

## Appendix B - English Units

### CCPS Recommended Distance Tables for Siting and Layout of Facilities

#### *CCPS Guidelines for Siting and Layout of Facilities*

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*Issued 06-April-2018*

The foundation for these tables is the original data provided in the 2003 Edition of this Guideline. Changes for the 2018 Edition are ***bold italicized*** and reflect a review between the distances provided in 2003 and current industry guidelines (i.e., GAP 2.5.2 and GAP 2.5.2.A). In general, the values provided in this edition considered the GAP distance recommendations for a process with "intermediate hazards."

A depiction of how distances are measured using the distance tables in Appendix B are shown in Figure B.1. The GAP-designated hazardous process definitions are as follows:

General hazardous process designations [GAP 2.5.2.A]	<b>Moderate hazard:</b> This category includes processes, operations or materials having a limited explosion hazard and a moderate fire hazard. This class generally involves endothermic reactions and nonreactive operations, such as distillation, absorption, mixing and blending of flammable liquids. Exothermic reactions with no flammable liquids or gases also fit in this hazard group.
	<b>Intermediate hazard:</b> This category includes processes, operations or materials having an appreciable explosion hazard and a moderate fire hazard. This class generally involves mildly exothermic reactions.
	<b>High hazard:</b> This category includes processes, operations or materials having a high explosion hazard and moderate to heavy fire hazard. This class involves highly exothermic or potential runaway reactions and high hazard products handling.
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**Appendix B - English Units**  
**CCPS Recommended Distance Tables for Siting and Layout of Facilities**

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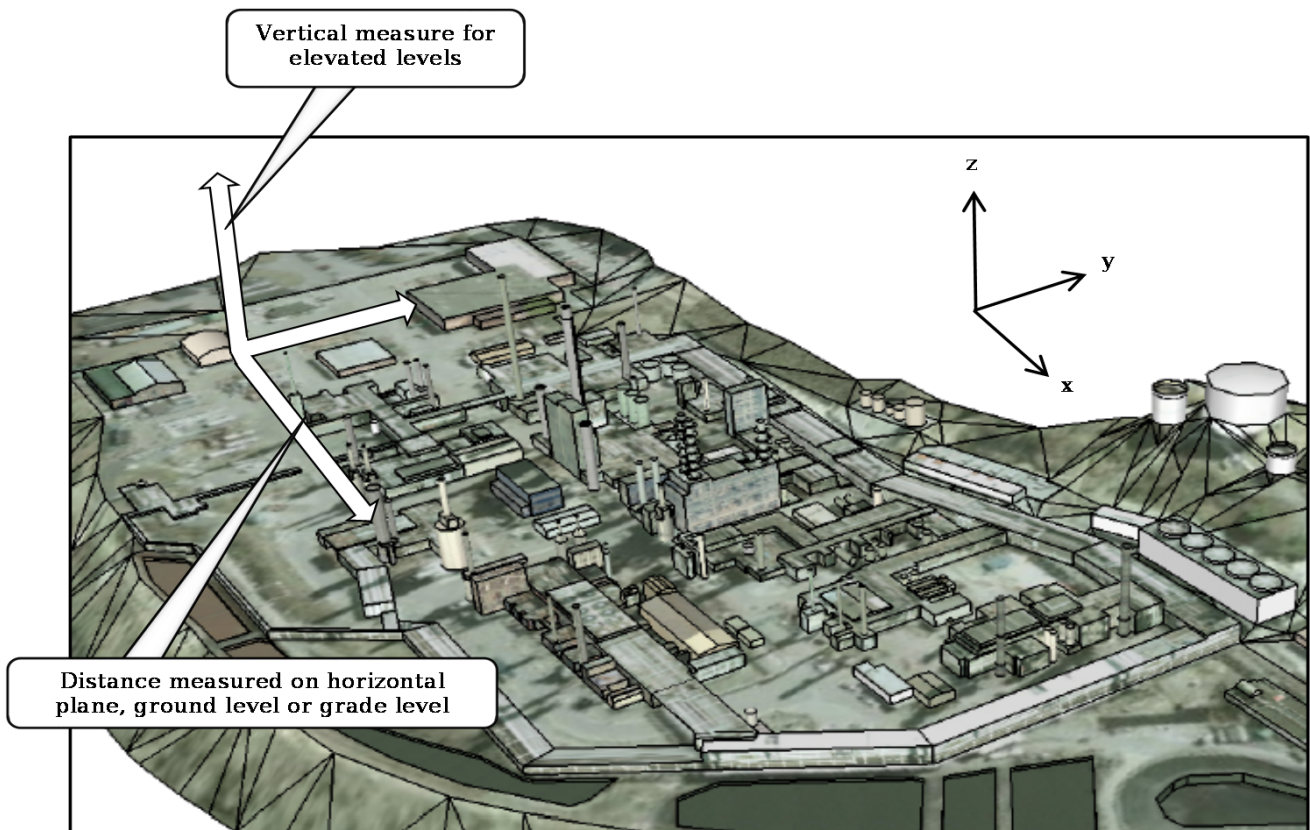


Figure B.1  
A depiction of how distances are measured using the tables in Appendix B

*Issued 06-April-2018*

Table B.1-E

## Typical facility and layout distances between process unit equipment for fire consequences

Explosion, toxic releases, or security issues may require greater distances

English Units - Issued 06-Apr-2018  
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Ground level, horizontal plane, or grade distance (ft.)

Line Item #	Distances Changes are noted for the 2018 Edition with <b><i>bold italicized</i></b> distances	Boundaries	Emergency Equipment	Process Vessels / Equipment	Heat Transfer Equipment	Rotating Equipment	Transfer Equipment (Structures)
<b>Boundaries</b>		(Another) Process Unit Battery Limit	Property	ESD Valves - Manual	Fire Pumps	Hydrants, Monitors	Water Spray & ESD Activation Switches
B.1-1	Process Unit Battery Limit	<b>100</b>					
B.1-2	Property	200					
<b>Emergency Equipment</b>							
B.1-3	ESD Valves - Manual	50	NM	NM	NM	NM	NM
B.1-4	Fire Pumps	<b>250</b>	NM	NM	NM	NM	NM
B.1-5	Hydrants, Monitors	NM	NM	NM	NM	NM	NM
B.1-6	Water Spray & ESD Activation Switches	50	NM	NM	NM	NM	NM
<b>Process Vessels / Equipment</b>							
B.1-7	Equip handling non-flammable, non-combustible, non-toxic materials	NA	NM	NM	NM	NM	NM
B.1-8	Reactors and Desalters	NA	200	50	200	50	50
B.1-9	Towers, Drums, Knock Out Pots, In-process Storage Tanks	NA	200	50	200	50	50
<b>Heat Transfer Equipment</b>							
B.1-10	Air cooled heat exchangers - process	NA	200	50	200	50	50
B.1-11	Boilers, Air Compressors, Power Generation (Utility Area)	100	100	50	<b>100</b>	50	50
B.1-12	Cooling Towers	<b>100</b>	100	50	<b>100</b>	50	50
B.1-13	Heat Exchangers	NA	200	50	200	50	50
B.1-14	Fired Heaters, Cracking Furnaces	NA	200	50	200	50	50
<b>Rotating Equipment</b>							
B.1-16	Gas Compressor, Expanders	NA	200	50	200	50	50
B.1-17	Pumps handling Flammables (> autoignition or self-igniting materials)	NA	200	50	200	50	50
B.1-18	Pumps handling Flammables (< autoignition or non-self-igniting materials)	NA	200	50	200	50	50
<b>Transfer Equipment (Structures)</b>							
B.1-19	Central Loading Racks for Trucks and Rail Cars (see Liquid Flammable Gas below)	<b>250</b>	100	50	200	50	50
B.1-20	Liquefied Flammable Gas (LFG) Loading Racks for Trucks and Rail Cars	<b>250</b>	350	50	<b>250</b>	50	50
B.1-21	Main Pipe Racks (piping not associated with unit)	NM	100	NM	50	NM	NM
B.1-22	Process Pipe Racks	NM	200	NM	200	NM	NM

Notes for Table B.1-E: Typical facility and layout distances between process unit equipment for fire consequences	
1	Distances are measured with the shortest line from one point to another point at ground level, horizontal plane, or grade. Refer to Figure B.1 for the "x,y,z" perspective. The "points" defined for measuring the distances are as follows:
1a	Distances between one block (e.g., a building or structure) to another block or boundary: Measure the shortest distance between the edge of the block and the other block or boundary. (This could be on the corner of a block.)
1b	Distances between equipment to equipment: Measure shortest distance between "points" or closest edge
2	These tables are not applicable to enclosed process units.
3	The typical distances cited in Table B.1 are based on potential fire consequences and processes with "Intermediate Hazards" [GAP 2.5.2.A]. Greater distances may be required based on modeled explosions and toxic releases.
4	Different distances may be warranted based on site-specific hazards and risks. Distances may be reduced or increased based on risk analysis or when additional layers of protection are implemented (such as: fire protection or emergency shutdown systems). Where unusual conditions require closer distances, appropriate risk reduction measures should be considered.
NA	Not applicable.
NM	No minimum distances requirement has been established for fire consequences. Use engineering judgement for distances and provide sufficient space for maintenance and fire fighting access.

**Table B.2-E**  
**Typical facility and layout distances between tanks and process unit equipment for fire consequences**  
Explosion, toxic releases, or security issues may require greater distances

English Units - Issued 06-Apr-2018 CCPS Guidelines for Siting and Layout of Facilities		Ground level, horizontal plane, or grade distance (ft.)							
Line Item #	Distances  Changes are noted for the 2018 Edition with <b><i>bold italicized</i></b> distances	Atmospheric and Low Pressure Storage (non-boilover) less than 10,000 gals	Atmospheric and Low Pressure Storage (non-boilover) greater than 10,000 gals	Atmospheric Storage (boilover potential)	Pressurized Storage	Refrigerated Flammable Storage	Portable Containers		
							Pressurized flammable gases (e.g. LPG and LFG) < 500 lbs. total storage	Pressurized flammable gases (e.g. LPG and LFG) 500 lbs. to 1 ton total storage	Pressurized flammable gases (e.g. LPG and LFG) 1 to 5 ton total storage *
	Boundary to Tank Distances								
B.2-1	Property Line or Boundary with adjacent industry	25	100	200	200	200	10	50	100
B.2-2	Public Access Right of Way (e.g., roads, rail lines, and parks)	50	100	200	250	250	10	50	100
B.2-3	Off-site populations (e.g., businesses/offices, residential housing)	50	250	500	350	250	25	100	250
B.2-4	Process Unit Battery Limits (except portable containers related to the process)	25	<b><i>200</i></b>	<b><i>200</i></b>	<b><i>300</i></b>	<b><i>200</i></b>	25	50	100
B.2-5	Utility Battery Limits (except portable containers related to the utility )	25	<b><i>200</i></b>	<b><i>200</i></b>	<b><i>300</i></b>	<b><i>200</i></b>	25	50	100
	Equipment to Tank Distances								
B.2-6	Fire water pumps (except the fuel source for the pump)	50	<b><i>250</i></b>	<b><i>250</i></b>	<b><i>300</i></b>	<b><i>250</i></b>	100	200	200
B.2-7	ESD and mitigation system activation points (activation point must be outside of tank diked area.)	50	50	50	50	50	50	50	50

\* Greater than 5 tons should be treated as Pressurized Storage

Notes for Table B.2-E: Typical facility and layout distances between tanks and process unit equipment for fire consequences	
1	Distances are measured with the shortest line from one point to another point at ground level, horizontal plane, or grade. Refer to Figure B.1 for the "x,y,z" perspective. The "points" defined for measuring the distances are as follows:
1a	Distances between one block (e.g., a building or structure) to another block or boundary: Measure the shortest distance between the edge of the block and the other block or boundary. (This could be on the corner of a block.)
1b	Distances between equipment to equipment: Measure shortest distance between "points" or closest edge
2	These tables are not applicable to enclosed process units.
3	The typical distances cited in Table B.2 are based on potential fire consequences and processes with "Intermediate Hazards" [GAP 2.5.2.A]. Greater distances may be required based on modeled explosions and toxic releases.
4	Different distances may be warranted based on site-specific hazards and risks. Distances may be reduced or increased based on risk analysis or when additional layers of protection are implemented (such as: fire protection or emergency shutdown systems). Where unusual conditions require closer distances, appropriate risk reduction measures should be considered.
NA	Not applicable.
NM	No minimum distances requirement has been established for fire consequences. Use engineering judgement for distances and provide sufficient space for maintenance and fire fighting access.

**Table B.3-E**

**Typical facility and layout distances between tanks of hazardous materials for fire consequences**

Explosion, toxic releases, or security issues may require greater distances

English Units 06-Apr-2018 CCPS Guidelines for Siting and Layout of Facilities		D = Diameter (larger of two tanks); Ground level, horizontal plane, or grade distance (ft.)									
Line Item #	Tank Type  Changes are noted for the 2018 Edition with <b><i>bold italicized</i></b> distances	Floating & Cone Roof Tanks (< 3,000 bbl.)	Floating & Cone Roof Tanks (3,000 to 10,000 bbl.)	Floating Roof Tanks (10,000 to 300,000 bbl.)	Cone Roof Tanks, Inerted Class I prod. (10,000 to 300,000 bbl.) *	Cone Roof Tanks, Class II & III Product (10,000 to 300,000 bbl.)	Floating & Cone Roof Tanks (> 300,000 bbl.)	Low Pressure Storage (up to 15 PSIG) < 10,000 gals	Low Pressure Storage (up to 15 PSIG) > 10,000 gals	High Pressure Storage (Bullet, Spheres)	Refrigerated Dome Roof Storage Tanks
B.3-1	Floating & Cone Roof Tanks (< 3,000 bbl.)	0.5 x D	Floating & Cone Roof Tanks (3,000 to 10,000 bbl.)	Floating Roof Tanks (10,000 to 300,000 bbl.)	Cone Roof Tanks, Inerted Class I prod. (10,000 to 300,000 bbl.) *	Cone Roof Tanks, Class II & III Product (10,000 to 300,000 bbl.)	Floating & Cone Roof Tanks (> 300,000 bbl.)	Low Pressure Storage (up to 15 PSIG) < 10,000 gals	Low Pressure Storage (up to 15 PSIG) > 10,000 gals	High Pressure Storage (Bullet, Spheres)	Refrigerated Dome Roof Storage Tanks
B.3-2	Floating & Cone Roof Tanks (3,000 to 10,000 bbl.)	0.5 x D									
B.3-3	Floating Roof Tanks (10,000 to 300,000 bbl.)	1 x D	1 x D	1 x D	Cone Roof Tanks, Inerted Class I Prod. (10,000 to 300,000 bbl.)	Cone Roof Tanks, Class II & III Product (10,000 to 300,000 bbl.)	Floating & Cone Roof Tanks (> 300,000 bbl.)	Low Pressure Storage (up to 15 PSIG) < 10,000 gals	Low Pressure Storage (up to 15 PSIG) > 10,000 gals	High Pressure Storage (Bullet, Spheres)	Refrigerated Dome Roof Storage Tanks
B.3-4	Cone Roof Tanks, Inerted Class I Prod. (10,000 to 300,000 bbl.)	1 x D	1 x D	1 x D							
B.3-5	Cone Roof Tanks, Class II & III Product (10,000 to 300,000 bbl.)	0.5 D	0.5 D	1 x D	1 x D	0.5 D	Floating & Cone Roof Tanks (> 300,000 bbl.)	Low Pressure Storage (up to 15 PSIG) < 10,000 gals	Low Pressure Storage (up to 15 PSIG) > 10,000 gals	High Pressure Storage (Bullet, Spheres)	Refrigerated Dome Roof Storage Tanks
B.3-6	Floating & Cone Roof Tanks (> 300,000 bbl.)	1 x D	1 x D	1 x D	1 x D	1 x D					
B.3-7	Low Pressure Storage (up to 15 PSIG) < 10,000 gals	1 x D 50' min	1 x D 50' min	1 x D 50' min	1 x D 50' min	1 x D 50' min	1 x D 50' min	1 x D 50' min	Low Pressure Storage (up to 15 PSIG) > 10,000 gals	High Pressure Storage (Bullet, Spheres)	Refrigerated Dome Roof Storage Tanks
B.3-8	Low Pressure Storage (up to 15 PSIG) > 10,000 gals	1.5 x D 100' min	1.5 x D 100' min	1.5 x D 100' min	1.5 x D 100' min	1.5 x D 100' min	2 X D	1 x D 50' min			
B.3-9	High Pressure Storage (Bullet, Spheres)	2 x D 100' min	2 x D 100' min	2 x D 100' min	2 x D 100' min	2 x D 100' min	2 X D	2 x D 100' min	2 x D 100' min	1 x D <b>100' min</b>	Refrigerated Dome Roof Storage Tanks
B.3-10	Refrigerated Dome Roof Storage Tanks	2 x D <b>150' min</b>	2 x D <b>150' min</b>	2 x D <b>150' min</b>	2 x D <b>150' min</b>	2 x D <b>150' min</b>	2 X D	2 x D 100' min	2 x D 100' min	1 x D 100' min	

<b>Notes for Table B.3-E: Typical facility and layout distances between tanks of hazardous materials for fire consequences</b>	
1	Distances are measured with the shortest line from one point to another point at ground level, horizontal plane, or grade. Refer to Figure B.1 for the "x,y,z" perspective. The "points" defined for measuring the distances are as follows:
1a	Distances between one block (e.g., a building or structure) to another block or boundary: Measure the shortest distance between the edge of the block and the other block or boundary. (This could be on the corner of a block.)
1b	Distances between equipment to equipment: Measure shortest distance between "points" or closest edge. (For distances between tanks and vessels, measure the shortest distance from shell to shell)
2	These tables are not applicable to enclosed process units.
3	The typical distances cited in Table B.3 are based on potential fire consequences and processes with "Intermediate Hazards" [GAP 2.5.2.A]. Greater distances may be required based on modeled explosions and toxic releases.
4	Different distances may be warranted based on site-specific hazards and risks. Distances may be reduced or increased based on risk analysis or when additional layers of protection are implemented (such as: fire protection or emergency shutdown systems). Where unusual conditions require closer distances, appropriate risk reduction measures should be considered.

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**Table B.4-E**  
**Typical facility and layout distances between on-site buildings for fire consequences**

Explosion, toxic releases, or security issues may require greater distances

English Units - Issued 06-Apr-2018 CCPS Guidelines for Siting and Layout of Facilities		Ground level, horizontal plane, or grade distance (ft.)											
Line Item #	On-Site Building  Changes are noted for the 2018 Edition with <b><i>bold italicized</i></b> equipment or distances	Property Line or Boundary	Process Unit containing flammables	Utilities	Process Equipment	Main Pipe Racks	Process Unit Pipe Racks	Atmospheric & Low Pressure Flammable & Combustible Storage Tanks (up to 15 PSIG) <10,000 gals	Atmospheric & Low Pressure Flammable and Combustible Storage Tanks (up to 15 PSIG) >10,000 gals	High Pressure Flammable Storage	Any Loading and Unloading Racks (non-LPG and LFG)	Any LPG and LFG Loading and Unloading Racks	Refrigerated Storage
B.4-1	Office, Lab, Maintenance, Warehouse	NM	<b>200</b>	100	200	100	100	<b>200</b>	250	350	<b>200</b>	<b>350</b>	<b>200</b>
B.4-2	Fire Station, Medical, Emergency Command Center	NM	<b>200</b>	<b>100</b>	200	100	100	<b>200</b>	<b>300</b>	350	<b>200</b>	<b>350</b>	<b>200</b>
B.4-3	Substation, Motor Control - Main (Note 5)	50	<b>100</b>	<b>100</b>	200	100	100	<b>200</b>	<b>300</b>	350	<b>200</b>	<b>350</b>	<b>350</b>
B.4-4	Substation, Motor Control - More than One Process Unit (Notes 5, 6)	50	<b>100</b>	<b>100</b>	50	25	25	100	250	250	<b>200</b>	<b>250</b>	<b>350</b>
B.4-5	Substation, Motor Control - One Process Unit (Note 5)	50	<b>100</b>	<b>100</b>	50	<b>25</b>	<b>25</b>	50	250	250	<b>200</b>	<b>250</b>	<b>350</b>
B.4-6	Control Room - Main	NM	<b>200</b>	100	<b>200</b>	100	100	<b>200</b>	250	350	<b>200</b>	<b>350</b>	<b>350</b>
B.4-7	Control Room - More than One Process Unit	NM	<b>200</b>	100	100	30	100	100	250	350	<b>200</b>	<b>350</b>	-
B.4-8	Control Room - One Process Unit	NM	<b>200</b>	100	50	<b>30</b>	<b>30</b>	50	250	250	<b>200</b>	<b>250</b>	-
B.4-9	Satellite Instrument House (SIH) - More than One Process Unit (Note 5)	NM	<b>100</b>	100	100	30	100	100	250	350	<b>200</b>	<b>350</b>	-
B.4-10	Satellite Instrument House (SIH) - One Process Unit (Note 5)	NM	<b>100</b>	100	50	10	10	50	250	250	<b>200</b>	<b>250</b>	-
B.4-11	Shelter (operations weather overhang) (Note 7)	NM	50	-	-	-	-	-	-	-	-	-	-
B.4-12	Shelter (dedicated to truck or barge unloading, sampling stations) (Note 7)	NM	50	-	-	-	-	-	-	-	-	-	-
B.4-13	<b>Portable buildings</b>	Industry guidance on the siting of portable buildings and tents is provided in the literature [i.e., API RP 753, API RP 756, and API TR 756-1]. (Note: Portable buildings include temporary buildings or trailers used to house people or store equipment.)											

<b>Notes for Table B.4-E: Typical facility and layout distances between on-site buildings for fire consequences</b>	
1	Distances are measured with the shortest line from one point to another point at ground level, horizontal plane, or grade. Refer to Figure B.1 for the "x,y,z" perspective. The "points" defined for measuring the distances are as follows:
1a	Distances between one block (e.g., a building or structure) to another block or boundary: Measure the shortest distance between the edge of the block and the other block or boundary. (This could be on the corner of a block.)
1b	Distances between equipment to equipment: Measure shortest distance between "points" or closest edge
2	These tables are not applicable to enclosed process units.
3	The typical distances cited in Table B.4 are based on potential fire consequences and processes with "Intermediate Hazards" [GAP 2.5.2.A]. Greater distances may be required based on modeled explosions and toxic releases. (Refer to Figure 5.1)
4	Different distances may be warranted based on site-specific hazards and risks. Distances may be reduced or increased based on risk analysis or when additional layers of protection are implemented (such as: fire protection or emergency shutdown systems). Where unusual conditions require closer distances, appropriate risk reduction measures should be considered.
5	Substations and Satellite Instrument Houses (SIH) - normally temperature controlled (i.e., air conditioned) buildings. Caution: SIHs are typically considered "unoccupied" for facility siting studies. If personnel use Substations or SIHs, then evaluate them as "occupied."
6	No direct comparable table for Substations in GAP 2.5.2. Interpretation for "More Than One Process Unit" is the same as "Main."
7	The distinction between shelters: a simple weather overhang typically has three walls, a roof, and no windows or doors; whereas truck, railcar, barge unloading "shelters" are used for the paperwork and protection of the unloading personnel from the weather during the transfer of the materials (rain, cold or hot temperatures).
NM	No minimum distances requirement has been established for fire consequences. Use engineering judgement for distances and provide sufficient space for maintenance and fire fighting access.

**Table B.5-E**

**Typical facility and layout distances between other types of equipment and operations for fire consequences**

Explosion, toxic releases, or security issues may require greater distances

English Units - Issued 06-Apr-2018  
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Ground level, horizontal plane, or grade distance (ft.)			
Line Item #	Spacing From	To	Minimum Distances

Changes are noted for the 2018 Edition  
with ***bold italicized*** distances

B.5-1	Process-unit battery limit	On-site unrestricted roadway	50
B.5-2	Emergency shutdown valve, manually operated	Edge of a potential pool fire involving the equipment the valve is isolating	50
B.5-3	Wastewater separators	Equipment handling flammables, continuous ignition sources	100
B.5-4	Multi-unit blowdown drums (Note: due to historical accidents associated with these, the current trend is to seek alternate, safer designs)	Process Unit Battery Limits	100
B.5-5		All other facilities	200
B.5-6	Transfer pumps, Out Side Battery Limits (OSBL), handling flammable and combustible liquids	Unit Substation (Single Unit)	<b><i>50</i></b>
B.5-7		Unit Substation (Multiple Units)	<b><i>100</i></b>
B.5-8		Main Substation	<b><i>200</i></b>
B.5-9	Off-property main railway	Equipment and storage tanks handling flammables	200
B.5-10	On-property main railway	Equipment and storage tanks handling flammables	100
B.5-11	On-property railway loading or platform	Equipment and storage tanks handling flammables	<b><i>200</i></b>
B.5-12	On-property railway spur	Equipment and on-site storage tanks handling flammables	25
B.5-13		Off-site storage tanks handling flammables	100
B.5-14	Wharves handling flammable liquids	Equipment handling flammables	200
B.5-15		Continuous sources of ignition	250
B.5-16	Wharves handling LPG and LFG	All other facilities	250
B.5-17	Cooling Tower (large, multi-cell, combustible)	Office, Lab, <b><i>Warehouse</i></b> , Emergency Center, Main Substation, Main Control Room	<b><i>200</i></b>
B.5-18		Single or Multi-Unit Substation, Single or Multi-Unit Control Room, or Satellite Instrument House	<b><i>100</i></b>
B.5-19		Flares	<b><i>See Table B.7</i></b>
B.5-20	Unit Substations	Process equipment handling Flammables	<b><i>100</i></b>
B.5-21	Electrical switch racks supporting shutdown or emergency functions	Equipment handling flammables	20
B.5-22		Fired heaters or gas compressors	50
B.5-23	Fire training areas	All other facilities	200

**Notes for Table B.5-E:****Typical facility and layout distances between other types of equipment and operations for fire consequences**

1	Distances are measured with the shortest line from one point to another point at ground level, horizontal plane, or grade. Refer to Figure B.1 for the "x,y,z" perspective. The "points" defined for measuring the distances are as follows:
1a	Distances between one block (e.g., a building or structure) to another block or boundary: Measure the shortest distance between the edge of the block and the other block or boundary. (This could be on the corner of a block.)
1b	Distances between equipment to equipment: Measure shortest distance between "points" or closest edge
2	These tables are not applicable to enclosed process units.
3	The typical distances cited in Table B.5 are based on potential fire consequences and processes with "Intermediate Hazards" [GAP 2.5.2.A]. Greater distances may be required based on modeled explosions and toxic releases.
4	Different distances may be warranted based on site-specific hazards and risks. Distances may be reduced or increased based on risk analysis or when additional layers of protection are implemented (such as: fire protection or emergency shutdown systems). Where unusual conditions require closer distances, appropriate risk reduction measures should be considered.
NA	Not applicable.
NM	No minimum distances requirement has been established for fire consequences. Use engineering judgement for distances and provide sufficient space for maintenance and fire fighting access.

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**Table B.6-E**

**Typical facility and layout distances for emergency response and operations accessibility**

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Line Item #	Ground level, horizontal plane, or grade distance		
	Spacing From	To	Maximum Distances (feet)
B.6-1	One process unit access way	Another access way	200
B.6-2	Fire hydrants protecting process units	Another fire hydrant	200
B.6-3	Fire hydrants in tank farms	Another fire hydrant	200
B.6-4	Firewater Monitors	Fire risk area	50
B.6-5	Access way	Access way	100
	Note: Access way should be at least 20 ft. wide; Basis for this distance is the typical fire hose length of 100 ft.		

Notes	
1	Distances are measured with the shortest line from one point to another point at ground level, horizontal plane, or grade. Refer to Figure B.1 for the "x,y,z" perspective. The "points" defined for measuring the distances are as follows:
1a	Distances between one block (e.g., a building or structure) to another block or boundary: Measure the shortest distance between the edge of the block and the other block or boundary. (This could be on the corner of a block.)
1b	Distances between equipment to equipment: Measure shortest distance between "points" or closest edge
2	Different distances may be warranted based on site-specific hazards and risks. Distances may be reduced or increased based on risk analysis or when additional layers of protection are implemented (such as: fire protection or emergency shutdown systems). Where unusual conditions require closer distances, appropriate risk reduction measures should be considered.

**Table B.7-E**

**Typical facility and layout distances for flare systems**

English Units - Issued 06-Apr-2018  
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Ground level, horizontal plane, or grade distance			
Line Item #	Spacing From	To	Minimum Distances (feet)
B.7-1	Elevated and grade level flares and burn pits (if radiation level calculations do not exist)	All other facilities	500
B.7-2	Enclosed ground flares	Property line, equipment handling flammables	100

Guidelines for Radiant Heat Calculations		
Line Item #	Permissible design level kW/m2 (Btu/h·ft2)	Conditions
B.7-3	1.58 (500)	Maximum radiant heat intensity at any location where personnel with <i>appropriate clothing</i> (Note 1) can be continuously exposed
B.7-4	4.73 (1,500)	Maximum radiant heat intensity in areas where emergency actions lasting 2 min to 3 min can be required by personnel without shielding but with <i>appropriate clothing</i> (Note 1)
B.7-5	6.31 (2,000)	Maximum radiant heat intensity in areas where emergency actions lasting up to 30 s can be required by personnel without shielding but with <i>appropriate clothing</i> (Note 1)
B.7-6	9.46 (3,000)	Maximum radiant heat intensity at any location where urgent emergency action by personnel is required. When personnel enter or work in an area with the potential for radiant heat intensity greater than 6,31 kW/m2 (2 000 Btu/h·ft2), then radiation shielding and/or special protective apparel (e.g. a fire approach suit) should be considered.
		SAFETY PRECAUTION — It is important to recognize that personnel with <i>appropriate clothing</i> (Note 1) cannot tolerate thermal radiation at 6.31 kW/m2 (2,000 Btu/h·ft2) for more than a few seconds.
Note for Radiant Heat Calculation Guidelines <i>Appropriate clothing</i> consists of hard hat, long-sleeved shirts with cuffs buttoned, work gloves, long-legged pants and work shoes. Appropriate clothing minimizes direct skin exposure to thermal radiation.		

From ANSI/API Standard 521, Pressure-relieving and Depressuring Systems, Fifth Edition, January 2007  
ISO 23251 (Identical), Petroleum and natural gas industries—Pressure-relieving and depressuring systems

**Table B.7-E**  
**Typical facility and layout distances for flare systems**

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*Table B.7-E - Continued*

	Thermal Radiation kW/m <sup>2</sup> (Btu/h·ft <sup>2</sup> )	Effect
B.7-7	1.5 (500)	Fire fighters can operate for long duration under normal conditions
B.7-8	5 (1,500)	Fire fighters can fight fire with normal protective clothing for a short time
B.7-9	8 (2,500)	Fire fighters can fight fire for short time if special cooled protective clothing is worn
		Fire unlikely to propagate beyond this point, even if no fire water applied
B.7-10	12 to 30 (4,000 to 9,500)	Fire should not propagate beyond this point if sufficient fire water applied
B.7-11	36 (11,000)	Fire likely to propagate no matter how much fire water applied

From "ExTool User Manual," Swiss Reinsurance Company, Zurich, 1998.

Notes Typical facility and layout distances for flare systems
Distances are measured with the shortest line from one point to another point at ground level, horizontal plane, or grade. Refer to Figure B.1 for the "x,y,z" perspective. The "points" defined for measuring the distances are as follows:
Distances between one block (e.g., a building or structure) to another block or boundary: Measure the shortest distance between the edge of the block and the other block or boundary. This could be on the corner of a block. For Flare calculations, the distance is measured from the perimeter of the calculated circle.