

**EXCHANGE SPECIFICATIONS
ASTM DIESEL GRADE HS NO. 2D, LS NO. 2D AND CARB VEHICULAR DIESEL
WESTERN REGION**

SPECIFICATION TEST	Methods	High Sulfur S5000	Low Sulfur S500	Ultra Low Sulfur S15	CARB Vehicle S15
Color	(1) Visual	Red	See Note 1	See Note 1	See Note 1
Appearance at 70°F	(1) D 4176	Bright and Clear	Bright and Clear	Bright and Clear	Bright and Clear
API Gravity, Min.	(2) D 1298 or D 4052 (2)	30	30	30	30
Flash Point, PM °F, Min.	(3) D 93	125	125	125	125
Aromatics, Mass %, Max.	D 5186				10
Cetane Number, Min.	(5) D 613	40	40	40	40
Cetane Index, Min.	D 4737	40	40	40	40
Cetane Index, Min.	(6) D 976		40	40	
Sulfur, Mass %, Max.	D 2622 or D 4294 or D 5453 or D 7039 or D5453	0.5	0.05 (7)	0.0015	0.0015
Distillation, °F, 90% Recovery	D 86	540 - 640	540 - 640	540 - 640	540 - 640
Viscosity, Kin., cSt @ 40 °F	D 445	1.9 - 4.1	1.9 - 4.1	1.9 - 4.1	1.9 - 4.1
Carbon Resid. Rams. 10% Bottoms, Mas %.	D 524 or D 4530	0.35	0.35	0.35	0.35
Ash, Mass %, Max.	D 482	0.01	0.01	0.01	0.01
Sediment and Water, Vol. %, Max.	D 2709	0.05	0.05	0.05	0.05
Copper Corrosion, Max. 3 Hours at 122°F	D 130	3	3	3	3
Thermal Stability, 90 Minutes % Reflectance, Min.	(8) D 6468	80	80	80	80
Cloud Point, °F, Max.	(9) D 2500	See Notes	See Notes	See Notes	See Notes
Pour Point, °F, Max.	D 97	See Notes	See Notes	See Notes	See Notes

NOTES:

1. High sulfur diesel must be dyed at the refinery (EPA regulations) to a visible pink color. According to IRS this fuel must contain Dye Solvent 164 at a concentration spectrally equivalent to 3.9 pounds per thousand barrels (PTB) (11.13 mg/liter) of solid dye Standard Solvent red 26. Low sulfur, ultra low sulfur and CARB diesel are generally on road diesels and consequently not dyed. However, if they are sold as non-taxable diesel or heating fuel they must be dyed to 3.9 PTB.
2. The Kinder Morgan Pipelines and the Chevron Pipelines have a minimum 30 API gravity specification.
3. 125 °F flash point minimum is for vehicles. Some marine fuels and utility companies require a 140 °F flash point.
4. CARB regulation limits the aromatics to 10 volume % maximum. CARB also permits the use of a CARB "alternate diesel" formulation. CARB alternate formulations specify the sulfur, cetane number, aromatics,

BRIEF SUMMARY: CARB Diesel Fuel Specifications and Test Methods

revised 9/11/08

This summary is not a legal document and not intended to be used in lieu of the regulations but as an aid to understanding the specifications of the regulated fuel properties.

CCR Section ^a	Diesel Parameter	Test Method	Specification	Designated Equivalent Limits CGR Section 2282(f)	Reproducibility
2281	Sulfur Content ^{b,c,d}	ASTM D2622-94 Equiv: ASTM D5453-93 Equiv: Canadian/CGSB-3.0, No. 16.0-95, Method S121	15 ppm	15 ppm	for D2622: 0.16(x) for D5453: 0.2217(x) ^{0.92}
2282	Aromatic Hydrocarbon Content ^{b,c,d}	ASTM D5186-96 (with correlation equation) ^e	10 v%	210 w%	0.75 (x) ^{0.23} (where x = wt%) ^e
2282(e)			small refiner: 20 v%		
2282(h)	API Gravity	ASTM D287-82 Equiv: ASTM D4052-96(2002) ^{f1}	not applicable	36 g° API (minimum)	0.5° API (at 60°F ±18°)
2284	Lubricity ^{b,c,d}	ASTM D6079-02	520 microns	520 microns	at 25°C = 0.127 mm at 60°C = 0.136 mm
2282(g)	Below are additional parameters specified for Certified Diesel Formulations (alternative formulations):				
	Polynuclear Aromatic Hydrocarbon Content (PAH)	ASTM D5186-96	Specified in the formulation.	3.5 w%	for x < 5.0 w%: 0.47 (x) ^{0.45} for x > 10 w%: 1.77 (x) ^{0.50}
	Nitrogen Content	ASTM D4629-96	Specified in the formulation.	500 ppm	0.85 (x) ^{0.54} x = average of 2 test results
	Cetane Number	ASTM D613-84 CARB using PAC Diesel Fuel Analyzer as a screen.	Specified in the formulation	53 (minimum)	2.5 @ 40' 2.6 @ 44' 3.1 @ 52' 3.3 @ 56'
	Check the executive order for each certified diesel formulation for any additional specifications, i.e. additive requirements.				

a = CCR Section 2285 exempts qualifying military vehicles from CARB diesel fuel requirements.

b = also applies to non-vehicular diesel fuel used in internal combustion engines except for locomotives and marine vessels.

c = CCR Section 2299 extends standard to apply to intrastate diesel-electric locomotives and harborcraft.

d = CCR Section 2479 extends standard to apply to mobile handling equipment at ports and intermodal rail yards using CARB diesel.

e = correlation equation: ArHC v% = (0.916)(ArHC w%) + 1.33

f = reproducibility values for intermediate and higher cetane numbers to be obtained by linear interpolation.

Note 1: for reproducibility, x = test result.

Note 2: values are maximums unless otherwise indicated.

Note 3: underline = current CARB enforcement test method.

BRIEF SUMMARY: CARB Phase 3 Gasoline Specifications and Test Methods

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CCR Section	Gasoline Parameter	Test Method	Flat	Averaging (DAL)	Cap	CARBOS-Cap Limits	Units	Reproducibility
2262 & 2262.3	Aromatic HC Content	ASTM D5580-00	25.0 ^a	22.0	35.0	38.7	v%	1.4
2262 & 2262.3	Benzene Content	ASTM D5580-00	0.80 ^a	0.70	1.10	1.22	v%	0.1409(x) ^{1.33}
2262 & 2262.3	Distillation, T50	ASTM D86-99 ^{b-1}	213 ^a	203	220	(RVP) 22.5 (non-RVP) 23.2	° F	variable
	Distillation, T90		305 ^a	295	330	335		
2262 & 2262.5b	Ethanol Content	ASTM D4815-04	10.0	cannot average	10.0	not applicable	v%	0.23(x) ^{0.57}
2262 & 2262.6a	MTBE Content	ASTM D4815-04	cannot add ^c ; limit 0.05	cannot average	0.05	not applicable	v%	0.12(x) ^{0.67}
2262 & 2262.3	Olefin Content	ASTM D6550-00 (modified)	6.0	4.0	10.0	11.1	v%	0.32(x) ^{0.5 d}
2262 & 2262.5	Oxygen Content	ASTM D4815-04 Equiv: GC/FTIR	1.8 to 2.2	cannot average	0 to 3.5 ^e 1.8 ^f to 3.5 ^e	not applicable	w%	ETOH: 0.23(x) ^{0.57} m%
2262 & 2262.6c	Oxygen Content (total, other than ETOH & MTBE)	ASTM D4815-04	cannot add; limit: 0.06	cannot average	0.06	not applicable	w%	variable
2262 & 2262.4	Reid Vapor Pressure ^{g,h}	ASTM D323-88 or 13 CCR Section 229Z	7.00 6.90 ⁱ	cannot average	6.40 - 7.20	5.99	psi	0.21
2262 & 2262.3	Sulfur Content	for > 10 ppm: ASTM D2622-94 (modified) or ASTM D5453-93	20	15	30	32 21 ^j	ppm	for S between 10 to 30 ppm: 40.5% (x)
		20 ^j			for 2622: for S > 30 ppm 19.2% (x)			
2257	Deposit Control Additive							for 5453: 0.2217(x) ^{0.92}
2253.4	Lead Content	ASTM D3237-79	0.05	cannot average	0.05	0.05	gm/gal	0.01
2254	Manganese Content	None specified, (using ASTM D2622-94)	cannot add	cannot average	cannot add	cannot add	ppm	not applicable
2253.4	Phosphorus Content	ASTM D3231-73	0.005	cannot average	0.005	0.005	gm/gal	0.0005

Specifications are listed in the individual deposit control additive certifications.

See Sections 2261, 2264, 2265, 2265.5, and 2266 for ethanol emission reduction, averaging, PM emissions offsetting, PM formulations, and test certified formulations, respectively.

a = small refiner limits are 35.0 for aromatic HC, 1.00 for benzene, 220 for T50, 312 for T90.

b = limits for RVP and non-RVP season gasoline.

c = a California production facility may use a supplied blending component with an MTBE content of 0.60 % volume or less in the production of California gasoline.

d = x is between 0.3 and 25 m% olefin. Conversion from m% to v% is (v% olefin) = (0.857)(m% olefin).

e = cap limit is 3.7 w% if oxygen is >3.5 w% and ethanol content is ≤ 10 v%.

f = 1.8% winter minimum applies Nov. 1 to Feb. 29 in the South Coast Area and Imperial County.

g = beginning and ending at different times of the year according to air basin (generally March through October).

h = for CARBOB final blends, a minimum RVP limit applies for producers and importers during non-RVP season.

i = applies when evap element of predictive model is used; RVP cap limit = 7.20.

j = applies on December 31, 2011; phase-in periods apply at facilities downstream from production and import facilities.

Note 1: for reproducibility, x = test result. Note 2: values are maximums unless otherwise indicated. Note 3: underline = current CARB enforcement test method.