

OIL PRODUCTS SYSTEMS		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Buried Pipelines	ASME/ANSI B31.4 ASCE TCLEE 1984	none ² earthquake	none earthquake	●
Aboveground Piping	ASME/ANSI B31.4 ASME/ANSI B31.3 API 2510 API 2508 ASCE TCLEE 1984	none ² none ² earthquake	none earthquake, wind, ice	●
Pumping Station Piping	ASME/ANSI B31.3 ASME/ANSI B31.4 API 2510 ASCE TCLEE 1984	none ² none ² earthquake	earthquake, wind, ice none	●
Well Facilities	ASME/ANSI B31.4 ASME/ANSI B31.3 API RP 14E	none ² none ²	none earthquake, wind, ice	
Refineries	API 2508 ASCE Petrochem. ASME/ANSI B31.3 ASME BPV ³	earthquake, wind none ² none ²	earthquake, wind earthquake, wind, ice earthquake, wind, ice	●
Storage Tanks	API 620 API 650 NFPA 59 API 2508 ASCE TCLEE 1984	earthquake, wind earthquake, wind earthquake	earthquake, wind	● ● ●

NATURAL GAS SYSTEMS		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Buried Pipelines	ASME/ANSI B31.8 PRCI (2000) ASCE TCLEE 1984	none ² earthquake earthquake	none earthquake earthquake	● ●
Aboveground Piping	ASME/ANSI B31.3 ASME/ANSI B31.8 ANSI Z223.1 NFPA 54, SGC, IFGC ASCE TCLEE 1984	none ² none ² none ² earthquake	earthquake, wind, ice none	●
Compressor Station Piping	ASME/ANSI B31.3 ASME/ANSI B31.8 ASCE TCLEE 1984	none ² none ² earthquake	earthquake, wind, ice none	●
Well Facilities	ASME/ANSI B31.8 API RP 14E	none ²	none	
LNG Facilities Piping	ASME/ANSI B31.3 NFPA 59A	none ² earthquake	earthquake, wind, ice earthquake	
Storage Tanks	API 620 API 650 ASME BPV ³ NFPA 59A ASCE 1984	earthquake, wind earthquake, wind none ² earthquake, ref. ANSI A58.1 earthquake	earthquake, wind earthquake, wind, ice earthquake, ref. ANSI A58.1 earthquake, ref. ANSI A58.1 for wind and snow	● ● ●

WATER SYSTEMS (Potable & Raw)		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Buried Pipelines	AWWA M11 ASCE TCLEE 15	none ² earthquake	none earthquake	●
Aboveground Pipelines	ASME/ANSI B31.3	none ²	earthquake, wind, ice	
Pumping Plants	ASME B31.3	none ²	earthquake, wind, ice	
Storage Tanks	ACI 350 AWWA D ⁵ ASCE 1984	earthquake earthquake, wind, snow earthquake	earthquake earthquake, wind, snow earthquake	● ● ●
Well Facilities				

WASTE WATER SYSTEMS		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Buried Pipelines	AWWA M11 ASCE TCLEE 15	none ² earthquake	none earthquake	●
Aboveground Pipelines	ASME/ANSI B31.3	none ²	earthquake, wind, ice	
Pumping Plants	ASME B31.3	none ²	earthquake, wind, ice	
Storage Tanks	ACI 350 AWWA D ⁵ ASCE 1984	earthquake earthquake, wind, snow earthquake	earthquake earthquake, wind, snow earthquake	● ● ●

ELECTRIC POWER SYSTEMS		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Substations	IEEE-693	earthquake	earthquake	●
Transmission Towers & Poles	ASCE-10 ASCE/IEEE Foundation ASCE Manual 52 ASCE Manual 72 IEEE NESC	wind, ice (ref. ASCE Manual 52 & 74) none none ² wind, ice, earthquake	wind, ice none none wind, ice, earthquake	●
Distribution Poles				
Buried Conduits				

TELECOMMUNICATION SYSTEMS		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Towers, Masts and Poles	TIA/EIA 222G TIA/EIA 222F	Earthquake, wind, ice Wind, ice	Earthquake, wind, ice Wind, ice	● ●
Buried Cables	Bell Core	Earthquake, flood	Earthquake, flood	
Underwater Cables				
Aboveground Cables	Bell Core	Earthquake, wind, ice, snow	Earthquake, wind, ice, snow	
Switching Equipment	Bell Core	Earthquake, fire	Earthquake, fire	
Cable Trays	SMACNA BSP (Bell System Practice) ASCE 7	none none Earthquake, wind, ice, snow	earthquake earthquake Earthquake, wind, ice, snow	

PORTS AND INLAND WATERWAYS		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Piers/Wharves	NCEL R-939 NAVFAC DM-25.1 ASCE TCLEE 12 NFESC TR-2069SHR	Earthquake earthquake earthquake	Earthquake earthquake earthquake	● ●
Breakwaters/Jetties	NCEL R-939 ASCE TCLEE 12	Earthquake Earthquake	Earthquake Earthquake	●
Sea Walls	NCEL R-939 ASCE TCLEE 12	Earthquake Earthquake	Earthquake Earthquake	●
Container Handling	ASCE-7 IBC, SBC, UBC ASCE TCLEE 12 AISC	earthquake, wind, snow, ice earthquake, wind, snow, ice earthquake none ²	earthquake, wind, snow, ice earthquake, wind, snow, ice earthquake earthquake, wind, snow, ice	●
Cargo Movement	ASCE-7 IBC, SBC, UBC ASCE-ASCE TCLEE 12	earthquake, wind, snow, ice earthquake, wind, snow, ice earthquake	earthquake, wind, snow, ice earthquake, wind, snow, ice earthquake	●
Marine Oil Terminals	CSLC NFESC, TR-2103-SHR ASCE-7 NFPA ⁴	Earthquake Earthquake earthquake, wind, snow, ice earthquake	Earthquake Earthquake earthquake, wind, snow, ice earthquake	

HIGHWAYS AND ROADS		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Bridges	FHWA 106 AASHTO CALTRANS FHWA-RD-94-052 FHWA 106	Earthquake earthquake, wind, snow, ice, flood earthquake, wind, snow, ice, flood earthquake earthquake	Earthquake earthquake, wind, snow, ice, flood earthquake, wind, snow, ice, flood earthquake earthquake	● ● ● ●
Embankments	CALTRANS	earthquake	earthquake	●
Road Beds				
Culverts	AASHTO CALTRANS	none ² none ²	none none	
Tunnels	AASHTO CALTRANS	none ² none ²	none none	
Retaining Walls	FHWA 106	Earthquake	Earthquake	
Signs	ASCE-7 IBC, SBC, UBC	earthquake, wind, snow, ice earthquake, wind, snow, ice	earthquake, wind, snow, ice earthquake, wind, snow, ice	

RAILROAD		NATURAL HAZARD PROVISIONS ⁸		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
System Reliability ⁶				
Bridges	AREMA Ch. 9 AREMA Ch. 7 AREMA Ch. 8 AREMA Ch. 9 AREMA Ch. 15	wind wind, ice earthquake wind	wind wind, ice earthquake wind	● ● ● ●
Embankments	AREMA Ch. 9	earthquake	earthquake	earthquake
Rails, Ties, and Ballast	AREMA Ch. 9	earthquake	earthquake	earthquake
Culverts	AREMA Ch. 9	earthquake	earthquake	earthquake
Tunnels	AREMA Ch. 9	earthquake	earthquake	earthquake
Signs	ASCE-7 IBC, SBC, UBC	earthquake, wind, snow, ice earthquake, wind, snow, ice	earthquake, wind, snow, ice earthquake, wind, snow, ice	

ELECTRICAL, MECHANICAL, AND ARCHITECTURAL COMPONENTS		NATURAL HAZARD PROVISIONS		
COMPONENT	GUIDE/STANDARD ¹	LOADING	DESIGN	EXISTING ⁷
Elect./Mech. Equip	ASCE-7 ASCE TCLEE 1984 ASME BPV ³ NFPA ⁴ IBC, SBC, UBC SMACNA	earthquake, wind, ice earthquake none ² earthquake earthquake, wind earthquake	earthquake, wind, ice earthquake earthquake, wind earthquake earthquake	● ●
Suspended Ceilings	IBC, SBC, UBC	earthquake	earthquake	●
Elevated Floors				

Man-made hazards will be added to future versions of this matrix.