



UOP LLC • 25 East Algonquin Road • Des Plaines, Illinois 60017-5017 • USA

STANDARD SPECIFICATION

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PLOT PLAN DESIGN CRITERIA FOR PROCESS UNITS

DATE	STATUS	APVD	AUTHD
31DEC03	Revised	RGP	RGP

1. GENERAL**1.1 Scope**

- a. This Standard Specification contains guidelines for developing safe, operable, and economical layouts of process equipment in new process areas and units.
- b. Exceptions or variations shown in the UOP Project Specifications take precedence over the requirements shown herein.

1.2 Definitions**a. Plot Plan**

A graphical layout indicating the placement of equipment in a process unit or units.

a. Process Area

The portion of a plant site in which the process units are located.

b. Process Tract

An area containing one or more process units serviced by a single unit pipe rack, surrounded by a continuous battery limit, and unpenetrated by interunit roads.

c. Battery Limit

The boundary of the process tract.

2. PLANT LAYOUT**2.1 General**

- a. Establish the location and dimensions of the proposed plant site before beginning development of the plot plan. Determine the current, or future, use of nearby land (e.g., other process units or offsites facilities and public facilities such as roads or housing). Proper clearances shall be maintained between equipment and facilities, both inside and outside of the process tract(s) of concern.
- b. The primary consideration for the layout and spacing of process units and their equipment is safety. Other considerations include maintenance, operation, construction, and economics (capital, operating, and maintenance costs).
- c. Process units and their equipment shall be arranged to conform as closely as possible to the general process flow scheme after the requirements of this specification, the UOP Project Specifications, and the UOP Piping and Instrument Diagrams have been accommodated. Process units that are part of the same overall plant shall be located together.



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- d. Equipment that is to be in a curbed or diked area shall be located together to facilitate spill control and collection, and to minimize the number and extent of the curbed or diked areas.
- e. When multiple process units are present, each unit's equipment shall be grouped together, i.e., do not intermingle equipment from different process units. Provide for the safe shutdown and maintenance of any unit(s) while other process units continue to operate. Operating equipment and piping shall not be present within the battery limits of the shutdown unit. The unit pipe rack is included when equipment for the shutdown process unit is on both sides of the rack. Process units that operate together and cannot be shut down independently may be considered as one unit.
- f. Piping within the process area shall be supported on elevated (overhead) pipe racks. An accessway shall be provided beneath each pipe rack. Sleepers and trenches shall not be used.
- g. Access to the process unit, buildings, stairways, etc. shall be provided directly from the battery limits, without passing by or under process equipment, piping, or pipe racks.

2.2 Terrain

- a. The topographic characteristics of the site may greatly affect the plant layout. Existing soil conditions, drainage, slope, accessibility, etc. shall be considered.
- b. Process units shall be located together, on a level site at a higher elevation than the storage tank and waste treatment areas. Where this is not feasible, drainage shall be arranged to separate the process area from the other areas.

2.3 Wind

- a. Consideration of the influence of wind direction is critical to the creation of a plot plan because the wind will carry and distribute any released material. A good plot plan maximizes the potential for the wind to carry any released materials away from occupied areas, sources of ignition, or other areas of concern.
- b. The governing wind direction shall be determined from a wind "rose." A wind "rose" indicates the frequency (i.e., percentage of the time) the wind blows from each direction. The governing wind may be from a specific or generalized direction.

2.4 Access

- a. A continuous straight, unobstructed road shall be provided along each side of each process tract. Each tract is therefore completely surrounded by interconnected access roads. The overall area within the roads shall not exceed 180,000 square feet (16,700 square meters). The maximum length of the tract shall be 600 feet (185 meters) with a recommended limit of 400 feet (120 meters). The maximum width of the tract shall be 300 feet (90 meters), with a recommended limit of 200 feet (60 meters).

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- b. Access shall be provided from at least two directions to all points within each process tract. At least one of the access routes shall not pass beneath any overhead obstructions such as a pipe rack. Additional access within process units shall be provided as needed.
- c. Process units and equipment shall be spaced to permit use of mobile equipment and power tools for servicing and maintaining equipment during operation and turnaround periods. Provide overhead clearance under pipeways and other structural supports for personnel and for passage of fire-fighting vehicles and mobile equipment.
- d. Provide a minimum spacing of 50 feet (15 meters) between process tract battery limits. Roadways may be located within this space.

2.5 Unit Pipe Rack

- a. Unit pipe racks support the electrical, instrument, pneumatic, process, and utility lines servicing the process unit(s) within the process tract. Process utility, and electrical/pneumatic instrument lines shall be on separate levels (typically process on the bottom, utilities in the middle).
- b. Pipe racks also provide support for air-cooled heat exchangers and walkways. With the exception of air-cooled heat exchangers, process equipment shall not be placed above or below any unit pipe rack.

2.6 Main Pipe Racks

Main pipe racks containing feed, product, and utility lines for a number of process tracts shall be located outside the battery limits of process tracts. They shall not be routed through process units. Process equipment shall not be located over, under, or adjacent to a main pipe rack. Provide overhead clearance for vehicles as required when the pipe racks pass over roadways and railroad tracks.

2.7 Roadways

- a. Roadways shall be straight, unobstructed, and located in a symmetrical manner, providing service to all process units. Roadways shall encircle each process tract, providing access for operation, maintenance, and firefighting. Dead end roads are not permitted.
- b. Road widths and clearances shall be sized to handle emergency vehicles and large moving equipment. The minimum width, excluding shoulders, shall be 28 feet (8.5 meters) for a 2-lane road. The minimum overhead clearance shall be 18 feet (5.5 meters).
- c. Roads shall be elevated slightly above the process tract to isolate tracts from each other, helping to prevent the spread of spills and fire.
- d. Access ways and secondary roads shall be provided within process tracts as necessary.



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2.8 Railroad Tracks

- a. The use of railroads within the process area is strongly discouraged. When a railroad is necessary, it shall not be a through line.
- b. Spur tracks shall be outside the process tract battery limits and a minimum of 50 feet (15 meters) from process equipment. The minimum overhead clearance shall be 23 feet (7 meters).

2.9 Maintenance

- a. Space for all unit maintenance shall be provided within the battery limits of each process unit. Examples include heater tube removal; exchanger bundle pulling; catalyst handling; tray, packing, or grid handling; compressor maintenance; and crane access to air cooler and equipment for which heavy maintenance lifts are expected (e.g., FCC, Reactor/Regenerator and Stacked Platforming Reactors).
- b. Major equipment shall be directly accessible from a roadway.
- c. Maintenance access to pump drivers shall be provided from beneath the unit pipe rack.
- d. At no time shall maintenance operations (e.g. tube bundle pulling, catalyst loading/unloading, etc.) block roads, stairways, platforms or otherwise interfere with the ability to escape from any area.

2.10 Process Tract Arrangement

In general, the optimal shape for the process tract is a rectangle with a centralized unit pipe rack. Process equipment is placed along both sides of the unit pipe rack. The unit pipe racks, and the process tracts, are arranged perpendicular to, and along one or both sides of, the main pipe rack.

2.11 Construction

The layout of process equipment shall facilitate the entry and placement of heavy construction equipment (e.g., cranes). The ability to bring the process equipment to its final site and complete the erection process shall also be considered, including provisions for swing (rotation) of the crane and load, and lifting tall items from the horizontal shipping position to vertical. Provision of laydown areas within the process tract may be necessary. Within the constraints imposed by process operation, safety, maintenance, etc., large process equipment shall be located to minimize the number of crane positions required to make the lifts.

2.12 Future

Provide space within the process units for future expansion or modification. Provide space within the process area for future process units. The space provided for future expansion shall remain free of obstructions; e.g., underground piping or utilities.

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3. PROCESS EQUIPMENT LAYOUT

3.1 General

- a. The minimum spacing of process equipment shall be as shown in Table-1A (English Units) or Table-1B (Metric Units). Unless noted, the spacings given are to the edge of the equipment or structure. These spacings are based upon recognized good practice developed from operating experience. When analytical methods such as the prediction of vapor cloud explosion overpressure circles (or spheres) require the use of greater spacings, those greater spacings shall govern.
- b. When space limitations prevent accommodation of the minimum spacing requirements of paragraph 3.1a., additional fire protection measures, including fire break floors and walls (without penetrations), sprinklers and foam systems, or instrumentation, may be necessary.
- c. When multiple trains (or even units) of equipment are specified, the arrangement shall provide for identical equipment (e.g. nozzle orientations, internals orientation, etc). The arrangement shall not result in mirrored equipment. Mirroring results in differences between the equipment in each train, complicating fabrication and construction.

3.2 Fired Heaters

- a. Fired heaters shall be positioned upwind of process equipment and storage tanks to reduce exposure of possible vapor leaks to ignition sources. Units with fired heaters shall be located together to allow the heaters to be optimally located with respect to the governing wind direction and to isolate the potential fire hazard(s).
- b. Fired heaters shall be placed at the open end of the process tract pipe rack, i.e., the end away from the connection to the main pipe rack, unless this conflicts with the requirements of paragraph 3.2a.
- c. Process equipment shall be located a minimum of 50 feet (15 meters) from fired heaters. In cases where equipment is directly connected to the heater, the heater feed is all vapor above its auto-ignition temperature, and minimum spacing is critical to the process, the equipment may be closer to the heater, provided there is access for maintenance and fire-fighting. Reactor circuits are an example of where a reduced heater-reactor spacing may be considered.
- d. Avoid locating tall equipment or structures (e.g., fractionating columns) downwind of, and near, heater stacks. The stack must extend at least 15 feet (5 meters) above the highest platform or other occupied areas within 50 feet (15 meters) of the discharge. The result may be greater than the height otherwise required for the stack.
- e. Provide tube removal/maintenance space within battery limits. Horizontal tubes shall be pulled towards the unit boundary. Crane access may be necessary, especially for vertical tubes.

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- f. Provide space for removal/maintenance of burners, soot blowers, convection sections, etc.

- g. Knockout drums or coalescers for fuel gas supply to fired heaters shall be located as close as possible to, but not less than 25 feet (7.5 meters) from, any fired heater.

3.3 Vessels and Reactors

- a. Vertical vessels up to 10 feet (3 meters) in diameter shall be a minimum of 8 feet (2.5 meters) apart. Vessels 10 feet (3 meters) to 16 feet (5 meters) in diameter shall be at least 10 feet (3 meters) apart. Vessels larger than 16 feet (5 meters) in diameter shall be a minimum of 13 feet (4 meters) apart.
- b. Horizontal vessels shall comply with the spacing requirements of paragraph 3.3a except when multiple vessels are supported by a common structure, in which case only access clearance is required. Minimum separation shall be 1.5 feet (500 mm) if access is not required.
- c. Small, non-hydrocarbon containing vessels (e.g., chemical injection and wash water tanks) may be placed immediately adjacent to the unit pipe rack. The vessel centerline is normally 8-10 feet (2.5-3 meters) from the pipe rack.
- d. Reactors and vessels with trays, removable internals, or relief valves shall have an adjacent drop area within the battery limits for installing and removing the trays, internals, or relief valves.
- e. Vessels containing packing, catalyst, clay, sieves, etc. shall have an adjacent drop area within the battery limits for material loading and unloading.

3.4 Tubular Heat Exchangers

- a. Locate exchangers at grade unless an elevated location is required by the process. Group exchangers together when possible.
- b. When placed below other equipment, provide sufficient overhead clearance for tube bundle handling and other maintenance equipment.
- c. Heat exchangers containing flammable liquids above 500°F (260°C), or their auto-ignition temperature (if lower), shall not be located beneath other equipment.
- d. When multiple shells are used for a single service, the arrangement shall consider whether the flow is in series or parallel and shall provide for symmetrical distribution when required (e.g. parallel flow).
- e. Shell and tube exchangers shall not be stacked over two shells high. The centerline elevation of the upper shell shall be no greater than 12 feet (3.5 meters). Place the hottest shell on top and the largest shell on the bottom. Do not include reboiler exchangers (especially Thermosiphon) in a stack.



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- f. Provide exchangers with an area for tube bundle pulling. Bundle pulling shall be towards the unit boundary and shall be entirely within the process unit's battery limits.
- g. Unfired reboiler exchangers shall be located a maximum of 5 feet (1.5 meters) from the vessel they serve. Do not locate reboiler exchangers beneath structures or other equipment.
- h. Vertical reboilers attached to fractionators shall be located as specified in the UOP Project Specification for Vessels and the UOP Piping and Instrument Diagram. The axis between the reboiler and the fractionator is parallel to the unit pipe rack. Provide approximately 3 feet (1 meter) clearance between the shells.

3.5 Air Cooled Heat Exchangers

- a. Process equipment shall not be located above or below air cooled heat exchangers.
- b. Air cooled heat exchangers shall be located above the unit pipe rack or on a structure used only for air cooled heat exchanger support
- c. Air-cooled heat exchangers shall not be located where the discharge air from one exchanger can become the incoming air to another exchanger.
- d. Provide crane access 30 feet (9 meters) wide to air-cooled heat exchangers for maintenance.
- e. Provide room for at least one additional bay adjacent to each effluent and overhead condenser.
- f. When specific information is not available, consider the inlet and outlet to be at the same end of the air-cooled exchanger. For fractionator overhead condenser rundown lines where a minimum run of horizontal pipe is specified on the UOP Piping and Instrument Diagram, the condenser outlet shall be located on the same side of the pipe rack as the associated receiver vessel. The distance between the air condenser outlet and the receiver shall be minimized following normal piping and equipment layout practices. The length of the horizontal portion of the rundown line shall be 70 lineal feet (20 meters) or less.

3.6 Pumps

- a. Pumps shall be located at grade.
- b. Pumps shall be located so that suction line lengths are minimized.
- c. Pumps shall not be located beneath equipment (especially air coolers) or structures.



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- d. Locate pumps in a row outside of and parallel to the unit pipe rack, with the driver (motor or turbine) towards the rack. The discharge nozzle shall be at least 10 feet (3 meters) from the pipe rack. There shall be a minimum of 10 feet (3 meters) of clear space behind the driver.
- e. Pump foundations shall be a minimum of 3 feet (1 meter) apart.
- f. Pumps taking suction from curbed equipment shall be within the same curb (to contain spills).
- g. Pumps taking suction from diked equipment shall be located outside of the dike so that they can remain in operation in the event of failure of the contained equipment.

3.7 Compressors

- a. Compressors shall be located downwind from heaters.
- b. The compressors for each process unit shall be located together.
- c. Compressors shall be located in an open-sided shelter with a vented roof.
- d. An overhead trolley and hoist travels over all of the compressors to aid in heavy maintenance. Provide a drop area adjoining the compressor shelter and directly accessible from a road. Locating the drop area at an intersection is ideal. The drop area shall be entirely within the battery limits.
- e. Allow space near each compressor for auxiliary equipment (e.g., lube oil systems).
- f. Compressors shall be located adjacent to a roadway for ease of maintenance.
- g. Compressors shall not be located beneath equipment or pipe racks.
- h. Suction and interstage knockout drums shall be located as close as possible to the compressors.

3.8 Process Area Tanks**a. General**

- (1) The requirements of this section apply to tanks located within the process area, generally within a process tract. Tanks in other locations; e.g., the tank farm, waste treatment area, and utility area, are not addressed.
- (2) Tanks shall be placed within the process area only when required for proper, economical operation of the process. These tanks are identified on the UOP Process and Instrument Diagrams. Otherwise tanks shall be located in the tank farm or other non-process area.
- (3) The requirements of this section apply to atmospheric and low pressure tanks (less than 15 psig (1.05 kg/cm²(g))). High pressure and refrigerated tanks are not



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included.

- (4) The requirements of this section apply to tanks containing flammable (combustible), hot, hazardous, dangerous, or harmful liquids. Among the materials included are hydrocarbons, caustics, and acids. The provisions are not required for tanks containing water or other non-hazardous materials.
- (5) The requirements of this section apply to tanks that may retain contents while the process unit(s) are shut down and drained ((e.g., during maintenance or modification).
- (6) Equipment other than tanks (e.g., pumps) shall not be located within the diked enclosure. Pumps shall be located as close as possible to the tank from which they take suction.

b. Tank Location and Spacing

- (1) Each tank shall be exposed to, adjacent to, and accessible from a road. No tank shall be placed behind another.
- (2) The distance between adjacent tanks shall be at least equal to the diameter of the larger tank.
- (3) Tanks shall be at least 30 feet (9 meters) from the nearest process equipment.
- (4) The dike shall be at least 15 feet (4.5 meters) from neighboring process equipment (other than the contained tanks and the associated pumps) and entirely within the battery limits of the process unit.
- (5) The minimum distance from each tank shell to the inside base of the dike shall be one-half the height of the tank.

c. Dikes

- (1) Tanks within the process area shall be surrounded by a dike. Multiple tanks may be within a single dike. When more than one tank is within a single dike, each tank shall be separated from the others by an intermediate dike.
- (2) The diked area shall contain the entire contents of the largest tank, exclusive of the volume occupied by the other tanks.
- (3) Intermediate dikes shall contain 10 percent of the volume of the contained tank, exclusive of the volume occupied by the tank.
- (4) Dikes and intermediate dikes shall be constructed of concrete.
- (5) Dikes shall be at least 10 feet (3 meters) from the unit battery limits.



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- (6) The maximum height of a dike is 6 feet (1800 mm) above the interior grade. The minimum dike height is 3 feet (900 mm) above the interior grade. The dike shall be at least 6 inches (150 mm) higher than the maximum level of the contained fluid.
- (7) Intermediate dikes shall be at least 18 inches (450 mm) shorter than the surrounding dike. The minimum height above the interior grade is 18 inches (450 mm). The intermediate dike shall be at last 6 inches (150 mm) higher than the level of the contained fluid.

3.9 Piping

- a. The equipment layout shall allow piping runs to be as short as possible with the minimum number of elbows, especially for hot, alloy, large diameter, or heavy wall lines.
- b. Thermal expansion of hot, alloy, heavy wall, or large diameter piping shall be considered during the equipment layout, so that whenever feasible the expansion can be accommodated without the use of expansion compensators.
- c. Piping shall not present "trippers", "head knockers" or other obstructions to personnel or equipment movements at grade, on platforms, stairways, ladders or elsewhere.
- d. Equipment shall be located to minimize the length and direction changes of piping carrying two phase, flashing, or condensing fluids or fluids subject to water hammer.
- e. Pipe racks shall be positioned in two perpendicular directions. Pipe rack level elevations shall be consistent in each direction but shall differ from the elevations of the perpendicular rack. Each level shall pass above, below, or between the levels of the perpendicular rack.

4. MISCELLANEOUS**4.1 Control Houses**

- a. Control houses shall be separated from process equipment and located adjacent to roadways. Placement outside of process tracts, even outside of the process area, is preferred. If located within the process tract, control houses shall be placed at the periphery of the process tract.
- b. Control houses shall be located upwind of process equipment.

4.2 Unit Substation

Process unit substations shall be located near a control house and adjacent to a roadway, upwind of process equipment.

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4.3 Outdoor Electrical Switch Racks

Electrical switch racks shall be upwind of equipment handling hydrocarbons. They shall be a minimum of 20 feet (6 meters) from process equipment, except that 50 feet (15 meters) shall be provided from fired heaters and compressors.

4.4 Emergency Booths and Change Houses

- When required, emergency booths shall be located beneath the edge of the pipe rack, spaced a maximum of 100 feet (30 meters) apart. Emergency booths shall be located as close as practical to the source of danger.
- When required, unit change houses shall be located upwind of the process equipment and between the process unit and the control house.

4.5 Cooling Towers

- Cooling towers shall be downwind of process equipment. The mist cloud will be carried away from the process unit where it could contribute to corrosion, interfere with instrument (and electrical) operation, and obscure vision.
- Locate cooling towers so the mist cloud does not obscure vision on roadways within or outside of plant boundaries.
- Cooling towers shall be at least 100 feet (30 meters) from fired heaters and 50 feet (15 meters) from other process equipment.

4.6 Flares

- Flares shall be located downwind (or cross wind) of process, utility, and other areas.
- Provide a sterile area (i.e., no vegetation or other flammable material) at least 200 feet (60 m) in radius around the flare. A larger radius (or taller flare) may be required to comply with accepted radiation limits at grade or platform.
- Equipment other than items that are part of the flare system (e.g., knockout drums) shall not be located within the sterile area.

4.7 Dusty Services

Items in dusty service (e.g., catalyst hoppers, sulfur handling equipment and sulfur piles, etc.) shall be located downwind of equipment and ignition sources. Dust clouds may promote corrosion, interfere with operation of instruments, valves, and equipment, clog air intakes, obscure vision, and in some circumstances form a flammable, even explosive, mixture.

4.8 Loading and Unloading Areas

Loading and unloading areas shall be downwind (or crosswind) of process and utility areas and other ignition sources.

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Table 1A
Minimum Spacing for Process Equipment (English Units)

PROPERTY BOUNDARY	UNIT BATTERY LIMITS	MAIN CONTROL HOUSE	UNIT CONTROL HOUSE	UNIT SUBSTATION	UNIT FIRED HEATERS	UNIT GAS COMPRESSORS- EXPANDERS	UNIT PLATFORMS & STRUCTURES	UNIT VESSELS & REACTORS	UNIT TUBULAR HEAT EXCHANGERS	UNIT AIR COOLED HEAT EXCHANGERS	UNIT PUMPS	UNIT REFRIGERATION, RECOVERY PLUS, ETC.	UNIT PIPEWAY	MAIN PIPEWAY	UNIT EQUIPMENT HANDLING NONFLAMMABLES	UNIT TANKS
NA																
200	50															
100	30	NA														
100	20	NM	NM													
NM	15	NM	NM	NM												
200	15	100	50	50	25											
200	15	100	100	50	100	12										
NA	15	NM	NM	NM	25	NM	NM									
200	15	100	50	50	50	30	8	NOTE 4								
200	15	100	50	50	50	30	3	NOTE 5	5							
200	15	100	50	50	50	30	3	20	15	NOTE 10						
200	15	100	50	50	50	30	10	10	10	10	6					
200	15	100	50	50	50	30	8	8	8	20	10	8				
200	NA	30	20	25	25	25	15	NOTE 6	15	NM	10	20	NM			
50	25	30	30	25	50	50	30	50	50	50	50	50	NM	NA		
NM	15	NM	NM	8	25	25	3	8	8	NM	8	8	5	10	NM	
200	15	100	50	50	100	30	10	30	30	30	NOTE 3	30	30	50	30	NOTE 9

Legend:

NA = Not applicable.

NM = No minimum spacing requirement has been established. Use engineering judgement for spacing.

Notes:

- Horizontal distances are in feet.
- Minimum horizontal distances between buildings, process equipment, and property lines are edge-to-edge dimensions.
- Pump clearances are to the discharge nozzle. See Paragraph 3.6 for further information.
- See Paragraphs 3.3a. and 3.3b. for further information.
- Provide the same clearance as between 2 vessels, see Paragraph 3.3a. Also see Paragraph 3.4g. for further information.
- Vertical vessels, and horizontal vessels that are oriented parallel to the unit pipe rack, shall be at least 20 feet from the unit rack. Horizontal vessels oriented perpendicular to the unit pipe rack shall be at least 15 feet from the unit pipe rack.
- These are structures and platforms supporting and providing access to process equipment. Clearances are to neighboring equipment.
- Pumps, excepting those taking suction from the tank(s), shall be a minimum of 30 feet from the tank(s). Pumps taking suction from the tank(s) shall be located adjacent to the dike.
- See Paragraph 3.8b. for further information.
- No minimum. Air intake shall not include the discharge from another air cooler.

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Table 1B
Minimum Spacing for Process Equipment (SI/MKS Units)

PROPERTY BOUNDARY															
UNIT BATTERY LIMITS															
MAIN CONTROL HOUSE															
UNIT CONTROL HOUSE															
UNIT SUBSTATION															
UNIT FIRED HEATERS															
UNIT GAS COMPRESSORS- EXPANDERS															
UNIT PLATFORMS & STRUCTURES															
UNIT VESSELS & REACTORS															
UNIT TUBULAR HEAT EXCHANGERS															
UNIT AIR COOLED HEAT EXCHANGERS															
UNIT PUMPS															
UNIT REFRIGERATION, RECOVERY PLUS, ETC.															
MAIN PIPEWAY															
UNIT PIPEWAY															
UNIT EQUIPMENT HANDLING NONFLAMMABLES															
UNIT TANKS															
NA															
60	15														
30	9	NA													
30	6	NM	NM												
NM	4.5	NM	NM	NM											
60	4.5	30	15	15	7.5										
60	4.5	30	30	15	30	4									
NA	4.5	NM	NM	NM	7.5	NM	NM								
60	4.5	30	15	15	15	9	2.5	NOTE 4							
60	4.5	30	15	15	15	9	1	NOTE 5	1.5						
60	4.5	30	15	15	15	9	1	6	4.5	NOTE 10					
60	4.5	30	15	15	15	9	3	3	3	3	2				
60	4.5	30	15	15	15	9	2.5	2.5	6	3	2.5				
60	NA	9	6	7.5	7.5	7.5	4.5	NOTE 6	4.5	NM	3	6	NM		
15	7.5	9	9	7.5	15	15	9	15	15	15	15	15	NM	NA	
NM	4.5	NM	NM	2.5	7.5	7.5	1	2.5	2.5	NM	2.5	2.5	1.5	3	NM
60	4.5	30	15	15	30	9	3	9	9	9	NOTE 8	9	9	15	9
															NOTE 9

Legend:

NA = Not applicable.

NM = No minimum spacing requirement has been established. Use engineering judgement for spacing.

Notes:

- Horizontal distances are in meters.
- Minimum horizontal distances between buildings, process equipment, and property lines are edge-to-edge dimensions.
- Pump clearances are to the discharge nozzle. See Paragraph 3.6 for further information.
- See Paragraphs 3.3a. and 3.3b. for further information.
- Provide the same clearance as between 2 vessels, see Paragraph 3.3a. Also see Paragraph 3.4g. for further information.
- Vertical vessels, and horizontal vessels that are oriented parallel to the unit pipe rack, shall be at least 6 meters from the unit rack. Horizontal vessels oriented perpendicular to the unit pipe rack shall be at least 4.5 meters from the unit pipe rack.
- These are structures and platforms supporting and providing access to process equipment. Clearances are to neighboring equipment.
- Pumps, excepting those taking suction from the tank(s), shall be a minimum of 9 meters from the tank(s). Pumps taking suction from the tank(s) shall be located adjacent to the dike.
- See Paragraph 3.8b. for further information.
- No minimum. Air intake shall not include the discharge from another air cooler.