| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | | | | CONVENTIONAL FACILITIES | The Conventional Facilities for the Linac Coherent Light Source (LCLS) will include renovations to the existing SLAC facilities and the development of new facilities. Included will be all major systems and subsystems contained herein that will be required to support the facilities related to the LCLS programmatic requirements. The scope of the WBS will include 13 elements: Sector 20 Injector Facilities, Magnetic Measuring Facility, Main Control Center Modifications, Linac Upgrades, Beam Transport Hall, Research Yard Modifications, Undulator Hall, Front End Enclosure, Beam Dump, Near Experimental Hall, X-Ray Transport & Diagnostic Tunnel, Far Experimental Hall and the Central Lab Office Complex. |
| 1 | 09 | | | | CONVENTIONAL FACILITIES (Continued) | Activities within these elements include, site preparation and development (including establishment of survey monuments for site alignment) , beam line housings including a beam dump, renovations to existing facilities, buildings, service buildings, utility systems (including cooling systems), fire protection systems, roads, sidewalks, landscaping, berms, fencing and parking areas. |
| 1 | 09 | 01 | | | System Management & Integration | This element will provide the overall project management to implement and integrate the design, construction, commissioning, and close-out for all phases of the project related to conventional facilities. |
| 1 | 09 | 01 | 01 | | Management | This element will provide overall level of effort management support for conventional facilities to include development of reports and peer reviews, attendance of meetings, insure integration of other systems interfacing with conventional facilities, software acquisitions and travel as required, managing the WBS including cost, schedule and resources; coordinate Title I, Title II and Title III efforts with AE firms and in-house support staff engineers, designers and drafters; coordinate Title III with subcontractors (including architectural and engineering firms) and general contractors and construction managers, and managing the close-out of activities including commissioning and final acceptance by end users. |
| 1 | 09 | 01 | 02 | | Cost Account Managers | This element will provide SLAC project management support during Title I, Title II and Title III activities throughout the WBS. The UTR will provide oversight for subcontractors (including architectural and engineering firms), labor service and in-house labor. During the construction phase (Title III), the UTR has the responsibility to monitor construction activities including safety program, tests for bolt torque, welding, concrete strength, pressure certification, fire systems and electrical testing for project compliance with technical specifications and regulatory compliance. |
| 1 | 09 | 01 | 03 | | Construction Management | This element will provide a support role for various construction management activities in support of the WBS. CM will support all phases of activities to include pre-construction services, bidding, field supervision, commissioning, and close-out. Particular emphasis will be given to validation of WBS schedules and estimates, value engineering and general construction support activities including Safety plan, EP site sampling analysis/characterization and disposal plans, LEED, quality control and preparing bid packages to release for construction. |
| 1 | 09 | 01 | 04 | | Mechanical Design (MD) | This element will provide SLAC MD drafting support and drawing research for as-builts in support of the WBS for Title I and Title II activities. |
| 1 | 09 | 01 | 04 | 01 | Mechanical Design Title 1 (Linac not included) | This element will provide MD effort (excluding Linac) in support of Title I activities. |
| 1 | 09 | 01 | 04 | 02 | Mechanical Design T1 Linac Facilities | This element will provide MD effort directly related to the Linac in support of Title I activities. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 01 | 04 | 03 | Mechanical Design Title 2 (Linac not included) | This element will provide MD effort (excluding Linac) in support of Title II activities. |
| 1 | 09 | 01 | 04 | 04 | Mechanical Design T2 Linac Facilities | This element will provide MD effort directly related to the Linac in support of Title II activities. |
| 1 | 09 | 01 | 04 | 05 | Mechanical Design Title 3 Linac Facility | This element will provide MD effort directly related to the Linac in support of Title III activities. |
| 1 | 09 | 01 | 04 | 06 | Mechanical Design Title 3 (Linac not Included) | This element will provide MD effort (excluding Linac) in support of Title III activities. |
| 1 | 09 | 01 | 05 | | Conventional Experiment Facility (CEF) | This element will provide SLAC CEF effort in support of the WBS for utility upgrades and misc engineering in-house support and project coordination in support of for Title I and Title II activities (Pre-Title I and Pre-Title II). Activities included in this element are field surveying, gathering user requirements, developing design criteria packages, obtaining user review and approvals, assisting in the request for proposal packages for engineering and construction firms, assisting in job walks for engineering and construction firms. |
| 1 | 09 | 01 | 05 | 01 | CEF Engineering Title 1(Linac Not Included) | This element will provide SLAC CEF effort (excluding Linac) in support of Title I activities. |
| 1 | 09 | 01 | 05 | 02 | CEF Engineering Title 1 Linac Facility | This element will provide SLAC CEF effort directly related to the Linac activities in support of Title I activities. |
| 1 | 09 | 01 | 05 | 03 | CEF Engineering Title 2 (Linac Not Included) | This element will provide SLAC CEF effort (excluding Linac) in support of Title II activities. |
| 1 | 09 | 01 | 05 | 04 | CEF Design Linac Facility Title 2 | This element will provide SLAC CEF effort directly related to the Linac activities in support of Title II activities. |
| 1 | 09 | 02 | | | Title 1 & Title 2 Conventional Facilities | This element will provide both SLAC in-house engineering, drafting support, and subcontractor architectural/engineering support for the Title I and Title II design efforts for the following WBS elements: Sector 20 Injector Facilities, Magnetic Measuring Facility, Main Control Center Modifications, Linac Upgrades, Beam Transport Hall, Research Yard Modifications, Undulator Hall, Front End Enclosure, Beam Dump, Near Experimental Hall, X-Ray Transport & Diagnostic Tunnel, Far Experimental Hall and the Central Lab Office Complex. |
| 1 | 09 | 02 | 02 | | A & E Services (S20, MMF, MMC not Incl) | This element will provide architectural and engineering support for the WBS (excluding S20, MMF and MCC). Included will be Title I and Title II construction document development to include drawings, specifications, studies and analyses, engineering and geotechnical study tunnel reports, cost and schedule estimates, renderings and engineering calculations. |
| 1 | 09 | 02 | 02 | 01 | Title 1 Design | This element will provide the preliminary architectural and engineering support for Title I phase of the design development for conventional facilities. This design phase further develops the conceptual design to include engineering studies and analyses, risk assessments, preliminary drawings and engineering specifications, cost and schedule estimates, and life cycle cost estimates. This phase will consume up to a third of the engineering effort. |
| 1 | 09 | 02 | 02 | 02 | Title 2 Design | This element will provide the architectural and engineering support for Title II phase of the design development for conventional facilities, including final working drawings, specifications and complete bidding documents for conventional facilities. This phase commences after approval of the Title I design by the DOE. |
| 1 | 09 | 02 | 03 | | A & E Services - (S20, MMF,MCC) | This element will provide architectural and engineering support for Sector 20 (shielding wall, RF hut and alcove modifications), Magnetic Measuring Facility and the Main Control Center upgrades. Included will be Title I and Title II construction document development to include drawings, specifications, studies and analyses, engineering reports, cost estimates, renderings and engineering calculations. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 02 | 03 | 01 | Title 1 Design (Sector 20) | This element will provide the preliminary architectural and engineering support for Title I phase. This design phase further develops the conceptual design to include engineering studies and analyses, risk assessments, preliminary drawings and engineering specifications, cost and schedule estimates, and life cycle cost estimates. This phase will consume up to a third of the engineering effort. |
| 1 | 09 | 02 | 03 | 02 | Title 2 Design (Sector 20) | This element will provide the architectural and engineering support for Title II phase of the design development for S20 Injector Facilities, including final working drawings, specifications and complete bidding documents. This phase commences after approval of the Title I design by the DOE. |
| 1 | 09 | 02 | 03 | 03 | Title 1 Design (MMF) | This element will provide the preliminary architectural and engineering support for Title I phase. This design phase further develops the conceptual design to include engineering studies and analyses, risk assessments, preliminary drawings and engineering specifications, cost and schedule estimates, and life cycle cost estimates. This phase will consume up to a third of the engineering effort. |
| 1 | 09 | 02 | 03 | 04 | Title 2 Design (MMF) | This element will provide the architectural and engineering support for Title II phase of the design development for MMF, including final working drawings, specifications and complete bidding documents. This phase commences after approval of the Title I design by the DOE. |
| 1 | 09 | 02 | 03 | 05 | Title 1 Design (MCC) | This element will provide the preliminary architectural and engineering support for Title I phase. This design phase further develops the conceptual design to include engineering studies and analyses, risk assessments, preliminary drawings and engineering specifications, cost and schedule estimates, and life cycle cost estimates. This phase will consume up to a third of the engineering effort. |
| 1 | 09 | 02 | 03 | 06 | Title 2 Design (MCC) | This element will provide the architectural and engineering support for Title II phase of the design development for MCC Upgrades, including final working drawings, specifications and complete bidding documents. This phase commences after approval of the Title I design by the DOE. |
| 1 | 09 | 03 | | | Construction-T3 Conventional Facilities | This element will provide the construction phase of activities to cover the receipt, inspection, assembly of the project conventional facilities, as well as any changes that are required during construction. Included will be support of: obtaining permits, safety plan, quality control, site preparations, buildings demolition, buildings construction, tunnels, shielding blocks, control rooms, preparation areas, laser rooms, experimental hutches, cooling systems, electrical systems, cable trays, ventilation systems, HVAC systems, drainage systems and utility systems. Installation of the interiors, commissioning, testing, punchlist, furnishing, final as-built drawings, operation and maintenance manuals, on-site safety and equipment training and other documentation of the facility are also prepared as part of Title III close-out activities. At the end of Title III the project is ready for activation and operation by the operations staff. [Note: cable tray within the Linac is not included]. |
| 1 | 09 | 03 | 01 | | Sector 20 Injector Facilities | This element will provide the requirements for Sector 20 Injector Facilities including the removal and rebuild/relocate Alcove Pump Room; RF Hut at approximately 200 square feet; Alcove modifications to include a new Laser Room, Load Lock Room and Control Room. This existing area consists of approximately 2,000 square feet of floor space at grade level adjacent to the Klystron Gallery. The area is in need of total renovations including roofing, siding, lighting, power, utilities, hvac and other interior modifications. The Laser Room and Load Lock Room will be environmentally controlled equivalent to a class 100,000 clean room. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 01 | 01 | Site Preparation | This element will provide the preparation of the site for construction activities, selective demolition, site grading and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal of existing site utilities as needed. Installation of temporary fencing is also included. |
| 1 | 09 | 03 | 01 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, equipment pads, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. Also included in this element is the installation of the shielding wall to include concrete, lead (Pb) and iron (Fe) with their appropriate structural supports. |
| 1 | 09 | 03 | 01 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 01 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 01 | 05 | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required controlling the room temperature and relative humidity for support buildings, rooms, enclosures and shafts. |
| 1 | 09 | 03 | 01 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 01 | 07 | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring, painting and epoxy coating. |
| 1 | 09 | 03 | 01 | 10 | Project Close Out Sector 20 Injector Facility | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 02 | | Magnetic Measurement Facility | The Magnetic Measurement Facility (MMF) consists of the construction of approximately 4,800 sf area of lab space in an existing warehouse building. The improvements include construction of a CMM room, MM lab, office, cradle assembly area and electrical and mechanical rooms. The existing building is approximately 25 ft high and the MMF area will be isolated by full height walls, and will have a clear height of 17 Ft. Provide new concrete foundations for the MM equipment. A new mezzanine area of approximately 1,300 sf, will be constructed of steel framed with concrete slab over a metal deck. Building services include fire protection system (wet sprinkler and fire alarm), plumbing, electrical and HVAC systems. The HVAC and electrical systems are to provide the required temperature controls for a minimal temperature tolerance of 0.18ºF and relative humidity of 45% RH, ±5% in the MM Lab. Installation of a chiller and piping for process loads and a small air compressor and compressed air piping. The existing building is a steel frame structure. The floor is a 6-inch thick reinforced concrete slab. |
| 1 | 09 | 03 | 02 | | Magnetic Measurement Facility | To accommodate the new facility some modifications will be necessary. These changes include installation of a new electrical feeder (800 amps, 480 volts, 3 phase) and Motor Control Center for the building. Some additional modifications will include the relocation of existing racks, Haz Material Storage and office cubicles that support the Stores operation currently in place. |
| 1 | 09 | 03 | 02 | 01 | Site Preparation | This element will provide the preparation of the site for construction activities to include demolition. This element covers the cost of removing and relocating existing site utilities as needed. Remove and provide temporary and permanent fencing as required. Included will be the tasks of unloading storage racks. |
| 1 | 09 | 03 | 02 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, equipment pads, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. Included will be the installation of two (2) cranes. |
| 1 | 09 | 03 | 02 | 03 | Electrical | This element will provide the installation of the project primary electrical 600 amp - 480V motor control center distribution system to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. Grounding, lighting, receptacles, conduit and wiring, transformers, disconnects, panel boards, switch gear shall also be included. Installation of fire alarm devices and pull stations. All power will be delivered to the vicinity of the technical system components to within 25 feet. |
| 1 | 09 | 03 | 02 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 02 | 05 | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. In addition the HVAC system will include a chiller, boiler, heat exchangers, chilled water cooling coil, circulating fans, humidifiers, hot water reheat coils, direct digital controls (DDC). |
| 1 | 09 | 03 | 02 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 02 | 07 | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring, painting and epoxy coating. |
| 1 | 09 | 03 | 02 | 10 | Project Close Out Magnetic Measurement Facility | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 03 | | Main Control Center Facilities Upgrade | The Main Control Center (MCC) for the linac is located in Bldg 005 and houses the operations staff for all linac activities, including PEP2. Modifications to MCC may include: expand and reorganize existing MCC layout to accommodate additional seating at control monitors utilizing modern control room consoles, upgraded lighting, and furnishings. When the LCLS is operational, LCLS will also be controlled from this existing facility. |
| 1 | 09 | 03 | 03 | 01 | Site Preparation | This element will provide the preparation of the site for construction activities including selective demolition. This element covers the removal of existing utilities as needed. Installation of temporary fencing is also included. |
| 1 | 09 | 03 | 03 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. |
| 1 | 09 | 03 | 03 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 03 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. |
| 1 | 09 | 03 | 03 | 05 | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. |
| 1 | 09 | 03 | 03 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 03 | 07 | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 03 | 10 | Project Close Out Main Control Center Facilitiy | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 04 | | Linac Facility | This element will provide upgrades to existing water-cooling and electrical systems from Sector 20 to Sector 30 of the SLAC Linac. Upgrades will include additional cooling water systems to support the RF gun and new Low Conductivity Water (LCW) requirements especially in sectors 24 and 25. Modifications will include upgrade to the existing electrical distribution system and switchgears. This element includes modifications to the LCW temperature control system. |
| 1 | 09 | 03 | 04 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 04 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will 3be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 04 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 04 | 10 | Project Close Out Linac Facility | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 05 | | Rearch Yard/B102,B211,B113 & Storage Trailers | This element will provide the various activities required by SLAC (CEF) department and a general contractor (GC) within the existing SLAC Research Yard. Some of the buildings that may be affected as a result of the LCLS project are building #064 Final Focus Test Beam, building #113 (hi-bay portion only), building #211, building #102 and #104, various storage containers and trailers #204, #4031, #4079, #4080 and #4081. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 05 | 01 | Site Preparation | This element will provide preliminary support activities of the site in advance of general contractor activities, including selective demolition, site grading and landscaping if required. Relocate persons in Building #102. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal and or modifications of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also included. This element will provide asbestos removal. (This element will be performed by CEF under WBS 1.9.3.5.1.1). This element will provide the preparation of the site for construction activities, selective demolition, site grading and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also includ |
| 1 | 09 | 03 | 05 | 02 | Structural | This element will provide preliminary support activities in advance of general contractor activities to support the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. (This element will be performed by CEF under WBS 1.9.3.5.2.1). This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. (This element will be performed by GC under WBS 1.9.3.5.2.2) |
| 1 | 09 | 03 | 05 | 03 | Electrical | This element will provide preliminary support activities in advance of general contractor activities to support the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. (This element will be performed by CEF under WBS 1.9.3.5.3.1). This element will provide the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. (This element will be performed by GC under WBS 1. |
| 1 | 09 | 03 | 05 | 04 | Utilities | This element will provide preliminary support activities in advance of general contractor activities to support the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. (This element will be performed by CEF under WBS 1.9.3.5.4.1). This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. (This element will be performed by GC under WBS 1.9.3.5.4.2) |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 05 | 05 | HVAC | This element will provide preliminary support activities in advance of general contractor activities to support the installation of air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. (This element will be performed by CEF under WBS 1.9.3.5.5.1). This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. (This element will be performed by GC under WBS 1.9.3.5.5.2) |
| 1 | 09 | 03 | 05 | 06 | Special System - Fire Protection | This element will provide preliminary support activities in advance of general contractor activities to support the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. (This element will be performed by CEF under WBS 1.9.3.5.6.1). This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. (This element will be performed by GC under WBS 1.9.3.5.6.2) |
| 1 | 09 | 03 | 05 | 07 | Interior | This element will provide preliminary support activities in advance of general contractor activities for the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. (This element will be performed by CEF under WBS 1.9.3.5.7.1). This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. (This element will be performed by GC under WBS 1.9.3.5.7.2) |
| 1 | 09 | 03 | 05 | 10 | Project Close Out Reasearch Yard | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 06 | | Access Road & Beam Transport Hall | The new Beam Transport Hall commences from the end of the Linac to the beginning of the Undulator Hall and replaces the existing Final Focus Test Beam enclosure. The existing Linac finish floor is approximately one foot lower than the required elevation of the new facility which will be at 247.25'. The BTH will have roughly the same general footprint of the FFTB extending from the BSY wall in the direction of the beam at 227 meters (length) x 4.5 meters (width) x 3 meters (height). The existing north access road will need to be modified to accommodate vehicular traffic over the portion of the new Undulator Hall that extends out into the Research Yard. Provisions will be made to allow access to either side of the Beam Transport Hall. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| **1** | **09** | **03** | **06** | **01** | Site Preparation | This element will provide the preparation of the site for construction activities, selective demolition, site grading, asphalt and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. Included in this element will be the labor required for the removal of utilities in support of the FFTB system. The removal of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also included. This element will include the removal of existing shielding blocks for the existing FFTB, Beam Dump and Muon shielding. |
| **1** | **09** | **03** | **06** | **02** | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. |
| **1** | **09** | **03** | **06** | **03** | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| **1** | **09** | **03** | **06** | **04** | Utilities | This element will provide for the removal of existing utilities in preparation for the demolition of the existing FFTB structure. This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| **1** | **09** | **03** | **06** | **05** | HVAC | This element will provide air handling exhaust systems, including ductwork and pumps. |
| **1** | **09** | **03** | **06** | **06** | Special System- Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| **1** | **09** | **03** | **06** | **07** | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |
| **1** | **09** | **03** | **06** | **10** | Project Close Out Beam Trans Hall | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| **1** | **09** | **03** | **07** | | Undulator Hall | The Undulator Hall (UH) shall be a tunnel commencing from the downstream end of the Beam Transport Hall thermal barrier. It shall extend 175 meters in the direction of the beam to the downstream end of the UH where it shall be enclosed by another physical thermal barrier separating the UH from the Beam Dump/Frond End Enclosure. The UH will contain 33 undulator magnets and associated equipment as it continues the electron beam to the Front End Enclosure and Beam Dump. The UH has tight alignment constraints, which places stringent requirements on its foundation and temperature stability. The interior dimensions are 4.5 meters (width) by approximately 4.0 meters (height). Access into the UH will be through an entry provided from the Beam Transport Hall. The UH shall be provided with heating, cooling, ventilation, and smoke purge systems. The floor elevation shall be maintained at 247.25' and will remain constant throughout the entire LCLS facilities. |
| **1** | **09** | **03** | **07** | **01** | Site Preparation | This element will provide the preparation of the site for construction activities, selective demolition, tunneling, site grading and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also included. |
| **1** | **09** | **03** | **07** | **02** | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns. |
| **1** | **09** | **03** | **07** | **03** | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| **1** | **09** | **03** | **07** | **04** | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| **1** | **09** | **03** | **07** | **05** | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. |
| **1** | **09** | **03** | **07** | **06** | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| **1** | **09** | **03** | **07** | **07** | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 07 | 09 | Tunneling | This element provides the installation of a cavern style tunneling effort utilizing a standard road-header type of equipment. The excavation, muck removal, initial and final reinforcing, shotcrete lining, lattice girders, drainage, temporary power, temporary lighting and ventilation is included. Entry portal will be located between Pep Ring Road and berm. The tunneling length starts at the berm and goes in the direction of the beam for 175 meters. There will be a thermal barrier at each end of the Undulator Hall. Thermal and vibration parameters are established. |
| 1 | 09 | 03 | 07 | 10 | Project Close Out Undulator Hall | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 08 | | Front End Enclosure | The Front End Enclosure (FEE) shall contain various diagnostic beam line components to separate the electron and x-ray-beams. The electron beam shall curve downward into the Beam Dump and the x-ray beam shall continue into the Near Experimental Hall and other facility components further downstream. A fire sprinkler system shall also be provided throughout the FEE. The floor elevation shall be maintained at 247.25’ and will remain constant throughout the entire LCLS facilities. |
| 1 | 09 | 03 | 08 | 01 | Site Preparation | This element will provide the preparation of the site for construction activities, selective demolition, site grading and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also included. |
| 1 | 09 | 03 | 08 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns. |
| 1 | 09 | 03 | 08 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 08 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 08 | 05 | HVAC | This element will provide ventilation and smoke purge systems. |
| 1 | 09 | 03 | 08 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 08 | 07 | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 08 | 09 | Tunneling | This element provides the cut-and-cover excavation effort utilizing standard equipment. The excavation, cast in-place concrete walls, lining, drainage, temporary power, temporary lighting and ventilation is included. Entry portal will be the same as used for the Undulator Hall. The tunneling length begins at the end of the Beam Dump and extends in the direction of the beam for 40 meters. |
| 1 | 09 | 03 | 08 | 10 | Project Close Out Front End Enclosure | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 09 | | Beam Dump | The function of the Beam Dump (BD) is to act as a terminal point for the high-energy electron beam. The electron beam separated from the x-ray beam bends downward within the Front End Enclosure and terminates into the Beam Dump. The actual dump is located directly below the FEE and will have provisions for occasional access for maintenance. Within the BD will be shielding blocks which act as radiation shields. The BD will provide ventilation and smoke purge systems. The floor elevation will be maintain at 247.25' and will remain constant throughout the entire LCLS facilities. |
| 1 | 09 | 03 | 09 | 01 | Site Preparation | This element will provide the preparation of the site for construction activities, selective demolition, site grading and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also included. |
| 1 | 09 | 03 | 09 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. |
| 1 | 09 | 03 | 09 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 09 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 09 | 06 | Special System (Fire Protection) Beam Dump | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 09 | 09 | Tunneling | This element provides the cut-and-cover excavation effort utilizing standard equipment. The excavation, cast in-place concrete walls, lining, drainage, temporary power, temporary lighting and ventilation is included. Entry portal will be the same as used for the Front End Enclosure. The tunneling length begins at the end of the Undulator Hall and extends in the direction of the beam for 40 meters. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 09 | 10 | Project Close Out Beam Dump | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 10 | | Near Experimental Hall | The Near Experimental Hall (NEH) is a two-story structure (below grade) that will begin downstream of the FEE and will extend approximately 33 meters in the direction of the beam. The primary function of the NEH is to house three experimental hutches. Each hutch shall have its independent PPS entry. Adjacent to the hutches shall be floor space to accommodate Prep and Control areas. Provisions shall be made for restroom facilities and 5-ton freight elevator. The second floor shall house a Laser Bay at approximately 6 meters x 32 meters. The NEH shall be provided with heating, cooling, ventilation and smoke purge systems. Provisions shall be made for the hutches to have process exhaust fans. A fire sprinkler system shall also be provided throughout the NEH. The floor elevation shall be maintained at 247.25' and remain constant throughout the entire LCLS facilities. |
| 1 | 09 | 03 | 10 | 01 | Site Preparation | This element will provide the preparation of the site for construction activities, selective demolition, site grading and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also included. |
| 1 | 09 | 03 | 10 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. |
| 1 | 09 | 03 | 10 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 10 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 10 | 05 | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. |
| 1 | 09 | 03 | 10 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 10 | 07 | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |
| 1 | 09 | 03 | 10 | 10 | Project Close Out Near Experimental Hall | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 11 | | X-Ray Transport & Diagnostic Hall | The XRTD tunnel shall extend 250 meters downstream of the NEH and shall extend to the FEH. The tunnel width configuration shall accommodate the main beam (0 degree) and the splitting of the referenced beam with +/- ¾ degree beams. A 4' wide aisle shall be maintained throughout the tunnel. The XRTD tunnel shall be provided with ventilation and smoke purge systems. A fire sprinkler system shall be provided throughout the XRTD. The floor elevation shall be maintained at 247.25' and will remain constant throughout the entire LCLS facilities. |
| 1 | 09 | 03 | 11 | 01 | Site Preparation | This element of site work will already be in place as a result of the site work established for the Near Experimental Hall. |
| 1 | 09 | 03 | 11 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns. |
| 1 | 09 | 03 | 11 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 11 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 11 | 05 | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. |
| 1 | 09 | 03 | 11 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 11 | 07 | Interiors | This element will provide the installation of all interior requirements including all general architectural features such as finishes onto masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 11 | 09 | Tunneling | This element provides the installation of a cavern style tunneling effort utilizing a standard road-header type of equipment. The excavation, muck removal, initial and final reinforcing, shotcrete lining, drainage, temporary power, temporary lighting and ventilation is included. Entry portal will be located west of Pep Ring Road. The tunneling length begins at the east end of the Near Experimental Hall and goes in the direction of the beam for 250 meters. |
| 1 | 09 | 03 | 11 | 10 | Project Close Out X-Ray Transport & Diagonistic | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 12 | | Far Experimental Hall | The Far Experimental Hall (FEH) shall be located 250 meters downstream of the NEH. It shall be located approximately 30 meters below grade and shall be constructed using conventional tunneling applications. The primary function of the FEH is to house experimental hutches. Each hutch shall have its independent PPS entry. Adjacent to the hutches shall be floor space to accommodate Prep and Control areas. The FEH shall be provided with heating, cooling, ventilation and smoke purge systems. Provisions shall be made for the hutches to have process exhaust fans. A fire sprinkler system shall be provided throughout the FEH. The floor elevation shall be maintained at 247.25' and will remain constant throughout the entire LCLS facilities. |
| 1 | 09 | 03 | 12 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns. |
| 1 | 09 | 03 | 12 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 12 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 12 | 05 | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. |
| 1 | 09 | 03 | 12 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 12 | 07 | Interiors | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 12 | 09 | Tunneling | This element provides the installation of a cavern style tunneling effort utilizing a standard road-header type of equipment. The excavation, muck removal, initial and final reinforcing, shotcrete lining, drainage, temporary power, temporary lighting and ventilation is included. Entry portal will be same as used for X-ray Transport Diagnostics tunnel. |
| 1 | 09 | 03 | 12 | 10 | Project Close Out Far Experimental Hall | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |
| 1 | 09 | 03 | 13 | | Central Laboratory Office Complex (CLOC) | The Central Laboratory Office Complex (CLOC) will be constructed to house the research offices and laboratory space to accommodate LCLS users, scientific and support staff. Each floor shall have experimental and research clusters and lab space. Included shall be a conference center. Parking will be provided adjacent to the office building and shall be architecturally attractive and moderately landscaped. The proposed location of the CLOC is on grade and adjacent to the east edge of PEP Ring Road. |
| 1 | 09 | 03 | 13 | 01 | Site Preparation | This element will provide the preparation of the site for construction activities, selective demolition, site grading and landscaping if required. This element covers the cost of general grading to create a suitable site and to control drainage and provisions for erosion control. The removal of existing site utilities as needed. Site clearing and grubbing to remove stockpiling of topsoil from construction site if required. Installation of temporary fencing is also included. |
| 1 | 09 | 03 | 13 | 02 | Structural | This element will provide the delivery, sorting and installation of the building frame system including concrete footings, slabs, foundations, rebar, bolts, base plates, building and support columns, roof and ceiling steel joists, open web joists, roof and floor decking. |
| 1 | 09 | 03 | 13 | 03 | Electrical | This element will provide the installation of the project primary electrical distribution systems to the main panel source of the area. The distribution of electric power will follow downstream and will include secondary electrical panels, transformers, disconnects, panel boards, switch gear and grounding for 480V, 3 phase; 208/120V, 3 phase; and 120V single phase. All power will be delivered to the vicinity of the technical system components to within 25 feet. This element will include the installation of general lighting, quad outlets and duplex outlets for 120V electric power. |
| 1 | 09 | 03 | 13 | 04 | Utilities | This element will provide the installation of the project utilities including domestic water, sanitary sewer, compressed air, storm drains and low conductivity water. Utilities required for technical system components will be delivered to within 25 feet of the equipment. |
| 1 | 09 | 03 | 13 | 05 | HVAC | This element will provide air handling and cooling systems, including ductwork, HEPA filters, chillers and pumps as required to control the room temperature and relative humidity for support buildings, rooms and enclosures and shafts. |
| 1 | 09 | 03 | 13 | 06 | Special System - Fire Protection | This element will provide the installation of a wet sprinkler fire protection system, including ancillary components such as valves, risers, etc. |
| 1 | 09 | 03 | 13 | 07 | Interior | This element will provide the installation of all interior requirements including all general architectural features such as masonry walls, gypsum board and metal stud walls, ceilings, flooring material, fixtures, painting and epoxy coating. |

| WBS NUMBER | | | | | TITLE | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | | |
| 1 | 09 | 03 | 13 | 10 | Project Close Out Central Laboratory Office Complex (CLOC) | This element will cover the receipt, inspection, assembly, commissioning, testing, punchlist, and furnishing of the project facilities and hardware, as well as any changes that are required during construction or assembly. Included in this final phase will be the receipt of operating and maintenance manuals, testing and on-site training for maintenance personnel, as-builts, and start-up of all equipment for validation of project (specification and drawing) compliance. At the end of the close out phase, the project will be ready for activation and operation by the operations staff. |