



Design Milestone Checklist



General Information and Instructions For Architect/Engineers

Purpose

The Range Project Design Milestones Checklists include the common items required during the range design process to the range designer, Architect/Engineer (AE) or other, and those involved in the design oversight. The checklists only highlight range design requirements that may be in addition to typical design requirement; typical design requirements still apply. Range designers should use the checklists to ensure that design submissions meet the minimum requirements at each Design Milestones: Concept (35%), Intermediate (65%), and Pre-Final (95%). Use the checklists in addition too, and not in lieu of, applicable Army publications (ARs, UFCs, TCs, FMs, etc.).

Design Checklists

The checklists are not specific to any single range type but are meant to guide the design for all range projects regardless of emplacements, features, and facilities that may be part of the specific project.

There is a different checklist for each of the three major design milestones. Each is based on the level detail required at the specific level of design. Early design stages, concept, 15%, etc., must address all of the items in the 35% checklist and include as appropriate.

Design Reviews

Range designers should address all applicable items from the appropriate checklist in each design milestone submittal. During design reviews, project stakeholders will provide feedback based, in part, on the items in the checklists.

Range Design Checklist for Concept (35%) Milestone

Project Type:	Project#:		
Project Location:	Date:		
Design Requirement:	Yes	No	Notes:
Civil			
C-1. Site Development Drawings			
C-1.A. Preliminary site layout information that includes, at a minimum:			
1	Targetry and primary downrange features, with unique identification (i.e. bunkers, trenches, target pads, lane markers, limit markers, etc.)		
2	Firing positions and firing trails, with unique identification		
3	Downrange roads		
4	Power centers (see Electrical Design requirements)		
5	Applicable range standard layout information supporting design review (i.e. target distance lines, lane lines, etc.)		
6	Range Operations and Control Area (ROCA) layout supporting design review analysis of separation requirements (i.e. range structures, access roads, parking, gates, range flag, etc.)		
7	Existing Site Survey which shows site features, preliminary environmental overlays (wetlands, endangered species, etc.), and site topography. Mounted Maneuver Range 35% designs must be based on recent, 1-foot (1/2 meter) survey data. Lane based qualification range and infantry battle course 35% designs should use recent, 1-foot (1/2 meter) survey data, but may use recent installation LIDAR data if the accuracy can be verified.		
8	Grading & drainage and tree/vegetation clearing design in sufficient detail to support Line of Sight analysis and cost estimating, based on appropriate survey data.		
C-1.B.	MEC / UXO risk map with range footprint overlay		
C-1.D.	Project footprint showing range layout with known location of protected wildlife, plants, wetlands, archeological sites, etc .		
C-1.E.	Standard civil details from Range Design Guide, with knowns notes to designer addressed and removed including target berm thickness		
C-3. Site Design Analysis Data			
C-3.A.	Range standard used (year) with references		
C-3.B.	Supported ammunition, with target berm calculations from "Target Protection Design Curve"		
C-3.C.	Supported platforms (vehicles in ROCA and downrange)		
C-3.D.	Line of Sight (LoS) parameters (height offset and location of Firing Point / Targetry Point)		
C-3.E.	Design criteria and code / standard references, with justification for any deviations		
C-4. Line of Sight (LoS)			
C-4.A.	Applicable 35% LoS Analysis documentation		

Design Requirement:		Yes	No	Notes:
Electrical				
E-1. Electrical Design Drawings				
E-1.A.	Preliminary details for each target emplacement (standards may be obtained from RTLP MCX)			
E-1.B.	Preliminary detail for power centers, emplacements that house transformers, and data communication distribution points (i.e. splice panels, data cable breakout boxes, etc.)			
E-1.C.	Preliminary "Single-line Diagram" for primary power, to include any primary requirements downrange			
E-1.D.	Preliminary "Single-line Diagram" for secondary power to downrange targets			
E-1.E.	Preliminary "Single-line Diagram" for data communication to downrange targets			
E-1.F.	Preliminary power and communications site plan (this may be submitted as two separate site plans, preference is to depict both on a single site plan)			
E-1.G.	Preliminary power and communications floor plan for the Control Tower or Range Operations Center that provides location for the termination of downrange data communication cables (this may be submitted as two separate floor plans, preference is to depict both on a single floor plan). Targetry system equipment is isolated from all other communications equipment and systems.			
E-2. Electrical Design Analysis				
E-2.A.	Narrative describing how power will be provided to all downrange targets and devices, including all primary and secondary requirements			
E-2.B.	Narrative describing how data communications will be provided to all downrange targets			
E-2.C.	Narrative description of what is being constructed at target emplacements, power centers, and any emplacements housing transformers, splice enclosures, or communications enclosures.			
E-2.D.	As required, narrative description describing how power and communications equipment will be installed in the Control Tower, Range Operations Center, and After Action Review building			
E-2.E.	Type of limit markers and how they will be controlled			
E-2.F.	Impact to the electrical design based on UXO risk, including actions taken by the design to mitigate clearance requirements			

ROCA Buildings				
Submittal meets Design Agents requirements for 35% Design				
R-1. Drawings				
1	All building sizes and layouts are standard designs and match the 1391 line items. Any deviations to the standard size or layout requires an Exception to Standard (ETS). A copy of the approved ETS is included in the design analysis.			
2	Floorplans of all ROCA buildings match between A, S, M, and E disciplines.			
3	Floorplans show correct location of, and connection between, targetry system equipment, DTR's, Workstations, etc.			

Range Design Checklist for Intermediate (65%) Milestone

Project Type:		Project#:		
Project Location:		Date:		
Design Requirement:		Yes	No	Notes:
Civil				
	Completed civil design that incorporates all items included from previous submittals			
C-1. Site Development Drawings				
C-1.A. Fully developed site layout information for all range features with ID, location, and orientation defined. Typical methods of definition could include:				
1	Targets (except Moving Armor Target (MAT)) and firing positions with a schedule providing Northing, Easting, and Elevation for each control point (control points are defined in detail drawings)			
2	Firing Trails and MATs having geometry alignment with associated grading profile			
3	Range Operations and Control Area (ROCA) with Northing and Easting for two corners of each building with finished floor elevations			
4	Maintenance access identified on range layout including, but not limited to: targetry, power centers, range features, etc.			
C-1.B. Fully developed limits of construction				
1	Limits of construction envelope includes all features; roads, trails, targets, markers, cameras, electrical trenches, etc. and proposed contractor access to isolated features.			
2	Civil and Electrical plans are coordinated			
C-1.C. Fully developed grading and drainage information for all range features				
1	Grading intent defined for all range related site features			
2	All downrange features are appropriately protected from live fire to prevent damage or injury (i.e. culverts, downrange electrical / data pedestals, or hard surfaces that could present ricochet hazards such as manhole covers)			
3	Mass grading areas defined (greater detail may be necessary if critical to ensure successful Line-of-Sight (LoS))			
4	Drainage design routes stormwater away from target emplacements / range features (NOTE: drainage features will be subject to live fire)			
C-1.D. Fully developed civil details based on Range Design Guide standards, with special attention to critical dimensions (i.e. emplacement front wall height, target protection berm width, etc.)				
C-1.E. MEC / UXO risk map includes, in addition to depicting the horizontal limits of construction, notes addressing:				
1	Summary of the UXO reconnaissance and subsequent UXO removal action either performed or planned for the site.			
2	Information regarding boundary / staking of UXO removal areas			
3	Support to be provided by the UXO contractor during construction			
4	Instructions for the contractor if an object resembling military munitions is found during construction			
C-2. Site Specifications				
C-2.A. Specifications for ricochet concerns and target protection berms. The outer foot of berm material will not contain aggregates larger than 1/2" in size (this is typically addressed in Spec Section 31 00 00, but may be placed where directed by local USACE District or National Guard Command)				

Design Requirement:		Yes	No	Notes:
C-3. Site Design Analysis / Calculations				
C-3.A.	Fully developed analysis and calculations to support all range related design			
C-4. Line of Sight (LoS)				
C-4.A.	Applicable 65% LoS analysis documentation			

Electrical				
E-1. Electrical Design Drawings				
E-1.A.	Fully developed "Single-line Diagrams" for primary power, secondary power, and data communications			
E-1.B.	Fully developed power and communications site plan that shows range layout and routing of power and data cables to all targets (this may be submitted as two separate site plans, the preference is to depict both on a single site plan)			
E-1.C.	Fully developed power and communications floor plan for the Control Tower and/or Range Operations Center, including termination locations of downrange data cables (this may be submitted as two separate floor plans, the preference is to depict both on a single floor plan)			
E-1.D.	Fully developed target emplacement details			
E-1.E.	Details for all power centers or downrange emplacements housing transformers or data enclosures (i.e. splice panels, data cable breakout boxes, etc.)			
E-1.F.	Fully developed details for all enclosures and data racks used for terminating downrange communications equipment in a Control Tower, Range Operations Center, or After Action Review building			
E-1.G.	Limit marker control diagrams and routing of control wires on site plan			
E-1.H.	Electrical corridors in medium and high-risk UXO areas defined on the electrical site plans (acknowledging the electrical site design cannot be completely diagrammatic in these areas). This data is required for UXO clearance contracts. Failure to submit this data with the 65% design may delay award of the UXO contract and put the project at risk			
E-2. Electrical Specifications				
E-2.A.	Construction Inspection and Target Interface Inspection requirements			
E-3. Electrical Design Analysis				
E-3.A.	Voltage drop calculations for secondary power to downrange targets			

ROCA Buildings				
	Submittal meets Design Agents requirements for 65% Design			
R-1. Drawings				
1	Drawings incorporate all items included from previous submittals and are developed to 65% design level.			
R-2. Design Analysis and Calculations				
1	Mechanical design includes Targetry System heat loads and temperature setpoint requirements			

Range Design Checklist for Pre-Final (95%) Milestone

Project Type:		Project#:	
Project Location:		Date:	
Design Requirement:		Yes	No
Civil		Notes:	
C-1. Site Development Drawings			
C-1.A.	Completed civil design that incorporates all items included from previous submittals		
C-2. Coordinate Schedule for all Range Features			
C-2.A.	Sufficient information for all targetry and firing positions so that naming, coordinate location, and orientation are provided		
C-3. Site Specifications			
C-3.A.	Completed specifications that incorporate all items included from previous submittals		
C-3.B.	Specifications have no open brackets		
C-4. Site Design Analysis / Calculations			
C-4.A.	Completed design analysis and calculations to support all range related design		
C-5. Line of Sight (LoS)			
C-5.A.	Applicable 95% LoS analysis documentation		

Design Requirement:		Yes	No	Notes:
Electrical				
E-1. Electrical Design Drawings				
E-1.A.	"Single-line Diagram" for primary power			
E-1.B.	"Single-line Diagram" for secondary power to targets			
E-1.C.	"Single-line Diagram" for data communications to targets			
E-1.D.	Target emplacement details			
E-1.E.	Power Center Details			
E-1.F.	Limit marker control diagrams and routing on site plan			
E-1.G.	Power and communications site plan showing all targets and devices downrange that receive power and/or data communications (this may be submitted as two separate site plans, the preference is to depict both on a single site plan)			
E-1.H.	Power and communications floor plan for the Control Tower and/or Range Operations Center (this may be submitted as two separate floor plans, the preference is to depict both on a single floor plan)			
E-1.I.	Communication enclosure and data rack details for equipment used to terminate downrange data cables			
E-2. Electrical Specifications				
E-2.A.	Construction Inspection and Target Interface Inspection requirements			
E-3. Electrical Design Analysis				
E-3.A.	Voltage drop calculations for secondary power to downrange targets			

ROCA Buildings				
	Submittal meets Design Agents requirements for complete/final Design			
R-1. Drawings				
1	Drawings incorporate all items included from previous submittals and are developed to complete design level.			
R-2. Design Analysis and Calculations				
1	Mechanical design includes Targetry System heat loads and temperature setpoint requirements			