

North Carolina Department of Environment and Natural Resources
Underground Storage Tank Section



UST System Design Part II



UST System Design

Specific Examples

- European Suction Piping
- Tank Manifolds (Siphon Bars)
- Piping Manifolds
- Transition Sumps
- Marinas

UST System Design

Specific Examples

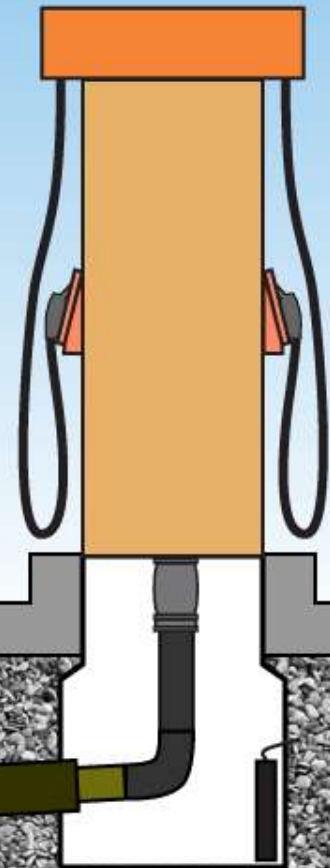
- Emergency Generators
- Remote Fills
- UST Anchoring
- Replacement of UST System Components
- Extension of Existing Piping



European suction-style piping must meet the same requirements as regular product piping



Ball valves or other means of isolation need to be installed to allow line tightness tests to be conducted



European Suction Piping



Siphon bars must meet the same requirements as regular product piping



Ball valves or other means of isolation need to be installed to allow line tightness tests to be conducted



All single-walled or metal components, including copper tubing used to maintain siphon must be contained



Tank Manifold (Siphon Bar) Design



Siphon bars must meet the same requirements as regular product piping



Ball valves or other means of isolation need to be installed to allow line tightness tests to be conducted



Copper tubing used to maintain siphon must be contained within double-walled UL971 pipe



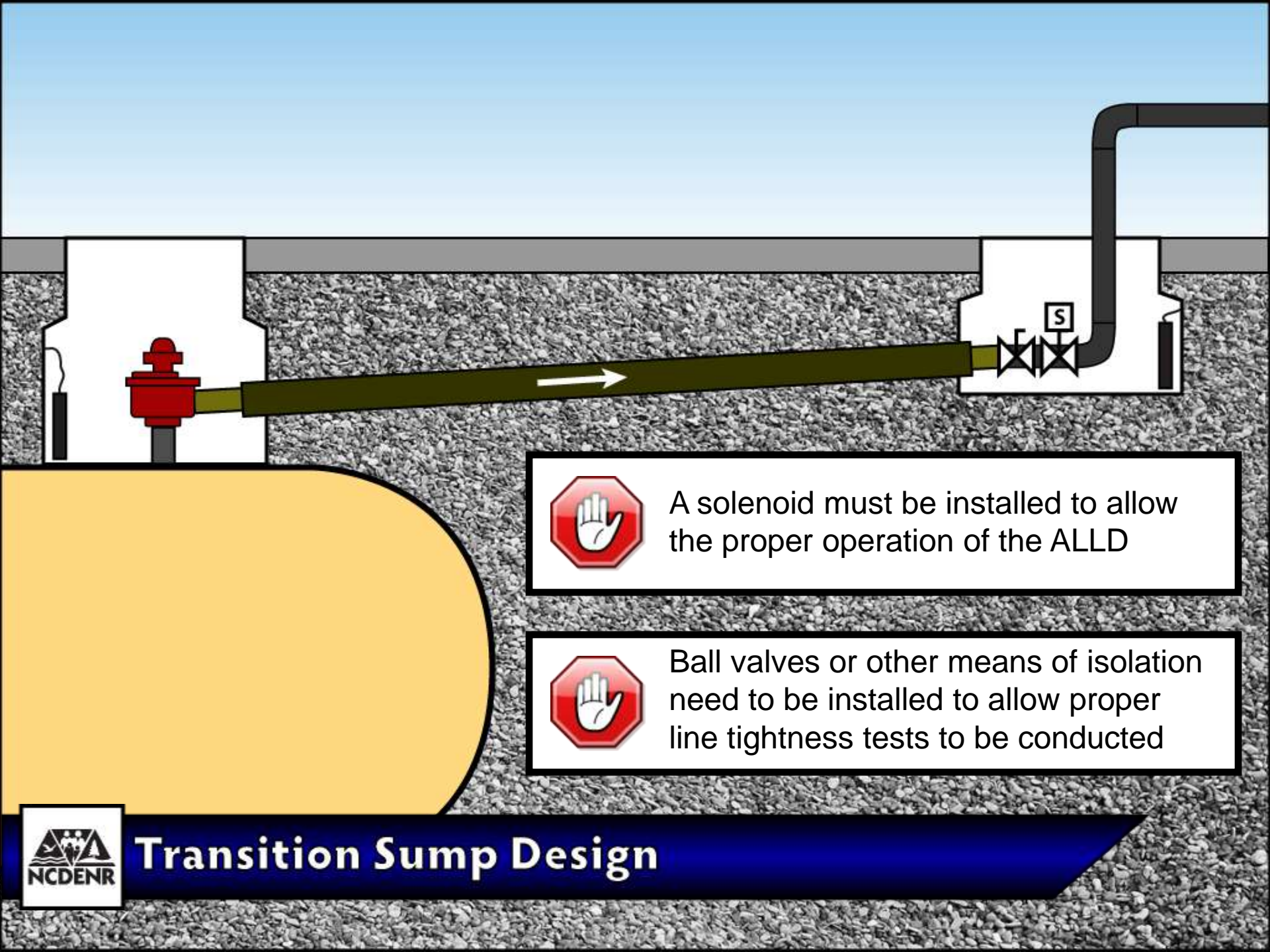
Tank Manifold (Siphon Bar) Design



For mechanical ALLDs to work properly, only one STP can be running at a time



Piping Manifold Design



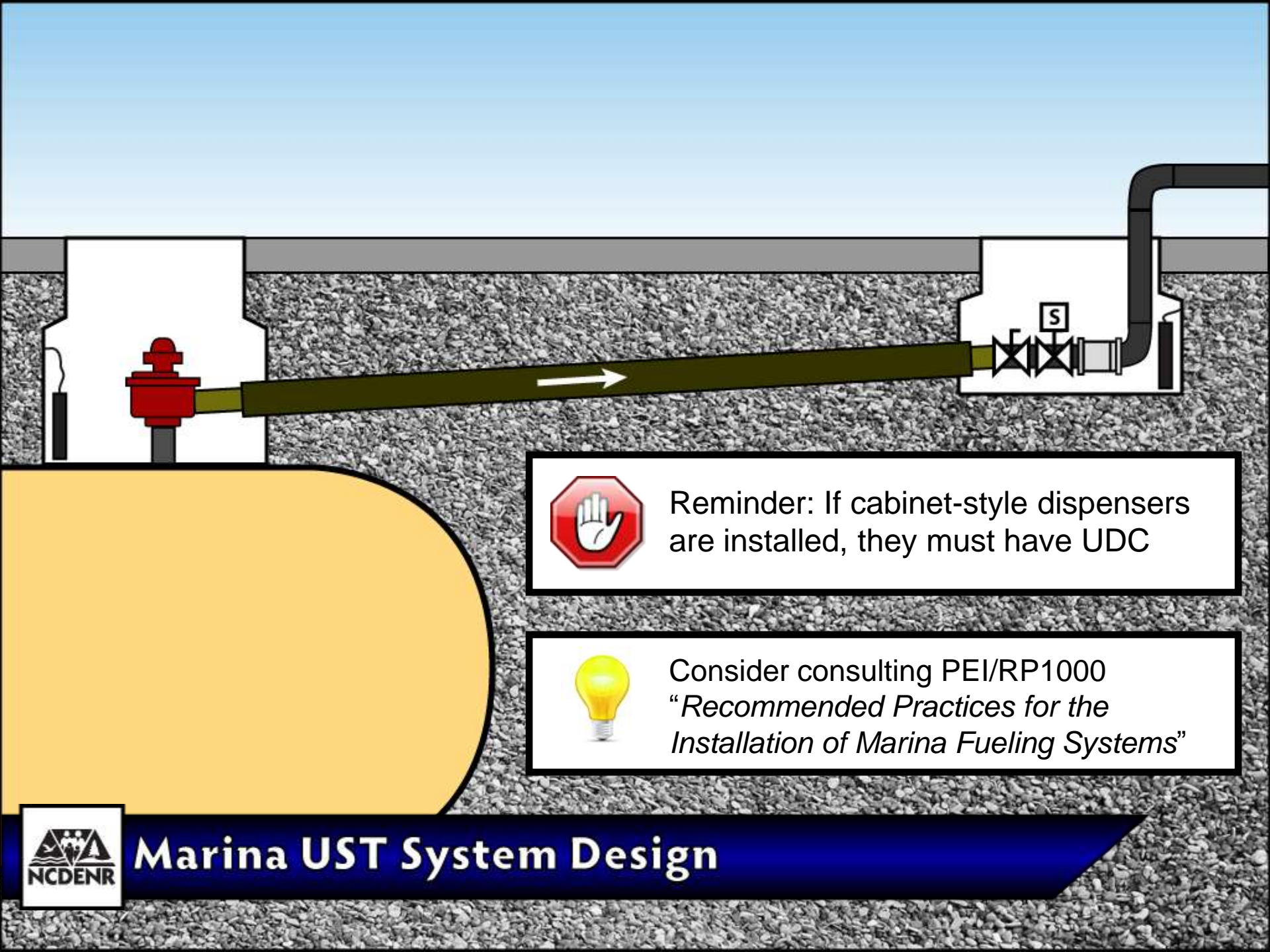
A solenoid must be installed to allow the proper operation of the ALLD



Ball valves or other means of isolation need to be installed to allow proper line tightness tests to be conducted



Transition Sump Design



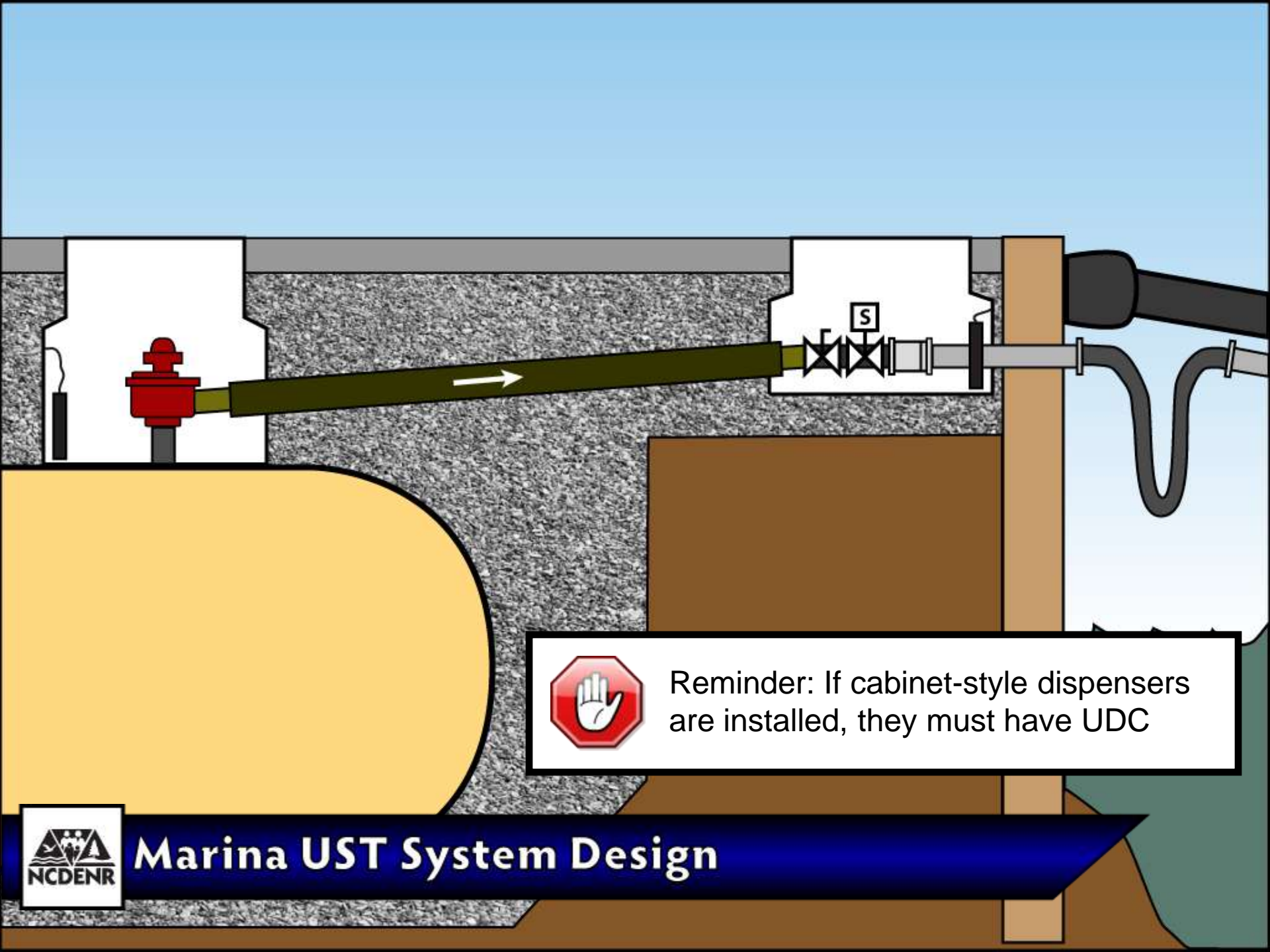
Reminder: If cabinet-style dispensers are installed, they must have UDC



Consider consulting PEI/RP1000
*“Recommended Practices for the
Installation of Marina Fueling Systems”*



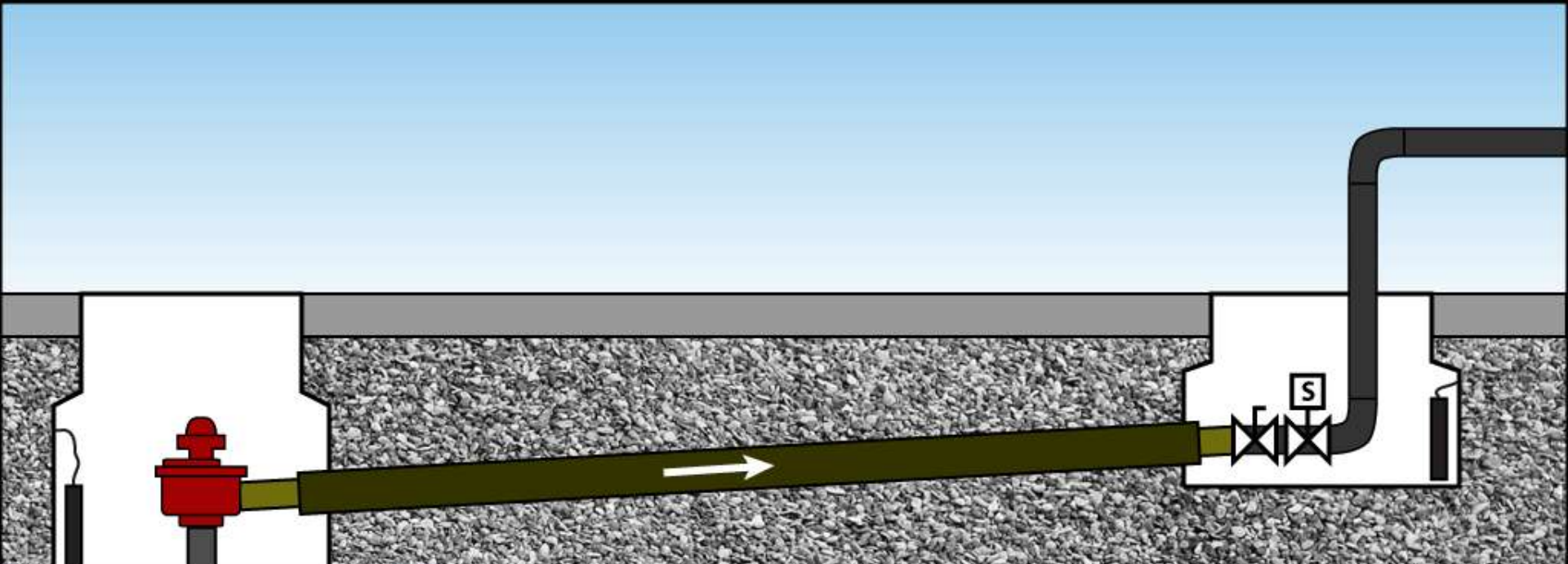
Marina UST System Design



Reminder: If cabinet-style dispensers are installed, they must have UDC



Marina UST System Design



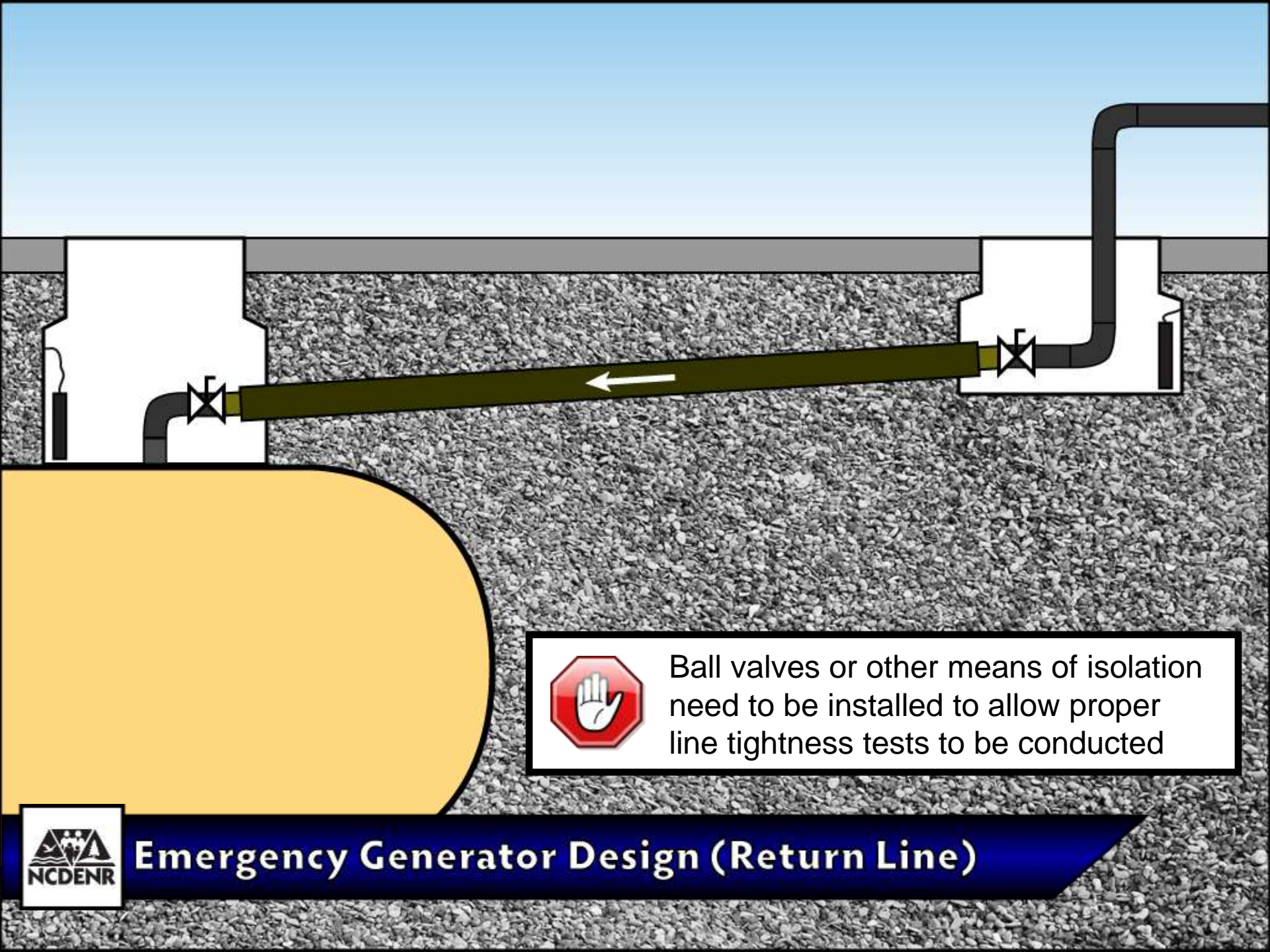
A solenoid must be installed to allow the proper operation of the ALLD



Ball valves or other means of isolation need to be installed to allow proper line tightness tests to be conducted



Emergency Generator Design (Supply Line)



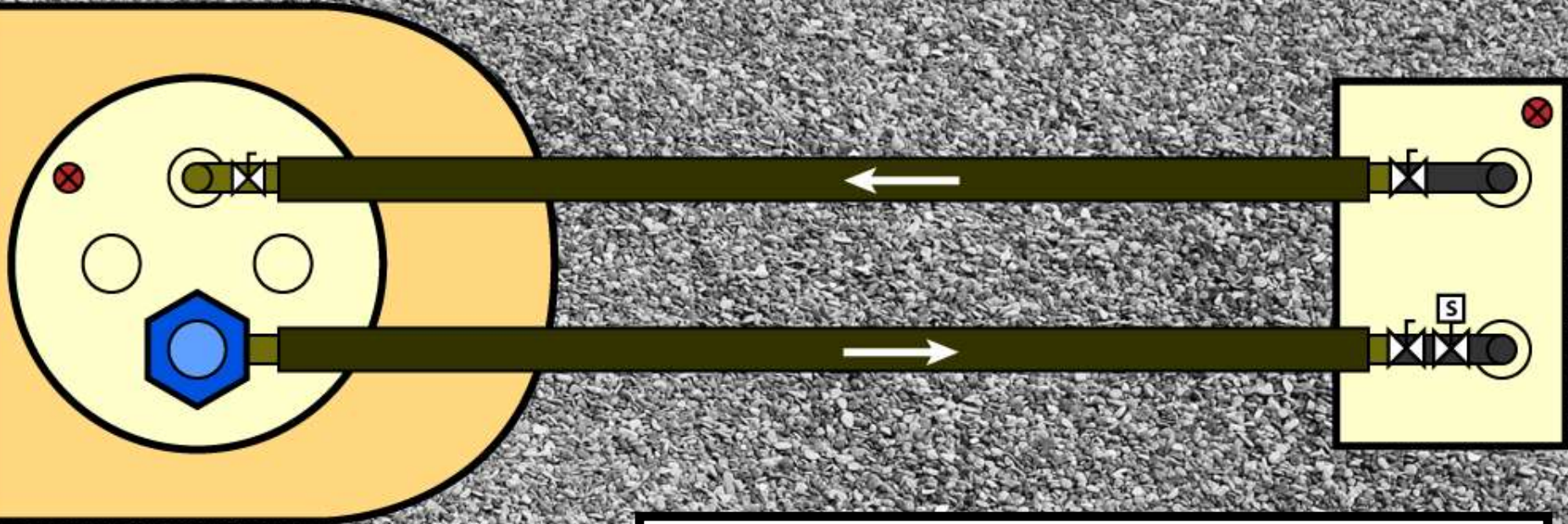
Ball valves or other means of isolation need to be installed to allow proper line tightness tests to be conducted



Emergency Generator Design (Return Line)



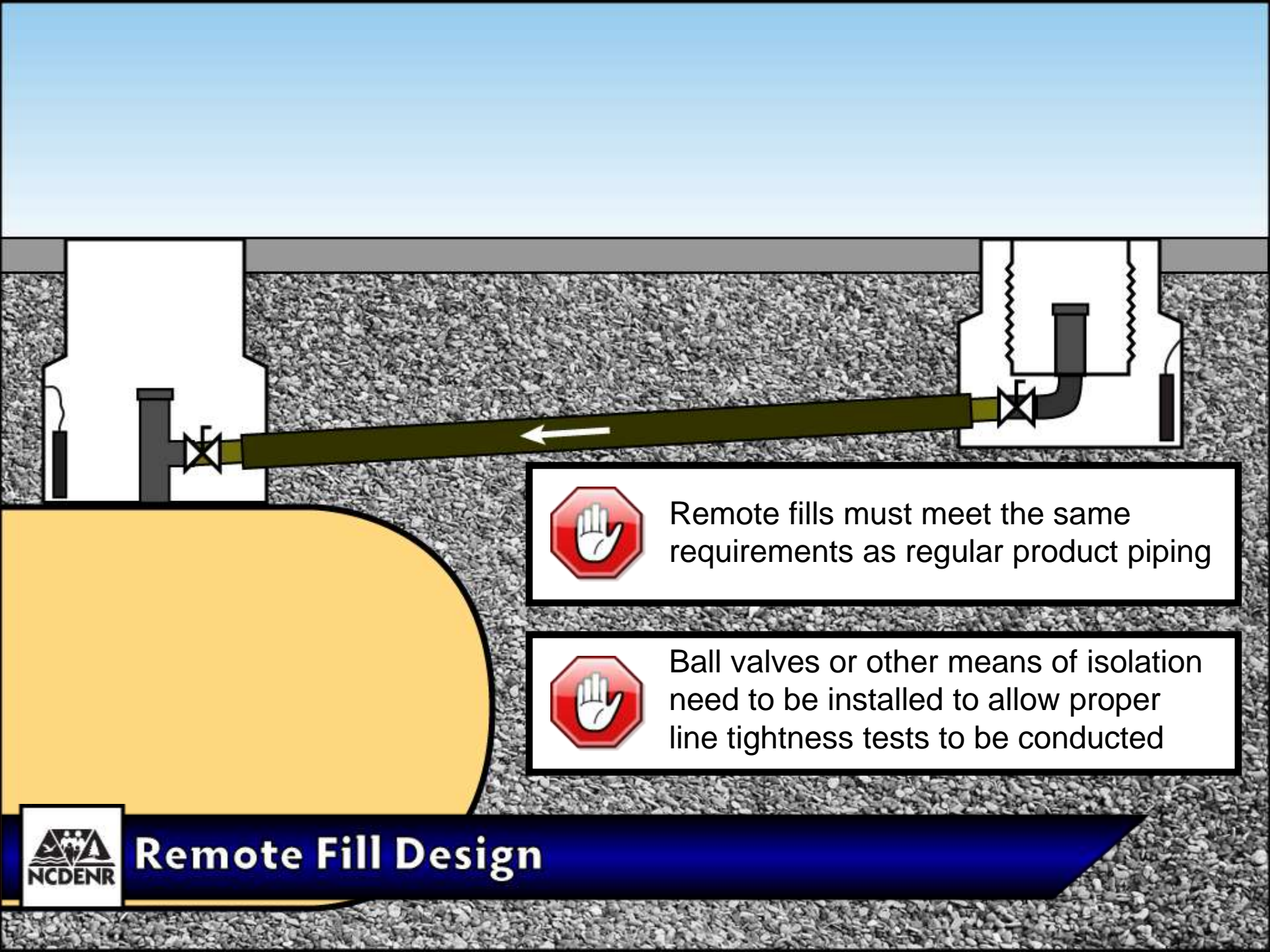
Ball valves or other means of isolation need to be installed to allow proper line tightness tests to be conducted



A solenoid must be installed to allow the proper operation of the ALLD



Emergency Generator Design



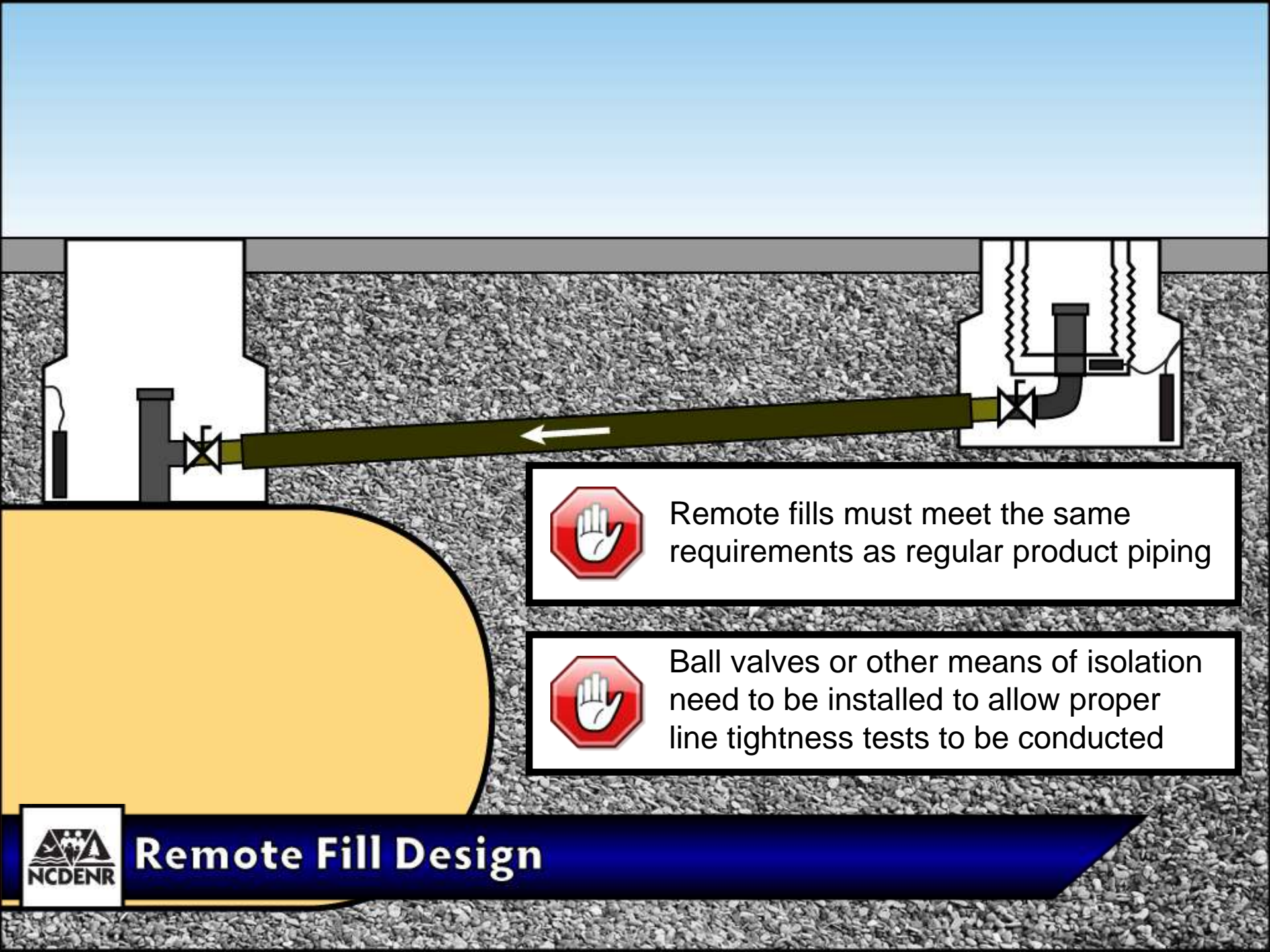
Remote fills must meet the same requirements as regular product piping



Ball valves or other means of isolation need to be installed to allow proper line tightness tests to be conducted



Remote Fill Design



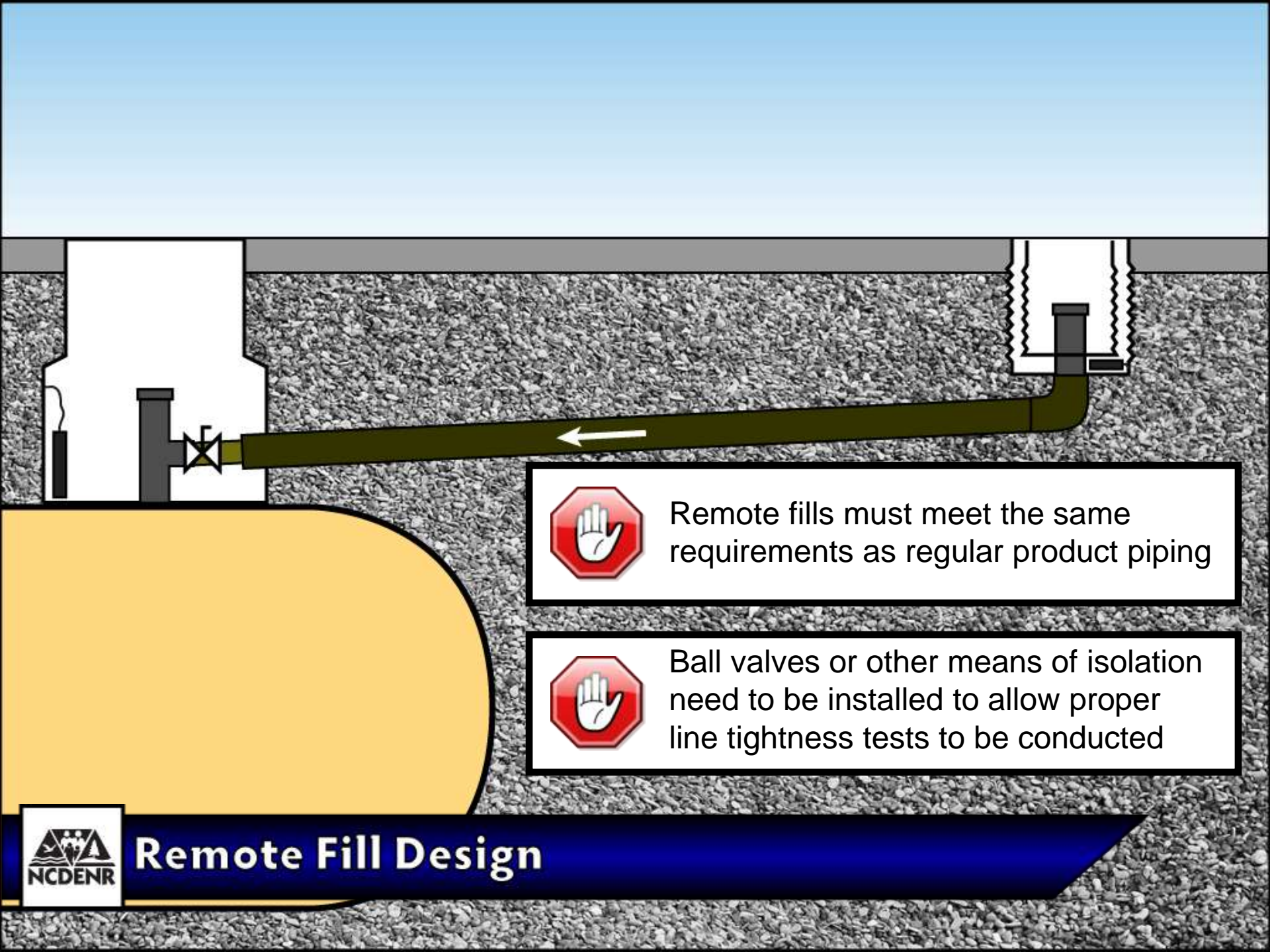
Remote fills must meet the same requirements as regular product piping



Ball valves or other means of isolation need to be installed to allow proper line tightness tests to be conducted



Remote Fill Design



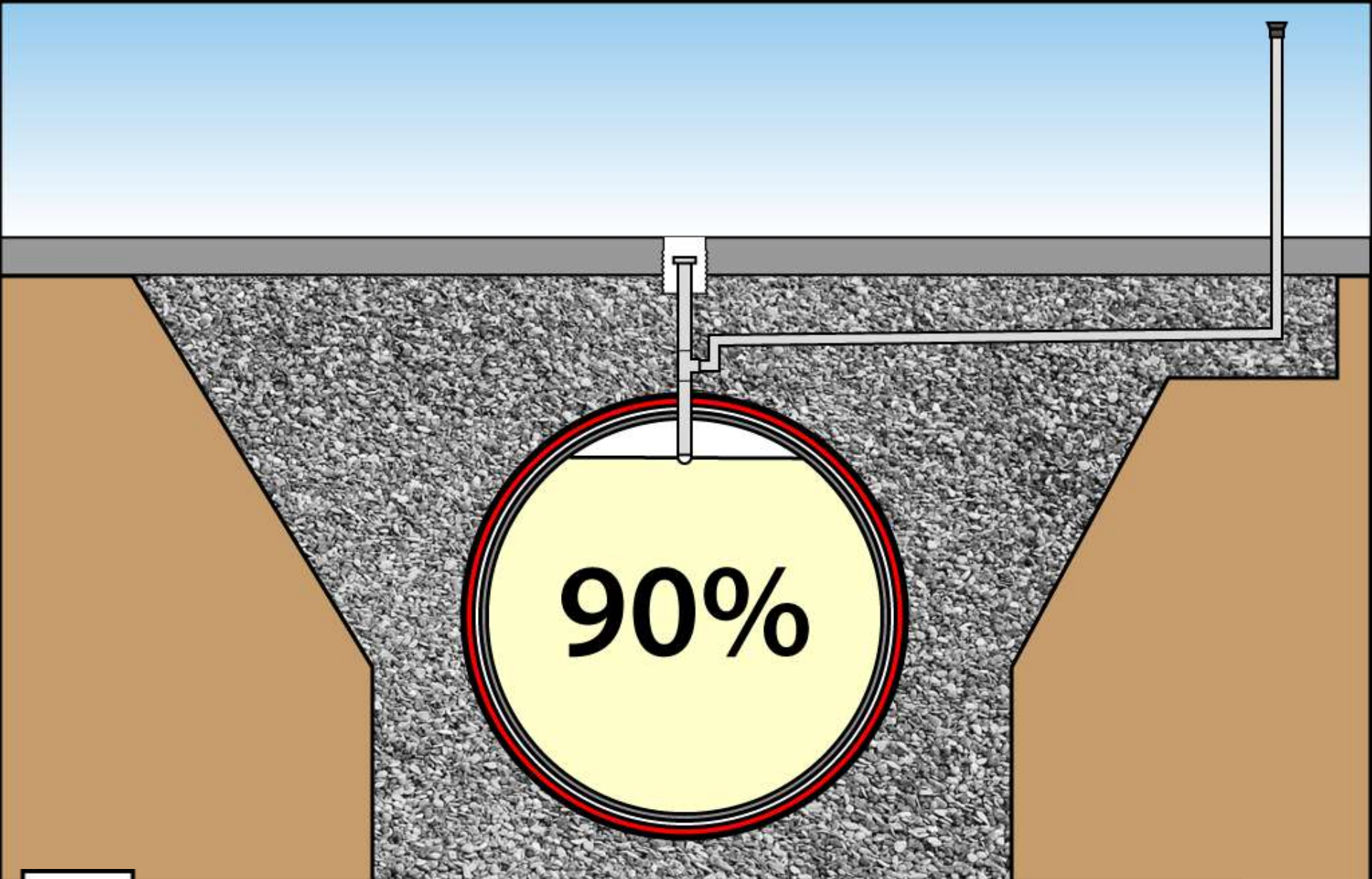
Remote fills must meet the same requirements as regular product piping



Ball valves or other means of isolation need to be installed to allow proper line tightness tests to be conducted



Remote Fill Design



Overfill Prevention (Ball Float)

XERXES CORPORATION 12,000 Gallon - 10' Diameter Double-Wall Tank

DIPSTICK READING	GALLONS	DIPSTICK READING	GALLONS	DIPSTICK READING	GALLONS	DIPSTICK READING	GALLONS	DIPSTICK READING	GALLONS	DIPSTICK READING	GALLONS	DIPSTICK READING	GALLONS
62-7/8"	6432	71-3/8"	7393	80-3/8"	8110	89-1/8"	9135	97-7/8"	10040	106-3/8"	11305	115-3/8"	11830
63"	6449	71-3/4"	7612	80-1/2"	8725	89-1/4"	9752	98"	10651	106-3/4"	11373	115-1/2"	11840
63-1/8"	6466	71-7/8"	7628	80-5/8"	8741	89-3/8"	9766	98-1/8"	10663	106-7/8"	11382	115-5/8"	11844
63-1/4"	6483	72"	7644	80-3/4"	8756	89-1/2"	9780	98-1/4"	10675	107"	11391	115-3/4"	11848
63-3/8"	6499	72-1/8"	7661	80-7/8"	8771	89-5/8"	9794	98-3/8"	10686	107-1/8"	11399	115-7/8"	11852
63-1/2"	6516	72-1/4"	7677	81"	8787	89-3/4"	9807	98-1/2"	10698	107-1/4"	11408	116"	11856
63-5/8"	6533	72-3/8"	7693	81-1/8"	8802	89-7/8"	9821	98-5/8"	10710	107-3/8"	11416	116-1/8"	11859
63-3/4"	6550	72-1/2"	7710	81-1/4"	8817	90"	9835	98-3/4"	10721	107-1/2"	11425	116-1/4"	11863
63-7/8"	6567	72-5/8"	7726	81-3/8"	8832	90-1/8"	9848	98-7/8"	10733	107-5/8"	11433	116-3/8"	11867
64"	6583	72-3/4"	7742	81-1/2"	8848	90-1/4"	9862	99"	10744	107-3/4"	11442	116-1/2"	11870
64-1/8"	6600	72-7/8"	7758	81-5/8"	8863	90-3/8"	9876	99-1/8"	10755	107-7/8"	11450	116-5/8"	11873
64-1/4"	6617	73"	7773	81-3/4"	8878	90-1/2"	9888	99-1/4"	10767	108"	11458	116-3/4"	11876
64-3/8"	6633	73-1/8"	7788	82-1/8"	8893	90-5/8"	9900	99-5/8"	10778	108-1/8"	11466	116-7/8"	11880
64-1/2"	6650	73-1/4"	7807	82-1/4"	8908	90-3/4"	9911	99-1/2"	10789	108-1/4"	11474	117"	11882
64-5/8"	6667	73-3/8"	7823	82-1/8"	8924	90-7/8"	9930	99-5/8"	10801	108-3/8"	11483	117-1/8"	11885
64-3/4"	6684	73-1/2"	7840	82-1/4"	8939	91"	9944	99-3/4"	10812	108-1/2"	11491	117-1/4"	11888
65"	6701	73-5/8"	7856	82-3/8"	8954	91-1/8"	9957	99-7/8"	10823	108-5/8"	11499	117-3/8"	11890
65-1/8"	6717	73-3/4"	7872	82-1/2"	8969	91-1/4"	9971	100"	10834	108-3/4"	11506	117-1/2"	11893
65-1/4"	6731	74"	7904	82-3/4"	8985	91-1/2"	9989	100-1/4"	10856	109"	11522	117-3/4"	11897
65-3/8"	6768	74-1/8"	7920	82-3/8"	8999	91-5/8"	9999	100-3/8"	10867	109-1/8"	11530	117-7/8"	11899
65-1/2"	6784	74-1/4"	7937	83"	9011	92-1/8"	10024	100-1/2"	10878	109-1/4"	11538	118"	11901
65-5/8"	6800	74-3/8"	7953	83-1/8"	9025	92-1/4"	10048	100-5/8"	10889	109-3/8"	11545	118-1/8"	11902
65-3/4"	6818	74-1/2"	7969	83-1/4"	9039	92-1/2"	10051	100-3/4"	10900	109-1/2"	11553	118-1/4"	11904
65-7/8"	6834	74-5/8"	7985	83-3/8"	9053	92-5/8"	10064	100-7/8"	10911	109-5/8"	11560	118-3/8"	11904
66"	6851	74-3/4"	8001	83-1/2"	9067	93-1/8"	10075	101"	10922	109-3/4"	11568		
66-1/8"	6868	74-7/8"	8017	83-5/8"	9104	92-3/8"	10090	101-1/8"	10933	109-7/8"	11575		
66-1/4"	6884	75"	8033	83-3/4"	9119	92-1/2"	10103	101-1/4"	10943	110"	11583		
66-3/8"	6901	75-1/8"	8049	83-7/8"	9134	92-5/8"	10117	101-3/8"	10954	110-1/8"	11590		
66-1/2"	6918	75-1/4"	8065	84"	9148	92-3/4"	10130	101-1/2"	10965	110-1/4"	11597		
66-5/8"	6934	75-3/8"	8081	84-1/8"	9163	92-7/8"	10143	101-5/8"	10975	110-3/8"	11604		
66-3/4"	6951	75-1/2"	8097	84-1/4"	9178	93"	10156	101-3/4"	10986	110-1/2"	11611		
66-7/8"	6968	75-5/8"	8113	84-3/8"	9193	93-1/8"	10169	101-7/8"	10997	110-5/8"	11618		
67"	6984	75-3/4"	8129	84-1/2"	9208	93-1/4"	10182	102"	11007	110-3/4"	11625		
67-1/8"	7001	75-7/8"	8145	84-5/8"	9222	93-3/8"	10195	102-1/8"	11018	110-7/8"	11632		

12,000 gallon – 10' diameter Xerxes DW FRP tank

100% Volume = 11,904 gallons

90% Volume = 11,904 – 1,190 gallons

Length of Ball Float = 10,714 gallons

= 118-3/8" – 98-5/8"

= ~19-3/4"



Overfill Prevention (Ball Float)

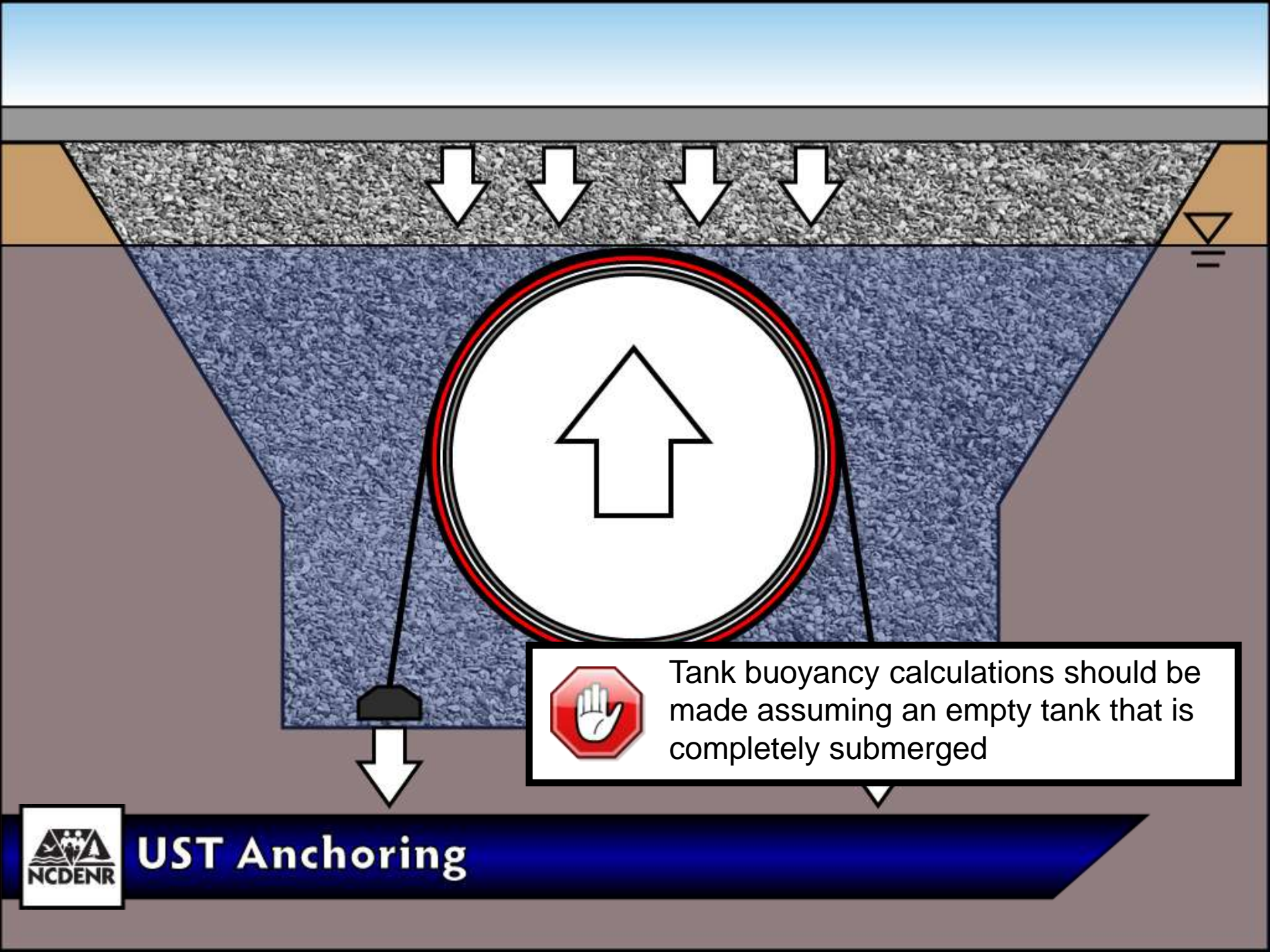
UST System Design


Anchoring

UST system designs must be engineered to prevent tanks from becoming buoyant

- Concrete deadmen
- Concrete hold-down pad
- Overburden





 Tank buoyancy calculations should be made assuming an empty tank that is completely submerged



UST Anchoring



UST Anchoring



Importance of Proper Anchoring



Importance of Proper Anchoring



Importance of Proper Anchoring



Importance of Proper Anchoring

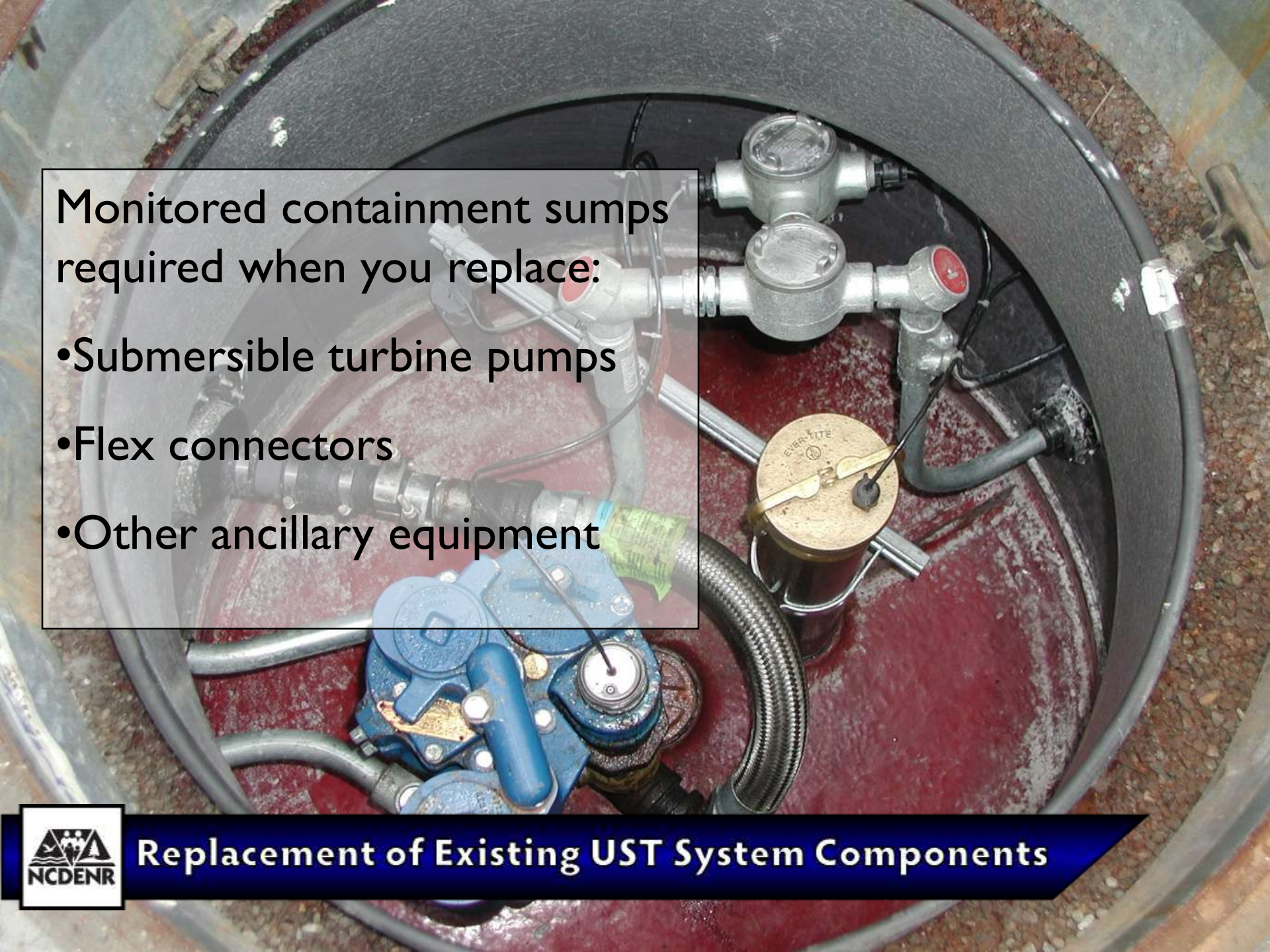


Monitored UDC sumps
required when you replace:

- Shear valves
- Flex connectors
- Other ancillary equipment



Replacement of Existing UST System Components

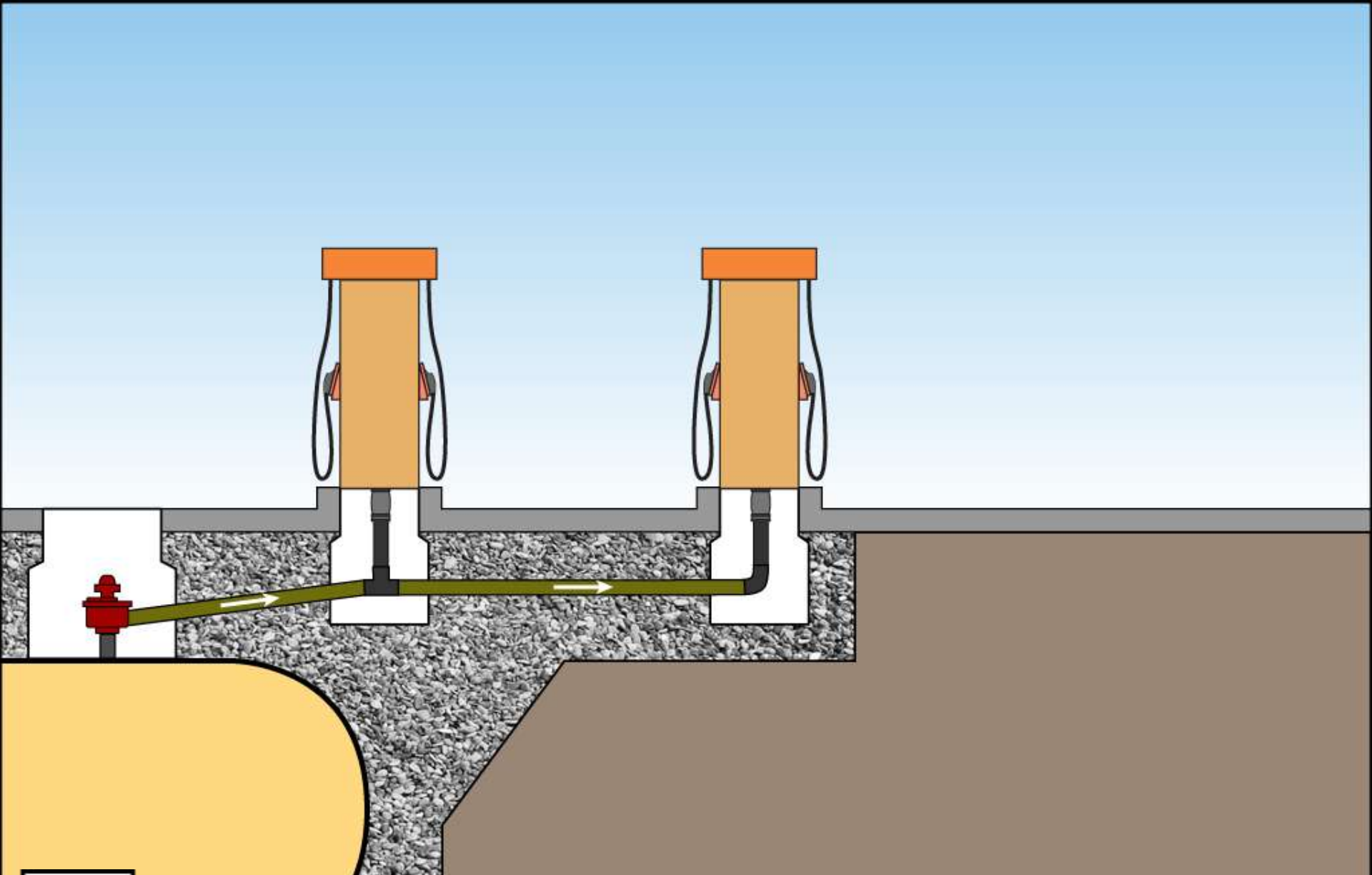


Monitored containment sumps
required when you replace:

- Submersible turbine pumps
- Flex connectors
- Other ancillary equipment



Replacement of Existing UST System Components

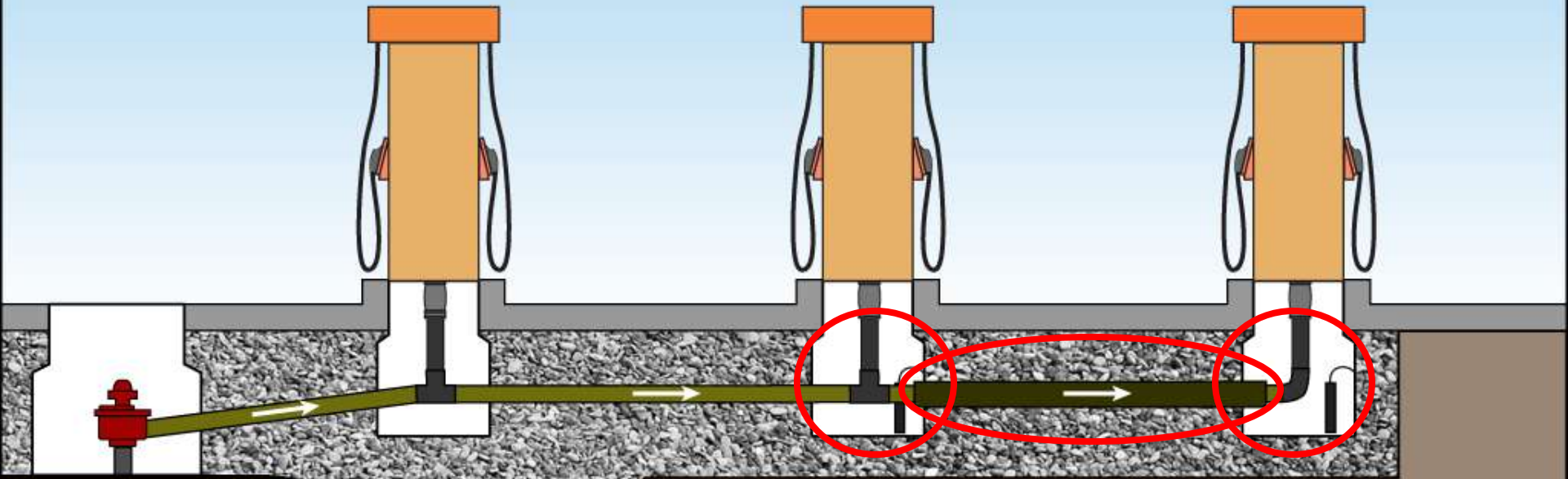


Extension of Existing Piping





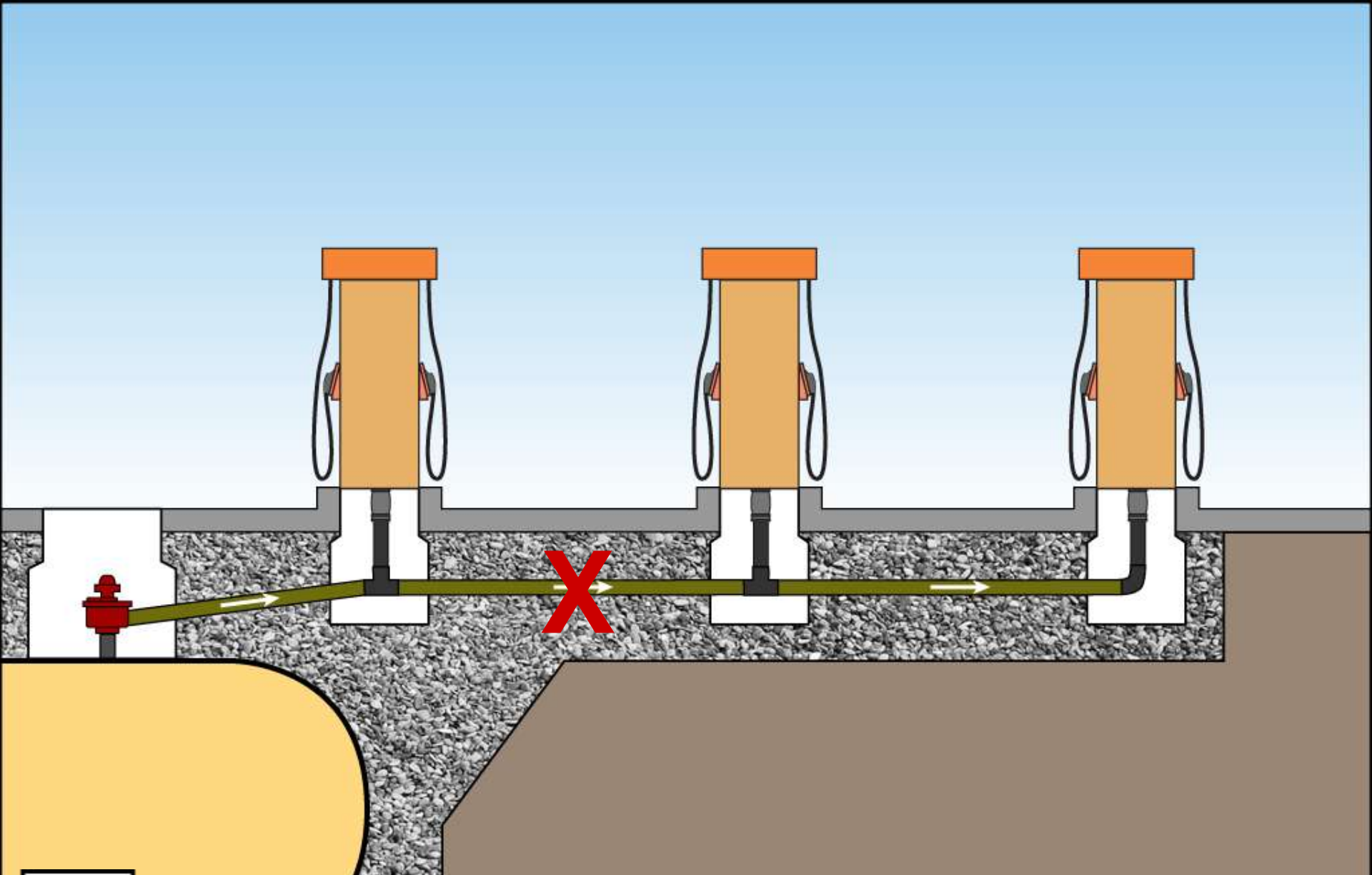
Secondary containment requirements apply to new components installed



Hint: Hydrostatically test containment sumps that will be used as part of the leak detection system prior to beginning

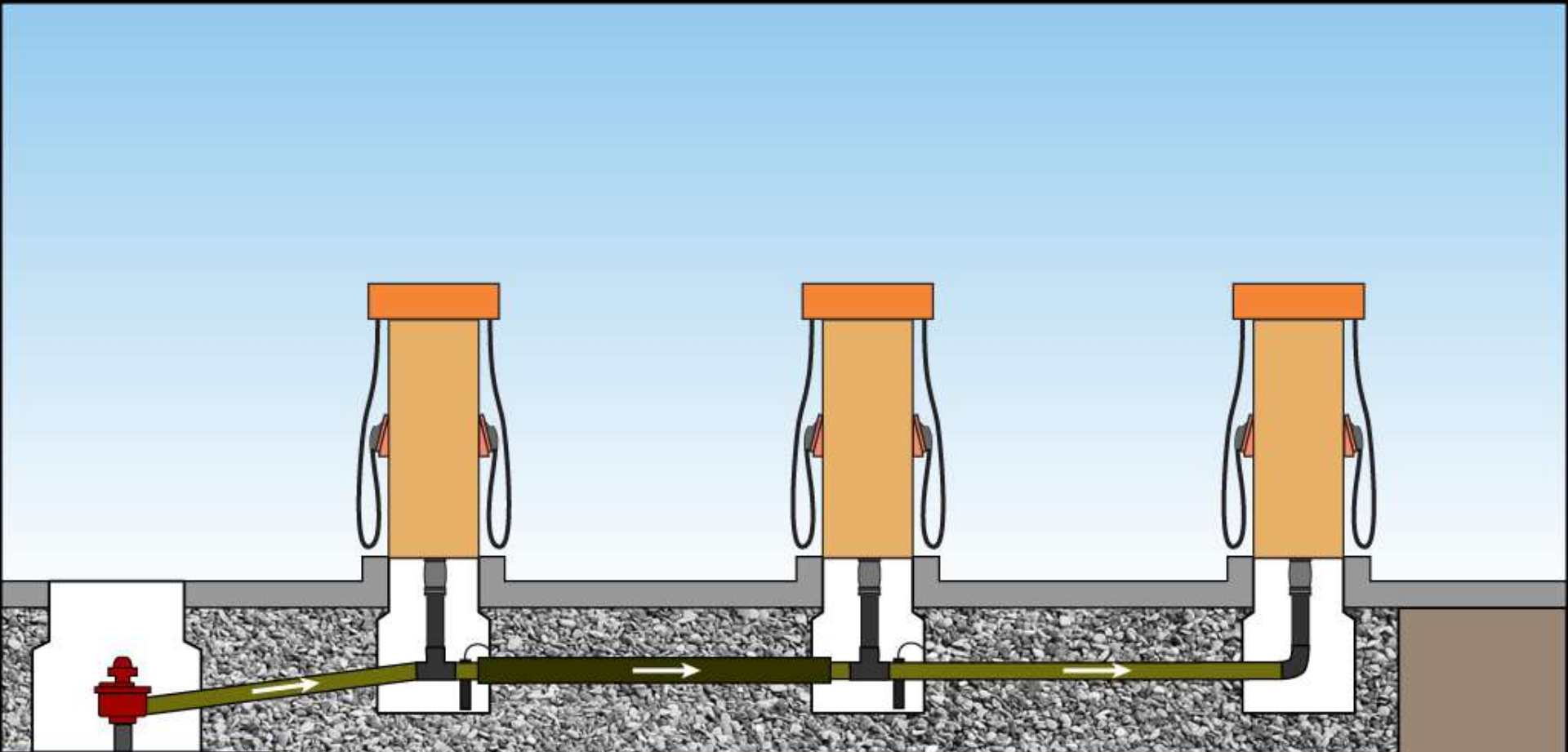


Extension of Existing Piping



Replacement of Existing Piping

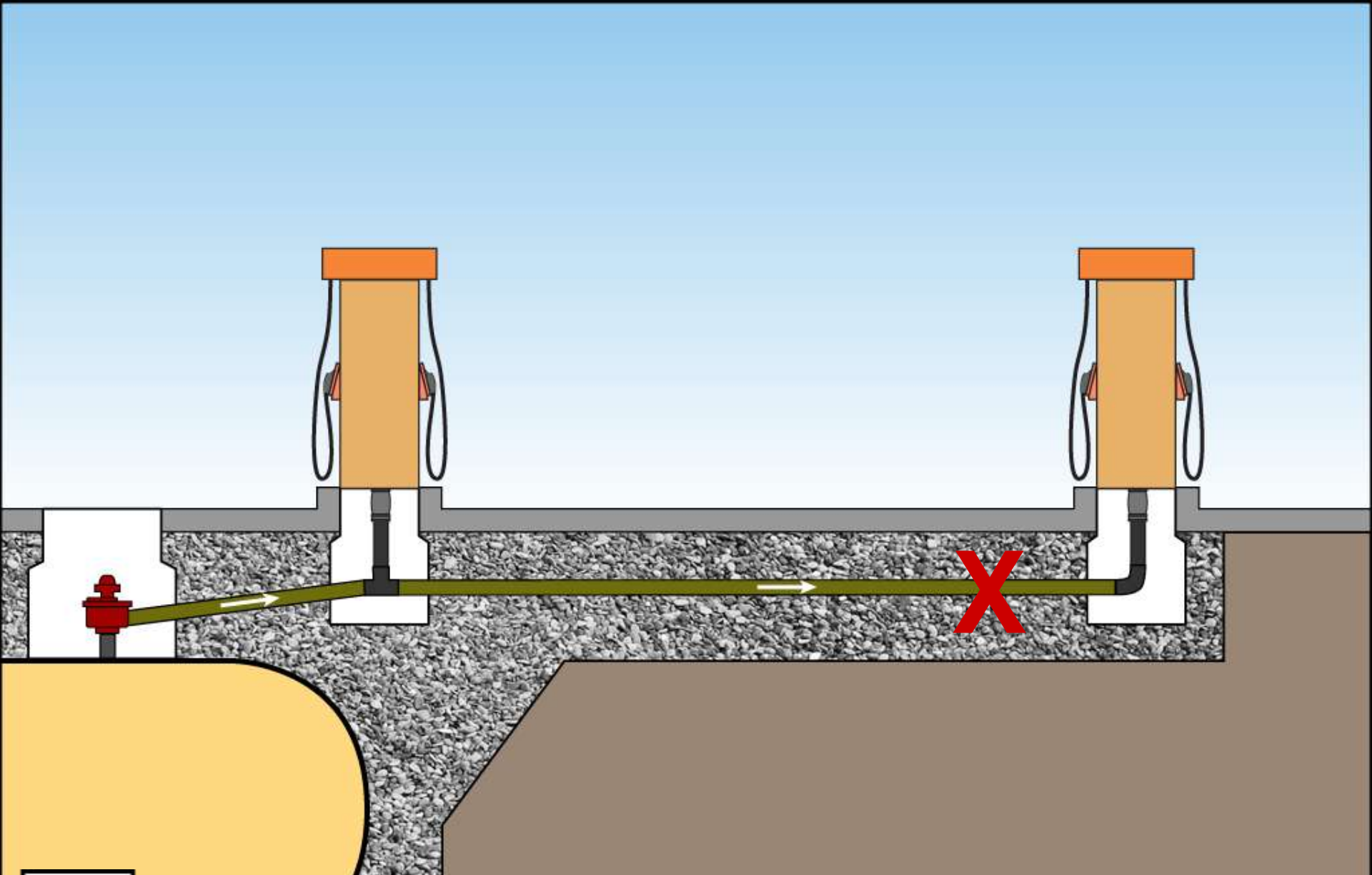




Secondary containment requirements apply to new components installed

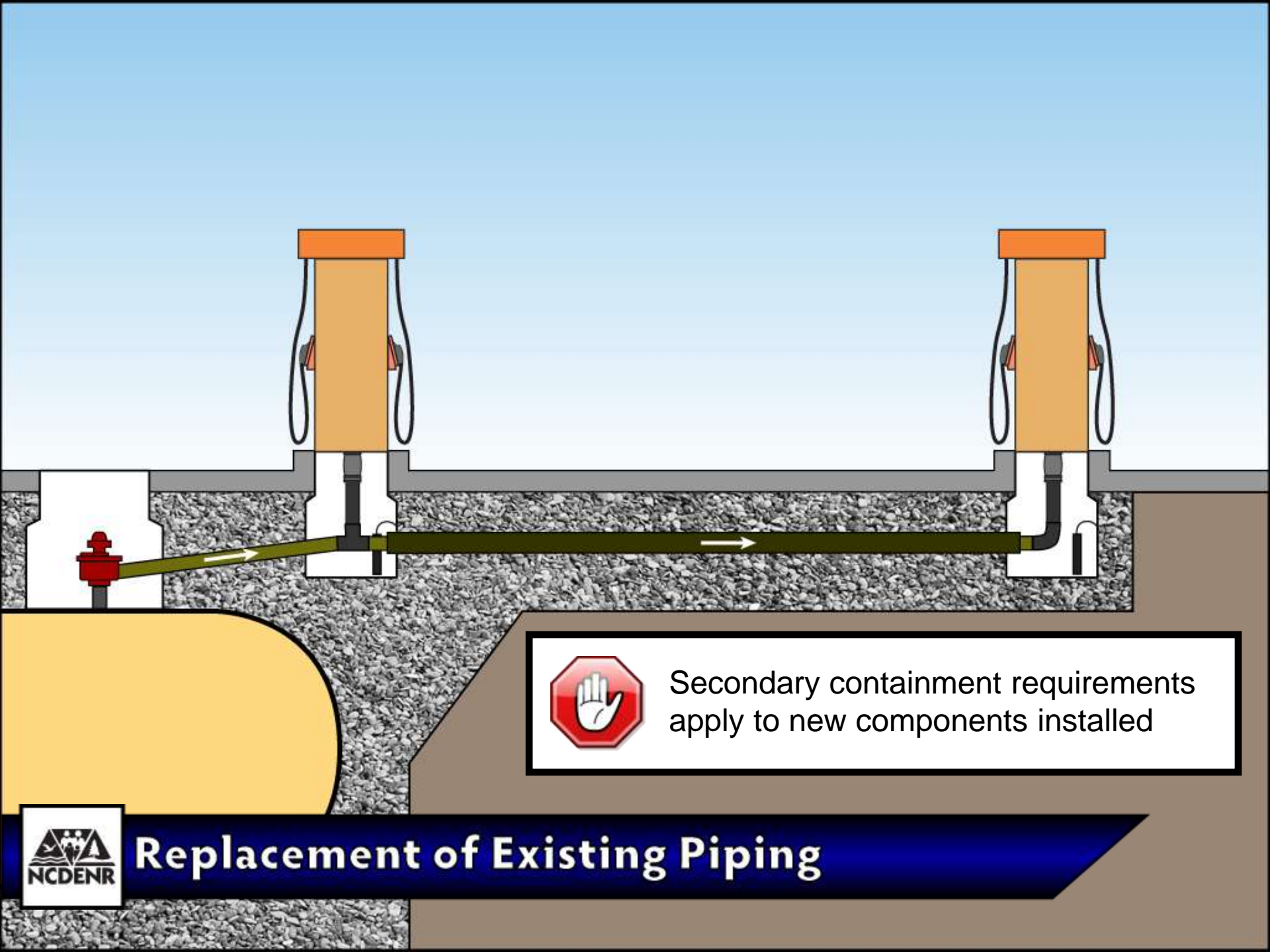


Replacement of Existing Piping



Replacement of Existing Piping





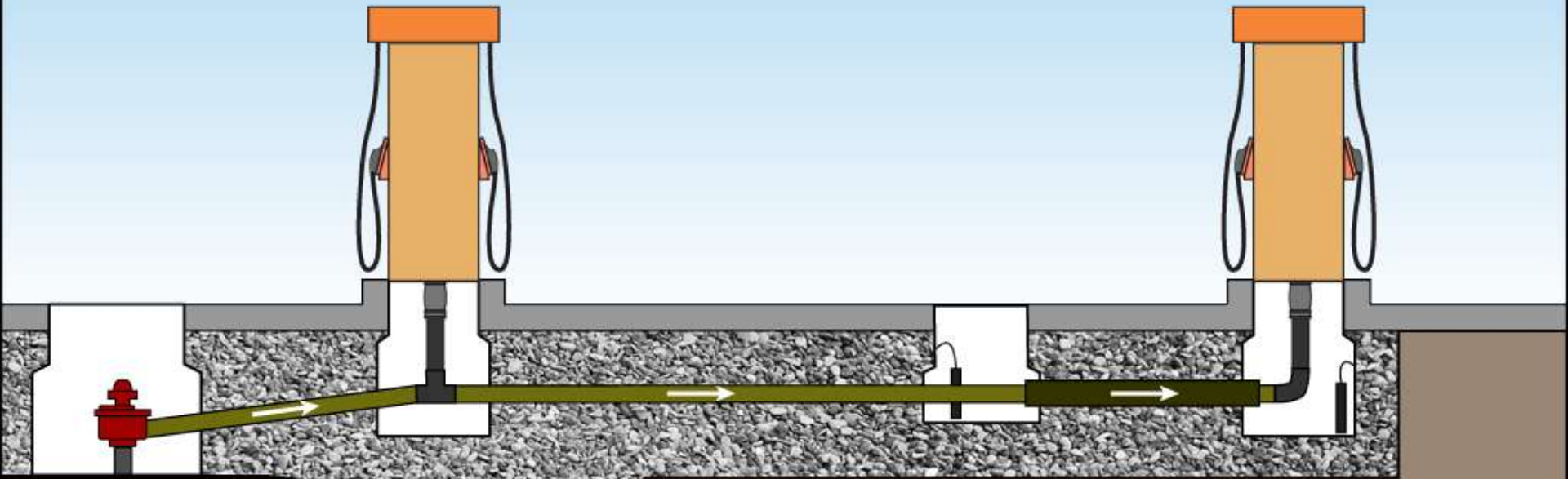
Secondary containment requirements apply to new components installed



Replacement of Existing Piping



Reminder: All metal or single-walled components must be installed within monitored containment sumps



Secondary containment requirements apply to new components installed



Replacement of Existing Piping

North Carolina Department of Environment and Natural Resources Underground Storage Tank Section



Questions?

