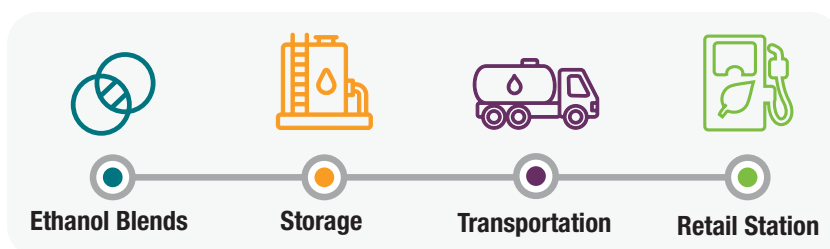


Infrastructure Compatibility with Ethanol

Determining Infrastructure Requirements for Ethanol Blends

For countries contemplating introducing gasoline-ethanol blends, these are the major considerations to determine infrastructure requirements:

- Assessment of the fuel supply chain at the points of contact with ethanol, which in general, includes blending of gasoline with ethanol, storage, transportation and fueling at the retail station.
- Evaluation of the compatibility of the equipment at these contact points with ethanol
- Ensuring the entire supply chain is “dry” or “water-free” to preserve the quality of the ethanol blended gasoline.



Material Compatibility with Ethanol

Material compatibility and evaluations can be made using the information listed in the chart.

Construction Materials

- Compatibility studies with ethanol blends have been published and can be used by comparing an equipment's material of construction and and of compatible materials with specific ethanol blends. For example, if one is evaluating compatibility for up to E15 of a storage tank whose material of construction is known, then the material can be referenced with the appropriate compatibility list, such as the one in Table 1. If someone is evaluating elastomers and sealants in equipment, a similar comparison can be made with the appropriate table.

Table 1: E15 Compatibility with Various Materials

METALS		
Compatible	Discoloration/Mild Corrosion	Non-Compatible
1020 Solid Steel	Brass	
1100 Aluminum	Phosphor Bronze	
201 Nickel	Zinc-plated (galvanized steel)	
304 Stainless Steel	Lead-plated (terne) steel	
ELASTOMERS		
Compatible	Uncertain ¹	Non-Compatible
Fluorosilicone Rubber	Styrene Butadiene Rubber (SBR)	Silicone Rubber
Fluoroelastomers (fluorocarbons)	Nitrite Rubber (BUNS, BUNAN)	Polyurethane Neoprene
SEALANTS		
Compatible	Non-Compatible ²	
Gasoila E-Seal	E-Seal Standard PTF E-Sealant Rector Seal	

1. SBR and NBR properties are highly dependent on material additives, processing and co-polymer concentrations. As such, some formations of SBR and NBR may not be compatible with E15 while others are.

2. Standard PTFE (Rector Seal) when combined with Teflon tape appears to be acceptable.

Material Compatibility with Ethanol

Equipment manufacturer statements

- Some manufacturers publish statements on which of their products are compatible with specific ethanol blends. As an example, if one is evaluating the ethanol compatibility for a tank whose manufacturer is known, that manufacturer can be looked up on a list of manufacturer statements for tanks in the U.S., such as the one shown in Table A1 (page 3). These lists are available in the Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends linked below, and have reference for pipes and associated underground storage tank equipment (Appendix B), and dispenser, hanging hardware, shear valve, and submersible turbine pump (Appendix C), among other things.

Safety code listings

- If the piece of equipment is known to meet a safety standard or code, then that standard or code can be examined to check what ethanol blend level it was certified for. In the U.S., the Underwriter's Laboratory, or UL code, is what is used. The UL safety code can be looked up in a listing of UL testing standards and the corresponding ethanol blend used as test fuel for that code, such as the one in Table F (page 3) for various equipment at the retail station. All equipment is compatible with E10, dispensers and hanging hardware with E25, most equipment with E85, and tanks and pipes with E100.

USGBC recommends working with the manufacturer of the equipment and following their recommendation.

Other Considerations

- The water bottoms (if any) from the storage tank for the ethanol blend must be removed before ethanol introduction. Excessive water will cause the blend to separate into two phases, both of which will be off-specification.
- Fire-fighting requirements for ethanol fires are different from those of gasoline-only fires, and is a consideration for the operating procedures of facilities with ethanol and ethanol blends.

Get Support

Reach out to the U.S. Grains & BioProducts Council's D.C. Team for assistance in evaluating the compatibility of a specific country's supply chain infrastructure with ethanol blends.

Selected References:

[1] [E15 Retailer Handbook \(RFA, 2015\)](#) – E15 Gasoline Blends Industry Guidelines, Specifications and Procedures, Retail Operations

[2] [Handbook for Handling, Storing and Dispensing E85 and Other Gasoline-Ethanol Blends \(DOE, Feb 2016\)](#)

[3] [Fuel Ethanol Industry Guidelines, Specifications and Procedures](#), pp. 48-50 (Materials Compatibility Information for Commonly Used Materials with Ethanol and Gasoline / Ethanol Blended Fuels), RFA, 2018

[4] [Intermediate Ethanol Blends Infrastructure Materials Compatibility Study: Elastomers, Metals and Sealants, March 2011](#) (experimental results from study undertaken to support the approval of E15 in the US. This study was part of the extensive study conducted by the government and industry on material compatibility and vehicle aging. It includes results for E0, E10, E15 and E20.)



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**Handbook for Handling,
Storing, and Dispensing
E85 and Other Ethanol-
Gasoline Blends**



Table A1: Tank Manufacturer Compatibility with Ethanol*

BLENDS	E10	E100
Manufacturer	✓	✓
FIBERGLASS^a		
Highland Tank	✓	✓
Containment Solutions	✓	✓
J.L. Houston Co.	✓	✓
Owens Corning (single wall 1965-1994)	✓	✗
Kennedy Tank and Manufacturing Co., Inc.	✓	✓
Owens Corning (double wall 1965-July 1, 1990)	✓	✓
Lancaster Tanks and Steel Products	✓	✓
Owens Corning (double wall July 2, 1990-December 31, 1994)	✓	✓
Lannon Tank Corporation	✓	✓
Xerxes (single wall prior to February 1981)	✗	✗
Mass Tank Sales Corp.	✓	✓
Xerxes (single wall February 1981-June 2005)	✓	✗
Metal Products Company	✓	✓
Xerxes (single wall since July 2005)	✓	✓
Mid-South Steel Products, Inc.	✓	✓
Xerxes (double wall prior to April 1990)	✓	✓
Modern Welding Company	✓	✓
Xerxes (double wall April 1990 and after)	✓	✓
Newberry Tanks & Equipment, LLC	✓	✓
STEEL^b		
Plasteela	✓	✓
Acterra Group Inc.	✓	✓
Service Welding & Machine Company	✓	✓
Caribbean Tank Technologies Inc.	✓	✓
Southern Tank & Manufacturing Co., Inc.	✓	✓
Eaton Sales & Service LLC	✓	✓
Stanwade Metal Products	✓	✓
General Industries	✓	✓
Talleres Industriales Potosinos, S.A. de C.V.	✓	✓
Greer Steel, Inc.	✓	✓
Tanques Antillanos C. x A.	✓	✓
Hall Tank Co.	✓	✓
Watco Tanks, Inc.	✓	✓
Hamilton Tanks	✓	✓
We-Mac Manufacturing Company	✓	✓

Letters stating compability:

- Petroleum Equipment Institute www.pei.org/ust-component-compatibility-library
- Steel Tank Institute www.steeltank.com/FabricatedSteelProducts/ShopFabricatedTanks/SteelandAlternativeFuels/tabid/465/Default.aspx

Appendix F: UL Testing Standards for Refueling Equipment*

UL TESTING STANDARD	EQUIPMENT COVERED	TEST FLUID (OR LISTING)
UL 58	Underground steel tanks (no test fluids)	No test fluid
UL 1746	External Corrosion Protection Systems for USTs (option to test with up to E100)	Option up to E100
UL 1316	Underground fiberglass tanks (option to test with up to E100)	Option up to E100
UL 971	Pipes and pipe fittings non-metallic (option to test with up to E100)	Option up to E100
UL 971A	Pipes and pipe fittings metallic (option to test with up to E100)	Option up to E100
UL 2447	Sumps: tank, dispenser, transition, fill/vent, spill buckets Sump fittings: penetration, termination, internal, test and monitoring Sump accessories: frames/brackets, covers/lids, & chase pipe	Requires E25 and E85
UL 2039	Flexible Connectors	Requires E25 and E85
UL 87	Dispensers	E10 listing only
UL 87A	Dispensers	Requires E25 and E85
UL 25	Meters	E10 listing only
UL 25A	Meters	Requires E25 and E85
UL 330	Hose and hose assemblies	E10 listing only
UL 330A	Hose and hose assemblies	Requires E25 and E85
UL 331	Filters	E10 listing only
UL 331A	Filters	Requires E25 and E85
UL 428	Submersible turbine pump	E10 listing only
UL 428A	Submersible turbine pump	Requires E25 and E85
UL 567	Breakaway, swivels, pipe connection fittings	E10 listing only
UL 567A	Breakaway, swivels, pipe connection fittings	Requires E25 and E85
UL 842	Shear valve	E10 listing only
UL 842A	Shear valve	Requires E25 and E85
UL 2586	Nozzles	E10 listing only
UL 2586A	Nozzles	Requires E25 and E85

*Can also be found in the [Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends](#)