

**Attachment C  
Deliverable Schedule, 15-30-60-90/100%**

Rev	Date	Description	POC	RM
0	2/1/06	Initial issue	Tobin Oruch, <i>ENG-CE</i>	Mitch Harris, <i>ENG-DO</i>
1	10/27/06	Added code analysis pg 3 Arch design criteria	Tobin Oruch, <i>CENG</i>	Kirk Christensen, <i>CENG</i>
2	6/16/08	Added energy deliverables under Multi-Discipline heading.	Tobin Oruch, <i>CENG</i>	Kirk Christensen, <i>CENG</i>
3	5/21/09	Admin changes; was App. C	Tobin Oruch, <i>CENG</i>	Gary Read, <i>CENG</i>
4	8/25/10	FCN Criteria doc. 90% expectations.	Tobin Oruch, <i>CENG</i>	Larry Goen, <i>CENG</i>

Requirements and Notes:

1. This schedule is required for projects with a total cost of over \$500k; smaller projects may adapt as desired.
2. Deliverables listed are Design Agency (AE) responsibility unless noted otherwise in AE's contract.
3. The percentage columns refer to project design review submittals that normally occur when the overall project is at the completion percentages given; the table indicates what is required at those percent-complete reviews (these may include "final" versions of some documents).
4. The 90% submittal is expected to be the Design Agency's complete and final documents (i.e., would be willing to apply PE seal and stand behind them); LANL's 90% review should merely be a final check of comment resolution from the 60% review and a review of the additional development from that time.
5. The 100% submittal is the 90% submittal documents with all compliance comments resolved, all others dispositioned as necessary, and documents approved and issued by design agency (AE).
6. Modification: The LANL Project may add to or make more aggressive this schedule. The project may also assign some tasks (e.g., commissioning) to the LANL Design Authority Representative (DAR) or another LANL entity if not required of Design Agency by Z10 Att B. To reduce or relax this schedule, the project shall obtain concurrence from the DAR.
7. The ESM contains additional detail on these deliverables as well as additional required deliverables. Project-specific documents such as F&Rs, Performance Criteria, and Design Criteria may also contain deliverable requirements not contained here.
8. For each succeeding deliverable, previous LANL standards compliance ("C") comments shall have been resolved, and all others dispositioned.
9. This is for preliminary and final design, not conceptual design or studies.
10. These submittals are to be delivered to LANL STR or their designee (e.g., Project Engr).

DISCIPLINE	REVIEW (%) <sup>3</sup>			
	15	30	60	90 <sup>b</sup>
<b>MULTI-DISCIPLINE</b>				
Formal written responses to review comments from previous phase <sup>c</sup>		X	X	X
Field Change Notice (FCN) Criteria document draft per <a href="#">AP-341-519</a> , Design Revision Control, which governs the field changes that may be made simply by the constructor. If practical, attach to Test & Inspection Plan (required for IBC work; see ESM Ch 16 IBC-IP Att B).			X	

DISCIPLINE	REVIEW (%) <sup>3</sup>			
	15	30	60	90 <sup>b</sup>
Field Change Notice (FCN) Criteria document final				X
LEED registration copy of application or USGBC webpage printout showing registered (when LEED is mandated; see ESM Ch 14, Sust Design)		X		
LEED certification proposed credits worksheet (when LEED is mandated)		X	X	X
Energy calculation showing 30% better than ASHRAE 90.1-2004 per ESM Ch 14		X	X	X
Energy Efficiency and Sustainability Report (ESM Ch 14, Sust Design) draft			X	
Energy Efficiency and Sustainability Report (ESM Ch 14, Sust Design) final draft				X
<b>Master Equipment List</b> (per Z10)				
Preliminary – major equipment pieces as a minimum			X	
Final (without data not yet known such as constructors choice when an option)				X
<b>Master Document List</b> (per Z10)				
Preliminary – documents in process to date			X	
Final				X
<b>Facility Design Description and/or System Design Descriptions</b> (if required for project by Z10 App B or ESM Chapters 10-Hazardous Process or 12-Nuclear)				
Preliminary – major systems described conceptually, preliminary design criteria and constraints, and other data indicated for this phase by Z10 App D, FDD.		X		
Updated – major system descriptions matching drawing representations and complete design criteria and constraints; minor systems described conceptually and have preliminary design criteria and constraints, other data per Z10 App D.			X	
Final – SDDs and all FDD information suggested by Z10 App D				X
For existing and new facilities requiring (re)configuration of floor plan(s) the subcontractor shall notify the STR for Record Floor & Emergency Evacuation Plans templates who shall initiate the processes involved in updating and incorporating the modifications per ESM Arch Chapter 4.				X
<b>DEMOLITION</b>				
<b>Demo Dwgs</b>				
Demolition dwgs, if applicable, shall be prepared using digital photographs of existing facility structures, systems & components as base dwgs to the maximum extent practicable. Items to be removed or demolished to be indicated by annotation or editing of the photographs				
Preliminary layout dwgs and elevations with pictures of existing inserted		X		
Fully annotated dwgs with details for demolition of critical SSCs			X	
Fully annotated dwgs with details for demo and/or temporary support of critical SSCs				X
<b>Demo Calcs</b>				
Complete structural calcs for any temporary shoring or structures required			X	
<b>Demo Specs</b>				
Outline specs complete		X		
Portray complete scope of work			X	
Complete				X
<b>CIVIL</b>				
Site survey to establish existing site grading, drainage, structure locations, existing overhead and underground utilities, and special site conditions and/or constraints	X			
Existing site conditions plan with locations of existing buildings, structures, existing contours, and drainage features	X			
Preliminary site grading and drainage plan with establish building location and orientation, access roads, parking location, and finish floor elevations	X			
<b>Civil Calcs</b>				
Preliminary, for topics described in ESM Ch 3, Civil		X		
All design calcs, including, but not limited to, the following:			X	
Drainage calcs and hydrologic analysis, where applicable			X	
Earthwork calcs of cut and fill volumes with applicable cross sections			X	

DISCIPLINE	REVIEW (%) <sup>3</sup>			
	15	30	60	90 <sup>b</sup>
Pressure, demand, and capacity analysis for sizing and material proposed in the utility system improvements			X	
Pavement design calcs			X	
Road design calcs including horizontal and vertical alignment, curve data, super elevation, minimum sight distances, and pavement thickness			X	
Traffic counts and future volume projections to a traffic impact analysis and to establish design parameters as required			X	
Final				X
<b>Civil Dwgs</b>				
Preliminary plan view of proposed improvements including geometry, typical sections, pavement sections, site grading and drainage, utility locations with applicable clearance offsets		X		
Plan view of proposed site grading and drainage improvements identifying locations of roads, curb and gutter, parking areas, sidewalks, buildings and structures			X	
Roadway or drainage structure plan and profile sheets with appropriate horizontal and vertical design information			X	
Utility plan sheets identifying the proposed improvements with existing utilities clearly identified in locations where conflicts could exist			X	
Profile for (gravity) sanitary sewer or steam and condensate lines			X	
Stamped Final				X
<b>Civil Specs</b>				
Outline specs required by ESM Ch 3 complete		X		
Draft Specs complete			X	
Final contract specs complete				X
Dwgs, Specs, & Commissioning Plan for utilities ready to issue for approval				X
<b>ARCHITECTURAL</b>				
<b>Arch Calcs</b>				
Completed Design Criteria (Including Life Safety and IBC Code Analysis)		X		
Updated Design Criteria if required			X	
Complete				X
<b>Arch Dwgs</b>				
Plan layouts and exterior elevations complete		X		
Updated version of 30% plan layouts and exterior elevations; preliminary wall sections and details ADA requirements finalized			X	
All plans, elevations, sections, details, interior elevations, and schedules completed, authorized, and ready to issue for approval				X
Updated Floor Plan or Record and Evacuation Plan (when affected) per ESM Ch 4				X
<b>Arch Specs</b>				
Outline specs complete		X		
Portraying complete scope of work			X	
100% complete, authorized, and ready to issue for approval				X
<b>STRUCTURAL</b>				
<b>Design Basis Document</b> (ref LANL ESM Chpt 5, Sect I)				
Draft with building function, design methodology, performance category, hazard category, acceptance criteria, etc.		X		
30% review comments addressed			X	
60% review comments addressed, complete				X
<b>QA Plan for Structural Design</b> (ref LANL ESM Chpt 5, Sect I)				
Preliminary	X			
Final		X		
<b>Structural Calcs</b> (ref LANL ESM Chpt 5, Sect I)				
Foundation description and preliminary sizing (e.g., footings, mats, slabs, piles, tie-beams, etc)		X		

DISCIPLINE	REVIEW (%) <sup>3</sup>			
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Superstructure description and preliminary sizing (e.g., concrete or steel, cast-in-place vs pre-stress, lateral force resisting system, demonstration of complete load path, etc.)		X		
Descriptions of special structural considerations		X		
Completed structural scheme with all members sized			X	
Calcs or manufacturer's catalog data validating sizing and selection of all components			X	
Secondary component designs (e.g., base-plates, seismic bracing, support stands, etc)			X	
Foundation design(s)			X	
Anchorage designs			X	
<b>Structural Dwgs</b> (ref LANL ESM Chpt 5, Sect I)				
Preliminary floor plans and cross-sections		X		
Complete and accurate with correct dimensions, tolerances, detail references, general and keyed notes and compatibility with other disciplines			X	
Beam, column and footing schedules as applicable			X	
Secondary component details			X	
Foundation details			X	
Anchorage details			X	
Reinforcement and connection details, including bolt and weld sizes			X	
Final (ensure notes give accurate instructions)				X
<b>Test and Inspection Requirements</b> (ref LANL ESM Chpt 5, sect. I)				
Preliminary			X	
Final				X
<b>Structural Specs</b> (ref LANL ESM Chpt 5, Sect I)				
Complete outline of specs		X		
Development and/or review and updating of construction specs, to include preliminary Test and Inspection Requirements			X	
Ready to issue for approval				X
Final Test and Inspection Requirements				X
<b>HVAC</b>				
<b>HVAC Calcs</b>				
Preliminary HVAC heating and cooling loads corrected for altitude		X		
Preliminary ASHRAE 62 ventilation calcs with exhaust, outside air and building pressurization requirements		X		
Preliminary duct sizing calcs including system pressure drops		X		
Preliminary energy conservation/sustainable design analysis		X		
Updated and resolving/addressing comments from the 30% design			X	
100% complete, authorized, and ready to issue for approval.				X
<b>HVAC Dwgs</b>				
Preliminary mechanical symbols and legend		X		
Preliminary HVAC floor plans showing major equipment, duct runs, and VAVs/heating coils		X		
Preliminary HVAC roof plans showing office layout and equipment room, major equipment, penetrations, and pipe/duct runs		X		
Preliminary airflow diagrams including major equipment, supply & return diffusers, transfer grills, dampers, VAV/ reheat coils, airflow rates, and facility/room pressurization requirements		X		
Preliminary P&IDs including major system equipment, control devices, control wiring & logic, and sequence of operation		X		
Preliminary equipment schedule including all major equipment with significant operating parameters and equipment specs		X		
Updated and that resolve/address comments from the 30% design			X	

DISCIPLINE	REVIEW (%) <sup>3</sup>			
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Preliminary mechanical sections, elevations, and details			X	
Final P&IDs			X	
All other dwgs 100% complete, authorized, and ready to issue for approval				X
<b>HVAC Specs</b>				
Complete an outline (listing) of the mechanical/HVAC construction specs		X		
Edited set of construction specs that are specific to this project			X	
100% complete, authorized, and ready to issue for approval				X
<b>PIPING</b>				
<b>Piping Calcs</b>				
Preliminary piping (HVAC) system calcs including flow rates, pipe sizing with friction factors, velocities, expansion/contraction and system equipment pressure drops for pump selection		X		
Preliminary plumbing systems calcs including the water supply and drainage fixture unit requirements per the UPC		X		
Preliminary roof drainage system calcs sized per the requirements of ESM, Chapter 6 §10A in Section D2040		X		
Preliminary natural gas system calcs including flow rates and pipe sizing per the requirements of UPC, UMC, ASME 31.8 and NFPA 54		X		
Preliminary steam/condensate system calcs incl. flow rates and pipe sizing		X		
Preliminary Plumbing Equipment Schedule including all major equip. and fixtures		X		
Updated and resolve/address comments from the 30% design			X	
100% complete, authorized, and ready to issue for approval				X
<b>Piping Dwgs (refer to the LANL Standard Details for mechanical)</b>				
Preliminary heating water P&ID		X		
Preliminary chilled water P&ID (as necessary)		X		
Preliminary Plumbing Symbols and Legend (see app. E1 to E3 of the LANL Drafting Manual)		X		
Preliminary Plumbing Floor Plans including office layout, restrooms, janitor's closets and equipment room, major equipment locations, fixture locations, and distribution and vent piping; enlarged plans maybe required to clearly show the plumbing systems in certain areas, e.g. equipment rooms		X		
Preliminary Plumbing Diagrams including riser diagrams for the potable water system, sanitary waste/vent system, roof drainage, and make-up water system. Major equipment, fixtures, and piping included on the riser diagrams		X		
Preliminary Process Piping Plans including all major equipment, pipe runs, pipe sizes, and water flow rates Enlarged plans maybe required to clearly show the systems in certain areas, e.g. equipment rooms		X		
Preliminary HVAC Piping Plans including all major equipment, pipe runs, pipe sizes, and water flow rates. Enlarged plans maybe required to clearly show the systems in certain areas, e.g., equipment rooms		X		
Final P&IDs			X	
Other drawings updated to resolve/address comments from the 30% design			X	
Preliminary Plumbing Details include major equipment requirements and specialties, e.g. backflow preventer installation assemblies, PRV piping details, floor drain details, and cleanout details			X	
100% complete, authorized, and ready to issue for approval				X
<b>Piping Specs</b>				
An outline (listing) of the mechanical/HVAC construction specs		X		
Edited set of construction specs that are specific to this project			X	
100% complete, authorized, and ready to issue for approval				X
<b>FIRE PROTECTION</b>				
<b>NOTE:</b> Detailed alarm and sprinkler system design, installation dwgs, and calcs are prepared by the installing sub-contractor after the construction contract is let. These plans are reviewed and approved by LANL as required submittals.				

DISCIPLINE	REVIEW (%) <sup>3</sup>			
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<b>Summary of Scope</b> Location, size, number of stories, construction, and occupancy of buildings and identification of locations to be provided with fire protection and fire alarm systems		X		
<b>Fire Drawings</b>				
Building Plan showing building layout, fire areas, and fire walls		X		
Site Plan showing size, type and location of underground water mains and location of hydrants, sprinkler system lead-ins, and sectional valves		X		
Building dwgs showing The architect's life safety analysis with applicable codes of record, IBC construction type, and NFPA 101 occupancy type Egress routes, common paths of travel, dead ends, exit widths, exit doors, etc Location and rating of all fire walls, barriers, doors and dampers Location of all HVAC ducts with cfm ratings for intake and exhaust ducts for each HVAC unit All areas to be sprinklered, including features of construction and HVAC that could present obstructions of which the sprinkler contractor must be aware All fire alarm system areas of coverage Location and rating of emergency lights			X	
Final dwgs incorporating previous review comments				X
<b>Fire Specs</b>				
Draft specs for architectural, site, civil, structural, roof, walls, doors, HVAC, sprinklers, fire alarms, testing, and other sections that relate to fire protection for the project		X		
Specs incorporating the general design criteria			X	
Specs for fire related construction features including rated walls, doors, and dampers			X	
Specs for built-up roof construction, where used			X	
Sprinkler systems Specify type of system – (wet pipe, dry-pipe, deluge) how actuated; type, style, and temperature rating of sprinkler heads; hydraulic design criteria, (e.g., Ordinary Hazard, Group 2) Allowed types of pipe and fittings, backflow preventer, other equipment anticipated on the installation			X	
For alarm systems: type of system, type of detectors, what calcs will be required, what interlocks are to be provided			X	
Final specs incorporating previous review comments				X
<b>INSTRUMENTATION AND CONTROLS</b>				
<b>I&amp;C Calcs</b>				
Preliminary device sizing calcs		X		
Completed calcs for all engineered instrumentation devices			X	
Finalized and ready to issue for approval				X
<b>I&amp;C Dwgs</b>				
Preliminary network drawing		X		
Preliminary control or P&ID drawing for each system		X		
Preliminary sequence of operations		X		
Preliminary BAS I/O list		X		
Preliminary Instrument List		X		
Preliminary Control Schematics (as required)		X		
Final P&IDs			X	
Dwgs updated to portray complete scope of work and substantially complete			X	
Completed instrument point list			X	
Completed Instrument List			X	
Major control panels shown on mechanical and electrical dwgs			X	

DISCIPLINE	REVIEW (%) <sup>3</sup>			
	15	30	60	90 <sup>b</sup>
Control power feeds shown on electrical floor plans and panel schedules			X	
Finalized and ready to issue for approval				X
<b>I&amp;C Specs</b>				
Preliminary specs, to include commissioning requirements including pre-functional testing, functional testing, and checklists		X		
Specs updated to portray complete scope of work, including start up and testing requirements, and substantially complete			X	
Finalized and ready to issue for approval				X
<b>Software QA/Control Documentation</b>				
Development, operating, and verification documentation for any AE-developed process-operating software				X
<b>ELECTRICAL</b>				
<b>Electrical Calcs</b>				
Preliminary electrical load study to estimate component sizes		X		
Preliminary fault current calcs		X		
Interior lighting calcs complete		X		
Preliminary paging system sound distribution calcs		X		
Load study complete; circuits sized and distribution components selected			X	
Fault Current calcs complete			X	
Voltage drop calcs complete			X	
Preliminary coordination study			X	
Exterior lighting calcs complete			X	
Paging system calcs complete; wiring sized and components selected			X	
All Electrical Calcs complete, checked, cross-discipline coordinated, sealed by PE, and ready for approval				X
<b>Electrical Dwgs</b>				
Preliminary site plan includes power and telephone service connection points and routing to project		X		
Prelim. one-line diagram portrays service and distribution system arrngmnt		X		
Preliminary power plans include electrical rooms and major electrical equipment locations		X		
Preliminary enlarged electrical room plans show electrical service and distribution equipment and NEC required working spaces		X		
Preliminary lighting plans include luminaire locations, type designators, and control device locations		X		
Preliminary luminaire schedule includes basic descriptions of luminaires shown on the preliminary lighting plans		X		
Preliminary telcom plans include telecon room locations and preliminary cable tray routing		X		
Preliminary paging system plans show speaker locations		X		
Site plan further developed to include site lighting			X	
One-line diagram further developed to show all component sizes and calculated fault currents			X	
Power plans further developed to show receptacles, mechanical equipment, building equipment, user equipment, and complete branch circuiting			X	
Final enlarged electrical room plans			X	
Lighting plans further developed to show complete branch circuiting and lighting controls			X	
Luminaire schedule further developed to include complete descriptions and catalog numbers of all luminaires			X	
Telcom plans further developed to show telcom outlet locations and final cable tray routing			X	
Preliminary telcom room plans include cable trays, receptacles, grounding, and equipment racks			X	



DISCIPLINE	REVIEW (%) <sup>3</sup>			
	15	30	60	90 <sup>b</sup>
Paging system plans further developed to show speaker circuiting and equipment locations			X	
Preliminary paging system riser diagram include paging controllers, amplifiers, speakers, and interconnections			X	
Preliminary fire alarm system plans show locations of FACP, pull stations, and horn/strobe units			X	
Preliminary fire alarm riser diagram includes all components and an input/output matrix			X	
Preliminary lightning protection system plans include locations of air terminals, main conductors, down conductors, and grounding counterpoise			X	
Preliminary grounding diagram include main grounding electrode, main electrode ground bar, supplemental ground bars, and bonding locations for piping and structural steel			X	
Preliminary telecom system riser diagram includes system from service to station outlets			X	
Preliminary motor control diagram created for typical each motor control configuration			X	
Preliminary Security System Riser Diagram			X	
Preliminary Panel Schedules created for each panel not detailed on the one-line. Include load descriptions and values.			X	
Preliminary Nameplate Schedules include equipment ID tags, category I nameplates, and arc-flash warning labels			X	
All the above complete, checked, cross-discipline coordinated, and ready for approval				X
<b>Electrical Specs</b>				
Complete list of electrical spec sections		X		
Specs in draft form			X	
Specs complete, checked, cross-discipline coordinated, and ready for approval				X
<b>COMMISSIONING (ESM Ch 15)</b>				
<b>Cx Plan</b>				
Preliminary plan defining Cx authority, how authority will verify that design agency and contractor will implement the F&OR requirements, and addressing coordination of all disciplines from design through the construction and warranty periods	X			
Finalized and ready to issue including list of design checklists, list of all planned Cx spec sections, and planned construction inspection and test checklists		X		
<b>Cx Specs</b>				
Preliminary Cx outline specs for all those listed in the plan		X		
Specs updated to include full scope of project and substantially complete (Note: Cx submittal requirements shall be coordinated with project Submittal Procedures)			X	
Finalized and ready to issue				X
<b>Cx Checklists</b>				
Completed Cx design and construction checklists including those for Division 1 and all applicable disciplines			X	
Finalized and ready to issue				X
<b>Cx Schedule</b>				
Proposed Construction Cx Schedule				X

Endnotes

Guidance on expectations for design and other project documentation deliverables is available in Master [EM Project Definition Rating Index](#) - Traditional (Conventional) Definitions.