acquired. **Construction** is the phase where the building takes shape, with site preparation and the installation of systems and finishes. Finally, **Close-Out and Handover** ensures the project is completed to specifications, with a final inspection and transfer of the completed project to the client.

# Project Delivery

Understanding the various design delivery options involves considering factors such as project goals, client preferences, project complexity, budget constraints, and the level of collaboration required. Explored in further detail in Manual #3 below is a list that identifies the steps toward understanding the best option of design delivery methods.

**Project Requirements:**
- Clearly outline the goals, constraints, and specific requirements of the project.
- Understand who the primary stakeholders are and what their priorities might be.
- Validate that the project aligns with the short and long-term strategic goals of the facility and campus.

**Project Complexity:**
- Consider the complexity of the project in terms of design intricacy, technical requirements, and potential challenges.
- Determine the level of expertise required for the project, both in design and execution

**Budget Resources:**
- Evaluate the budget available for the project and whether it aligns with certain delivery options.
- Consider the availability of in-house teams, external consultants, or freelancers.

**Timeline and deadlines:**
- Understand the project timeline and deadlines. Some delivery options may be more time-efficient than others.
- Identify critical milestones and determine how different delivery methods impact meeting those milestones.

**Preferences:**
- Assess the level of client involvement desired. Some clients prefer to be actively engaged in the design process, while others may prefer a more hands-off approach.
- Consider how clients prefer to communicate and collaborate with the design team.

**Collaboration level**
- Evaluate the extent to which collaboration among team members and stakeholders is crucial for the success of the project.
- Consider how feedback will be incorporated into the design process.

**Flexibility and Adaptability:**
- Assess how likely the project is to undergo changes or iterations during the design process.
- Choose a delivery option that allows for flexibility and adaptation to changing requirements.

**Long-Term Goals:**
- Consider whether the client has long-term goals beyond the initial design, such as ongoing maintenance, updates, or scalability.

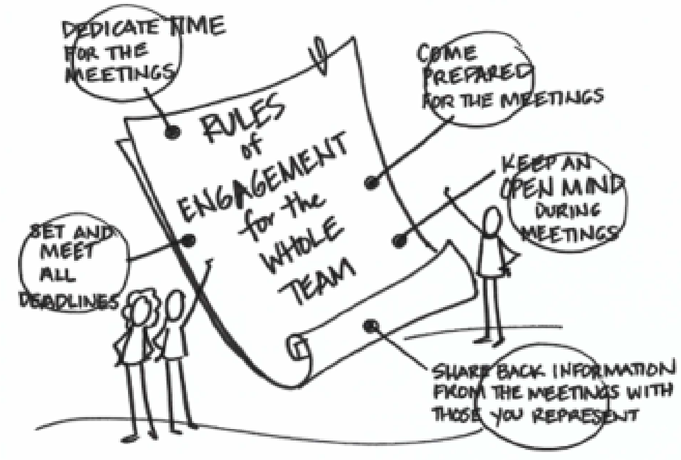
**Technology and tools:**
- Consider the technology and tools required for the project. Some design delivery options may leverage specific software or platforms.

**Risk Tolerance:**
- Evaluate the level of risk tolerance for the project. Some delivery options may be more or less risky depending on the circumstances.

By systematically considering these factors, you can narrow down the design delivery options that align best with the unique characteristics of your project. It may also be beneficial to consult with key stakeholders and team members to gather diverse perspectives and insights before making a final decision. Keep in mind that hybrid approaches, combining elements of different delivery methods, are also common and can be tailored to suit specific project needs.

## PROJECT DELIVERY OPTIONS

| | | |
|---|---|---|
| **Design-Bid-Build** | **Construction Management at Risk** | **Public-Private Partnership** |
| **Design-Build** | **Integrated Project Delivery** | **Fast-Track Construction** |




*We The People:* **Develop an agreement between all team members early on in the project.**

# DESIGN TEAM

**Project Manager:**

- Develop and maintain the project schedule.
- Facilitate communication among team members.
- Ensure that the project stays within budget.
- Coordinate and lead regular team meetings.

**Designers:**

- Contribute creative ideas and innovative solutions to the design process.
- Collaborate with other team members to integrate various perspectives into the design.
- Produce detailed design documents and specifications.

**Architects:**

- Ensure that the design aligns with building codes and regulations.
- Collaborate with engineers and other specialists to integrate structural and technical requirements into the design.
- Provide expertise on spatial planning and aesthetics

**Engineers:**

- Evaluate the structural and technical feasibility of the design.
- Collaborate with architects and other specialists to integrate technical requirements into the design.
- Ensure that all engineering aspects comply with relevant standards.

# DESIGN COORDINATORS

**Communication Specialist:**

- Develop and implement a communication plan for the team.
- Ensure that project updates and important information are communicated effectively to all team members.
- Facilitate communication between the team and external stakeholders.

**Flexibility Liaison:**

- Identify potential challenges or changes in project scope.
- Work with team members to adapt to changes in the design or project requirements.
- Keep the team informed about any adjustments to the original plan.

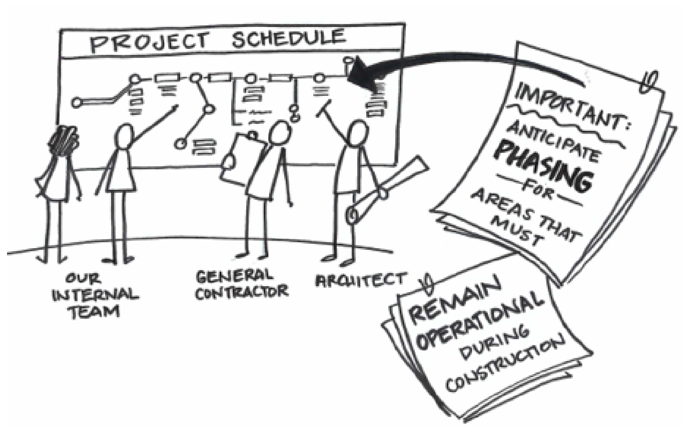
**Quality Assurance Coordinator:**

- Establish and enforce quality standards for the project.
- Conduct regular reviews to ensure that the design meets established criteria.
- Collaborate with team members to address any quality concerns.

**Follow-through Team:**

- Ensure that tasks and action items are completed on time.
- Collaborate with other team members to address any delays or roadblocks.
- Take responsibility for the successful implementation of the project.

**Although these roles may have different names and different organizational structures depending on the design delivery method chosen their goals are the same, to keep the project on time, on budget and to meet the needs of the users and provide the best possible outcome.**



# Responsibility of the Owner

Embarking on a healthcare facility project is a complex journey, requiring meticulous planning and collaboration. Today, let's delve into key strategies to ensure the seamless integration of medical equipment and the success of your project.

**Selecting Medical Equipment:**

- Initiate the process early to align equipment needs with building design, especially HVAC requirements.
- Engage specialty consultants for large projects to assist with equipment selection, furniture, and timely procurement.
- Collaborate with vendors for valuable insights, ensuring that selected equipment aligns seamlessly with project goals.

**Determining Project Budget:**

- Thoroughly assess total project costs, encompassing construction, equipment, design fees, and other essential items.
- A well-defined budget provides a roadmap for decision-making, ensuring financial clarity throughout the project.

**Setting the Project Schedule:**

- Actively participate in setting the project schedule, working closely with the general contractor and architect.
- Anticipate phasing for areas requiring operational continuity during construction to minimize disruptions.

**Evaluating Design Solutions:**

- Scrutinize proposed design solutions prepared by the architect in the early planning phase.
- Ensure designs not only meet current needs but also accommodate future expansion, aligning with the facility's growth.

**Identifying Key Decision Maker:**

- Designate a key decision maker to represent the owner throughout all project phases.
- A single point of contact facilitates effective communication, streamlining decision-making among diverse stakeholders

**Performing Construction Rounds:**

- Conduct regular construction rounds to assess progress and troubleshoot issues.
- Adjust the frequency based on the construction stage, with more frequent rounds as the project nears completion.

**Monitoring Change Orders:**

- Maintain vigilant control over change orders to avoid unnecessary costs and delays.
- Ensure changes align with project goals, budget, and are well-communicated to the entire project team

**Performing Infection Prevention Rounds:**

- Conduct regular rounds to evaluate the adequacy of barriers specified in the infection control risk assessment (ICRA).
- Determine the type of barriers required, ensuring a safe and controlled environment throughout construction.

The success of healthcare facility projects lies in a holistic approach. By selecting equipment strategically, managing budgets effectively, and fostering open communication, we can build healthcare spaces that not only meet current needs but anticipate and embrace the challenges of the future.

# The Perioperative Multidisciplinary Team

**Organizing and Leading the Multidisciplinary Team:**

- Take a leadership role or actively participate in a multidisciplinary team.
- Foster collaboration among clinical and construction teams to ensure seamless integration of expertise.

**Gathering Perioperative Data:**

- Collect perioperative data, including types and numbers of procedures, and related expenditures.
- Use data to inform decisions and ensure that construction plans align with the operational needs of the perioperative team.

**Interpreting Clinical Information for the External Team:**

- Bridge the gap between clinical and construction language.
- Ensure effective communication by translating clinical requirements into construction terminology and vice versa.

**Educating Staff and Construction Workers:**

- Educate clinical staff on construction requirements, such as barriers and changes in traffic patterns.
- Provide infection control training for construction workers to maintain a safe healthcare environment.

**Collaborating with Infection Preventionist:**

- Collaborate closely with an infection preventionist to enforce and enhance infection prevention measures.
- Anticipate and address potential infection control breaks during the construction process.

**Anticipating and Creating Contingency Plans:**

- Proactively identify potential problems during the project.
- Collaborate with the multidisciplinary team to create contingency plans for issues such as altered traffic patterns, budgetary constraints, disrupted workflow, and more.

**Addressing Specific Challenges:**

- Consider challenges such as interruptions in medical gas, water, electricity, or vacuum.
- Address potential disruptions to information technology, life safety procedures, waste disposal processes, noise, patient inconvenience, and more.

## ANTICIPATING POTENTIAL PROBLEMS

Alterations to traffic patterns

Disrupted workflow

Employee/provider dissatisfaction

Fire hazards

Infection control breaks

Interruptions in medical gas, water, electricity, or vacuum

Interruptions to the regulated medical waste and hazardous waste disposal processes

Patient inconvenience

Presence of air contaminants

Staff morale

Budgetary constraints

Equipment delivery problems

Equipment malfunctions

Inappropriate construction staff conduct

Interruptions in functionality of information technology

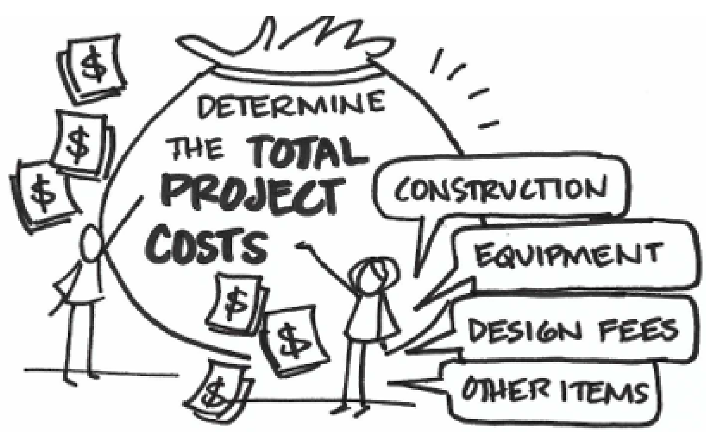
Interruptions to the elements of the life safety procedures

Noise and vibration from construction activities

Patient transport issues

Relocation of supplies

Surgeon and staff inconvenience



# The Architect

The architects role is multifaceted and crucial to creating a functional, safe, and efficient healthcare environment. Here are key aspects of an architect's role in this context:

**Space Planning and Layout:** Architects are responsible for designing the layout and spatial organization of the operating room. This includes considerations for the arrangement of surgical equipment, patient positioning, and the flow of medical staff.

**Compliance with Regulations and Standards:** Architects must ensure that the design adheres to relevant healthcare regulations, building codes, and industry standards. This includes considerations for infection control, accessibility, and safety protocols.

**Collaboration with Healthcare Professionals:** Architects collaborate closely with healthcare professionals, including surgeons and nurses, to understand their workflow and specific requirements. This collaboration ensures that the design meets the needs of medical practitioners and supports efficient patient care.

**Integration of Medical Equipment:** Architects work on integrating specialized medical equipment into the design, considering factors such as placement of surgical lights, anesthesia machines, imaging devices, and other essential tools.

**Aesthetic and Ergonomic Design:** Architectural elements, such as lighting, color schemes, and materials, are carefully chosen to create a visually pleasing and calming environment. Additionally, architects consider ergonomic design principles to enhance the comfort and efficiency of medical staff.

**Infection Control Measures:** Designing spaces with features that facilitate easy cleaning and adherence to infection control protocols is a critical aspect. This includes selecting materials resistant to bacteria and ensuring smooth, sealed surfaces. For information on Infection control measures refer to Manual 6

**Future-Proofing and Flexibility:** Architects consider the potential for future technological advancements and changes in healthcare practices. Designing with flexibility in mind allows for adaptations to emerging technologies and evolving medical procedures.

**Project Management and Coordination:** Architects often play a role in project management, coordinating with other professionals, contractors, and stakeholders to ensure that the design vision is executed effectively and within the specified timeline.

In essence, an architect's role in designing an operating room extends beyond aesthetics to encompass the intricate balance of functionality, safety, compliance, and collaboration with healthcare experts. This holistic approach contributes to the creation of a state-of-the-art operating environment that prioritizes patient care and the well-being of medical staff.

# The General Contractor

The contractor's role is typically focused on the practical implementation of the design plans and ensuring that the construction process aligns with the intended vision for the space. While architects, healthcare professionals, and design teams primarily handle the conceptual and detailed design phases, the contractor plays a pivotal role in translating those plans into a physical reality. Here are key aspects of the contractor's role in designing an operating room:

**Construction Implementation:** The contractor is responsible for executing the construction phase based on the architectural and design plans. This includes tasks such as site preparation, foundation work, framing, and installation of building systems.

**Material Procurement:** Contractors are often involved in procuring construction materials, ensuring that the specified materials meet quality standards and are in accordance with the design requirements.

**Building Codes and Regulations:** Contractors must adhere to local building codes and regulations relevant to healthcare facilities. They play a crucial role in ensuring that the construction complies with safety, accessibility, and health standards.

**Coordination with Subcontractors:** Operating room construction involves various specialized tasks, such as installing medical gas systems, electrical work, and HVAC installations. Contractors coordinate with subcontractors who specialize in these areas to ensure their seamless integration.

**Timeline and Schedule Management:** Contractors are responsible for managing the construction timeline and schedule. They work to ensure that the project stays on track, coordinating activities to meet deadlines and milestones.

**Budget Management:** The contractor oversees budgetary aspects of the construction, including cost estimation, resource allocation, and expense management. They aim to keep the project within budget while delivering the desired quality.

**Quality Assurance:** Contractors are accountable for the quality of construction work. This includes implementing quality control measures, conducting inspections, and addressing any issues that may arise during construction.

**Communication and Collaboration:** Effective communication is vital. Contractors collaborate closely with architects, designers, healthcare professionals, and other stakeholders to address any changes, challenges, or unforeseen circumstances during construction.

**Safety Compliance:** Ensuring a safe construction environment is a key responsibility. Contractors implement safety protocols, provide training for construction personnel, and maintain a secure work site.

**Post-Construction Coordination:** After construction, contractors may be involved in post-construction tasks, such as final inspections, addressing punch-list items, and coordinating the turnover of the operating room to the healthcare facility.

While the contractor's role is more focused on the execution and management of the construction process, their active collaboration with the design team and other stakeholders is crucial for achieving a successful and functional operating room.

# Glossary of Terms

**ADA Compliance:**
Adherence to the Americans with Disabilities Act standards, ensuring accessibility for individuals with disabilities.

**BIM (Building Information Modeling):**
A digital representation of the physical and functional characteristics of a building, aiding in collaborative design and construction processes.

**Blueprint / Plans:**
A detailed architectural plan or drawing that outlines the design and specifications of a construction project.

**Change Order:**
A written document that modifies the original construction contract, often due to alterations in scope, schedule, or budget.

**Critical Path:**
The sequence of stages determining the minimum time needed for an operation or project.

**Curb Appeal:**
The attractiveness of a property when viewed from the street, influencing its overall visual appeal.

**Environmental Impact Assessment (EIA):**
An evaluation of the potential environmental effects of a project, including its impact on air, water, and ecosystems.

**Fast-Track Construction:**
A project delivery method that accelerates the construction schedule by overlapping design and construction phases.

**HVAC (Heating, Ventilation, and Air Conditioning):**
Systems that control indoor climate conditions, including temperature and air quality.

**LEED Certification:**
Leadership in Energy and Environmental Design, a rating system that assesses the environmental performance of a building.

**Life Cycle Cost Analysis:**
An assessment that considers the total cost of owning and operating a facility over its entire lifespan.

**Punch List:**
A list of incomplete or deficient items that need to be addressed before the project is considered finished.

**Programming:**
The process of defining the requirements and functions of a building or space to guide the design.

**Request for Information (RFI):**
A formal inquiry seeking clarification or additional details about a specific aspect of the project.

**Site Analysis:**
The process of evaluating a location to determine its suitability for a construction project, considering factors like topography, climate, and accessibility.

**Stakeholder:**
An individual or group with an interest or concern in the outcome of a project, including owners, users, and the community.

**Schematic Design:**
The initial phase of design where rough sketches and concepts are developed to explore the project's overall look and feel.

**Sustainability:**
Design and construction practices that aim to minimize negative environmental impacts and promote long-term ecological balance.

**Value Engineering:**
A systematic method to improve the function and value of a project without compromising quality.

**Zoning Regulations:**
Rules and guidelines imposed by local authorities to control the use of land and structures within a specific area.