

List of Mechanical Deliverables

SN	Deliverable	Tool	Deliverable Contents	Developed During *	Deliverable/Data required for				Comments
					Procurement	Construction	Start-Up &	Project Controls	
1	Load Calculation (HVAC Software Output), Psychrometric Analysis, Fresh Air Calculation, and HVAC Equipment Load Calculation.	Hevacomp, HAP, TRACE, MS Excel, MS Word	Load Calculation is a compilation of HVAC software output prints showing cooling and heating requirements for the building based on fenestration, occupants, and meteorological data. Psychrometric Analysis is a diagram which shows the air process for a given system (mostly complex) to attain the room temperature and %RH requirements based on outdoor condition (single or dual season). The Psychrometry is the basis for humidification, dehumidification, total heating and cooling requirements, as well as the capacity of HVAC equipment. For healthcare and other cleanroom application where minimum air change is required, tabulation showing the minimum ACH airflow and load calculation must be provided as basis for equipment cooling and heating requirements. The minimum ACH will be the basis for BMS programming especially for Centralized VAV application. Fresh/Outdoor Air and Exhaust Air calculation based on the latest ASHRAE 62.1 version must be included in the deliverables for verification of OA-AHU and Exhaust Fan capacity. Other calculations shall include, (1) AHU, OA-AHU, and FCU cooling and heating capacity with Energy Recovery Equipment, (2) AHU air flowrate, pressure head, and consumed power, (3) Fan and Pump flowrates, pressure head, and power consumption, (4) Cooling Tower and Fan rating, (4) Chiller Nominal Capacity and considered de-rating factor, (5) Steam Boiler Capacity calculation including make-up water and condensate water return system.	D					Refer to Document EPM-KEM-TP-000026 for the check list for Standard Mechanical Deliverables during design stage.
2	Mechanical Fire and Life Safety System Calculation	CFD Analysis Software, MS Excel, MS Word	For <u>Prescriptive Based Approach</u>, calculation includes (1) airflow rates, number of open doors considered, pressure differential and air velocity, and air leakages required for pressurization of staircase or areas between smoke zones; (2) Fire Load and Heat Release Rates, smoke reservoir details, sprinklered or non-sprinklered building for smoke extraction strategy; (3) Fire Load and Heat Release Rates, smoke reservoir details, pressure differential across doors between smoke zones, sprinklered or non-sprinklered building for engineered smoke extraction strategy. For <u>Performance Based Approach</u> (such as Parking Ventilation and Smoke Control), CFD Analysis shall be submitted. Calculation shall include capacity (air flow, head loss, and power consumption) and fire rating of fans and appurtenances based on resulting plume temperature.	D					Refer to Document EPM-KEM-TP-000026 for the check list for Standard Mechanical Deliverables during design stage.

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3	Fire Hose and Sprinkler System Calculation	Hydraulic Calculation Software, MS Excel, MS Word	A/E shall specify type of hazard considered (light, ordinary, or extra hazard) for Pipe Schedule Method pipe sizing. The Contractor approved Civil Defense Fire Sprinkler Specialist can use Hydraulic Calculation complying with NFPA 13 to reduce required pipe size resulting from Pipe Schedule Method. The document shall include fire water storage requirements and capacity (flow, head loss, and power consumption) for Fire Pump and Jockey Pump.	D					Refer to Document EPM-KEM-TP-000026 for the check list for Standard Mechanical Deliverables during design stage.
4	Plumbing System Calculation	MS Excel, MS Word	Calculation includes cold and hot water system storage requirements based on reputable Standards. Fixture Units (water and drainage) calculation and summation as appearing in the Single Line Diagram shall be presented base on nodes. The document shall include fire water storage requirements and capacity (flow, head loss, and power consumption) for Fire Pump and Booster Pump.	D					Refer to Document EPM-KEM-TP-000026 for the check list for Standard Mechanical Deliverables during design stage.
5	Clean Agent System Calculation	AgentCalcs, Janus Design Suite, Kidde Fenwall, and other software	Software output shall include all parameters required by the Code such as discharge time, room volume, temperature consideration, and clean agent concentrations.	D					Refer to Document EPM-KEM-TP-000026 for the check list for Standard Mechanical Deliverables during design stage.
6	Riser Diagrams	2D	Riser Diagrams are a schematic representation of the functional relationship among equipment, piping or ducts, in-line components, major instrumentation, and process control for a given system. They provide the quantities of equipment and components, supply/return flow rates, and general sizing criteria. Riser Diagrams shall be created for all HVAC, Fire Protection, and Plumbing systems.	D		Y	Y		Refer to Document EPM-KEM-TP-000002 for the check list for an HVAC Riser Diagram.
7	Process Instrumentation Diagrams (P&IDs) for Air and Water Distribution System	2D	P&IDs define the flow of the process, indicate the quantities of equipment and components, characterize the control and instrumentation, and identify components furnished by others for a given system. Each component on a P&ID is uniquely identified in accordance with the Entity or A/E numbering system as required by the contract documents. P&IDs may not be required for all systems when sufficient detail is shown on the corresponding Riser Diagrams and Equipment Schedules. P&IDs are critical requirements for the programming of the BMS controllers.	D		Y	Y		Refer to Document EPM-KEM-TP-000004 for the check list for a P&ID.
8	Equipment Schedules	2D	The Mechanical Equipment Schedules are typically extracted from the 3D Model software tool by equipment type for a given system (or group of similar systems). They list the unique tag/mark number(s), the location/system/service, basic sizing/process information, manufacturer name, and model number for each line item.	D	Y	Y	Y	Y	Refer to Document EPM-KEM-TP-000005 for the check list for an Equipment Schedule.
9	Mechanical Equipment List	MS Excel	This document is a comprehensive, electronic listing of all mechanical equipment for the entire project. The list includes information from all of the Mechanical Equipment Schedules and also includes additional columns for various drawing and procurement document references. The document also list equipment details and ratings used for Fire and Life Safety System.	D		Y	Y	Y	Refer to Document EPM-KEM-TP-000012 for the template for a Mechanical Equipment List.
10	Mechanical Plant Room Layout Drawings	2D	These drawings show the exact location and elevation of Mechanical equipment and associated electrical/control accessories along with duct/pipe tie-ins points. They often include architectural features from the general arrangement of the room.	D		Y	Y		Refer to Document EPM-KEM-TP-000001 for the check list for a Mechanical Plant Room Layout Drawing.

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11	HVAC Layout Drawings	2D	These drawings show the layout of HVAC equipment along with duct and piping arrangements, locations, sizes, and configurations. Drawings also includes Car Parking Ventilation and Smoke Management System.	D		Y	Y		Refer to Document EPM-KEM-TP-000003 for the check list for an HVAC (Duct) Layout Drawing.
12	Mechanical Life Safety System Single Line Diagram	2D	Fire and Life Safety (FLS) System diagrams shows all mechanical systems and equipment, either dedicated or non-dedicated system intended to be used for smoke control and management for the purpose of life preservation during fire. The diagram helps the contractor and project management to understand the concept of fire ad life safety of the building related to the mechanical systems. FLS can include Staircase Pressurization, Lift Lobby or Lift Shaft Pressurization, Atrium Smoke Extraction, Zoned Smoke Control System, and Car Parking Smoke Control System.	D		Y	Y		Refer to Document EPM-KEM-TP-000026 for the check list for Standard Mechanical Deliverables during design stage.
13	Fire Protection Layout Drawings	2D	These drawings show the layout of the fire protection system piping for a building/facility area/room.	D		Y	Y		Refer to Document EPM-KEM-TP-000006 for the check list for a Fire Protection (Pipe) Layout Drawing.
14	Plumbing Layout Drawings	2D	These drawings show the piping layout for building/facility plumbing supply and drainage lines by area or floor.	D		Y	Y		
15	Underground (U/G) Utility Layout Drawings	2D	These drawings show the layout of the U/G utility piping for an area.	D		Y	Y		Refer to Document EPM-KEM-TP-000007 for the check list for a U/G Utility (Pipe) Layout Drawing.
16	HVAC Symbols, Legends, and Technical Notes	2D	These drawings include general notes, symbology, and abbreviations that apply to HVAC Layout Drawings.	D		Y			
17	HVAC Typical Construction Detail Drawings (TCDDs)	2D	These drawings show generic HVAC configurations that are repeated throughout the buildings or facilities on a project and are referenced on specific HVAC Layout Drawings where appropriate. Additional notes appear on the TCDDs as needed.	D		Y			Refer to Document EPM-KEM-05-000002 for an HVAC TCDD.
18	Fire Protection Symbols and Legends	2D	These drawings include general notes, symbology, and abbreviations that apply to Fire Protection Layout Drawings.	D		Y			
19	Fire Protection Typical Construction Detail Drawings (TCDDs)	2D	These drawings show generic fire protection configurations that are repeated throughout the buildings or facilities on a project and are referenced on specific Fire Protection Layout Drawings where appropriate. Additional notes appear on the TCDDs as needed.	D		Y			Refer to Documents EPM-KEM-05-000001 and EPM-KEM-00005 for two Fire Protection TCDDs.
20	Plumbing Symbols and Legends	2D	These drawings include general notes, symbology, and abbreviations that apply to Plumbing Layout Drawings.	D		Y			
21	Plumbing Typical Construction Detail Drawings (TCDDs)	2D	These drawings show generic plumbing configurations that are repeated throughout the buildings or facilities on a project and are referenced on specific Plumbing Layout Drawings where appropriate. Additional notes appear on the TCDDs as needed.	D		Y			Refer to Documents EPM-KEM-05-000003 and EPM-KEM-00004 for two Plumbing TCDDs.
22	General Project Specification and Particular Project Specification	2D	General Project Specifications shall be provided by the A/E. Particular Specification shall be provided for Special Multi-discipline Systems such as (1) BMS to include Data Point Schedule and Sequence of	D		Y	Y	Y	

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			Operation, (2) Integration requirements for Fire and Life Safety Systems, Low Current System (or ELV), and Mechanical System (as applicable).						
23	FDAS Cause and Effect Matrix	2D	C&EM shall be prepared by the A/E to indicate all systems and appurtenances included in the Life Safety Systems including time delays required, single and double knocking and FACP response to each activation of field devices. The Electrical Designer shall lead the coordination with the Fire Engineer, Mechanical Designer, and Architect to reflect FLS requirement in all design plans.	D		Y	Y	Y	

* B- Basic Design phase, D - Detailed Design Phase