



**Method for the Extended Analysis of Hydrocarbon Liquid
Mixtures Containing Nitrogen and Carbon Dioxide by
Temperature Programmed Gas Chromatography**

*Adopted as a Standard 2002
Revised 2014*

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Impact Statement
**Method for the Extended Analysis of Liquid Hydrocarbon Mixtures Containing Nitrogen
and Carbon Dioxide by Temperature Programmed Gas Chromatography**
GPA 2186

Purpose

This standard covers the determination of the chemical composition of natural gas liquid streams where precise physical property data of the hexanes and heavier fraction is required. This procedure is applicable for liquid hydrocarbon mixes which may contain nitrogen and carbon dioxide and/or hydrocarbon complexes C1 through C10 that fall within the ranges listed in Table 1.

This standard had previously seen only minor revisions since its adoption as a technical standard in 1986. In this revision, portions that had become obsolete and that did not reflect current industry practices were revised. In addition, the example calculations that utilize GPA 2145 to reflect the 2009 revision of GPA 2145 and all calculations related to those presented in GPA 2172 were removed and referenced to GPA 2172.

Also, the QA/QC related material previously included in this standard have been removed and referenced to GPA 2198.

The most significant changes to the standard involve updates to the method to maintain consistency with current technologies.

Contracts

It is recognized that parties may enter into a contractual agreement different from this Standard.

Economic / Commercial Impact

GPA 2186 may currently be referenced in custody transfer contracts. There are no anticipated costs associated with the implementation of the revised method. However, companies should assess their own economic impact of implementing the method into their measurement, accounting and laboratory systems.

Environmental / Safety Impact

GPA 2186-14 is expected to have no environmental or safety impact on the industry.

Operations / Maintenance Impact

GPA 2186-14 should result in no changes to programs, spreadsheets, and other software tools used to perform the analysis that are covered by this standard.

Facilities Design

GPA 2186-14 is expected to have no impact on facilities design.

Implementation

It is proposed that this revised standard have an implementation date one year after publication.

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1.0 Scope

1.1 This method is intended for the compositional analysis of natural gas liquid mixtures where precise physical property data of the hexanes and heavier fraction are required. The procedure is applicable for mixtures which may contain components of nitrogen, carbon dioxide, and/or hydrocarbon compounds C₁ - C₁₄.

Table 1 - Components and Recommended Compositional Ranges

<u>Components</u>	<u>Concentration Range (mole %)</u>
Nitrogen	0.01 – 5.0
Carbon Dioxide	0.01 – 5.0
Methane	0.01 – 5.0
Ethane	0.01 – 95.0
Propane	0.01 – 100.0
Iso-Butane	0.01 – 100.0
N-Butane and 2,2-Dimethylpropane	0.01 – 100.0
Iso-Pentane	0.01 – 15.0
N-Pentane	0.01 – 15.0
2,2-Dimethylbutane, 2,2-Dimethylbutane, and 2-Methylpentane, 3-Methylpentane, Cyclopentane, N-Hexane	0.01 – 15.0
Heptanes & Heavier	0.01 – 5.0

2.0 Summary of Method

2.1 Components to be determined in a natural gas liquid sample are physically separated by Gas Chromatography and compared to calibration data obtained under identical operating conditions on a mixture (or mixtures) of known composition.

2.2 A fixed volume of sample in the liquid phases is isolated in a suitable sample inlet valve. The fixed volume is injected into a chromatographic system.

2.2.1 The Hexanes Plus components are individually separated using a capillary column, temperature programming and a flame ionization detector (FID). (See Figure 2A and Figure 2B.) Appendix A contains a packed column alternative to the capillary column method.

2.2.2 Nitrogen/Air, Carbon Dioxide and C₁ to C₅ or Hexanes Plus hydrocarbons are analyzed using GPA Standard 2177 (Analysis of Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography), latest version.

2.2.2.1 If the allocation calculation method is chosen, the C6 plus portion of the GPA 2177 analysis must be reported.

2.2.2.2 If the bridging calculation method is used, the C6 plus portion of the GPA 2177 analysis is not required.

2.2.2.3 Future reference to the nitrogen through pentanes or hexanes analysis will be called, "GPA 2177 analysis".

2.2.2.4 Future references to the hexanes plus individual component separation will be called, "this standard".

2.2.3 The combined GPA 2177 analysis and analysis from this standard may be performed using two different instruments or may be combined into a single chromatograph. (see Figure 1)

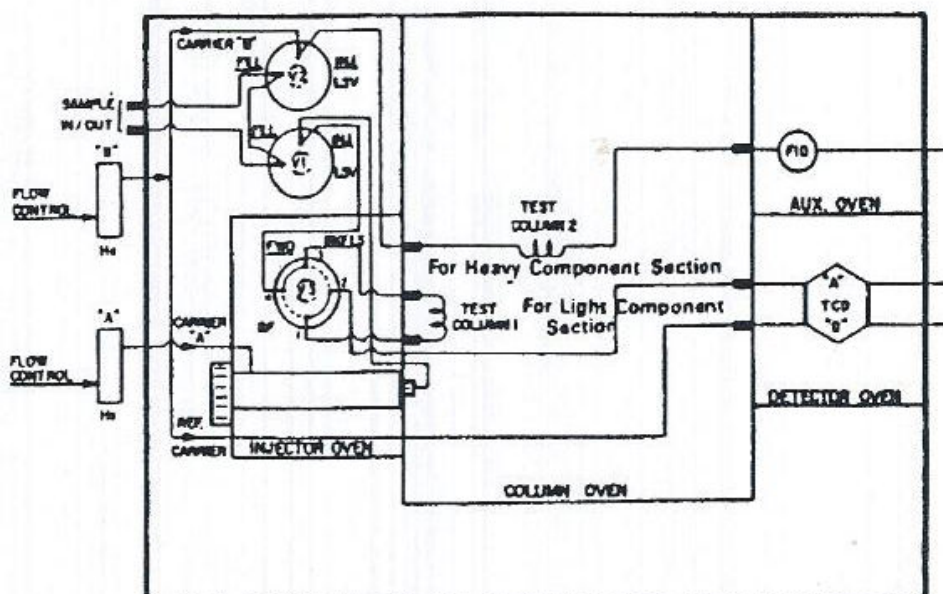


Figure 1 – Possible Valve, Column and Detector Configuration for a single instrument performing the GPA 2186 Analysis

2.3 An electronic integrator/computer data station is utilized to provide peak area information and to perform calculations. Individual component peak areas of the unknown sample are mathematically compared to peak areas of corresponding components in a known reference standard (or standards).

2.4 The GPA 2177 analysis and the GPA 2186 analysis are then used to calculate the weight, mole and liquid volume percent of each component using one of the calculation procedures (allocation or bridging).

2.4.1 The allocation and bridging calculation procedures differ only in the way the weight percent of the hexanes plus components are calculated. GPA studies have shown that, when performed correctly, both procedures produce final results that are essentially identical.

Note 1: The term “C_n” is used in this document. The subscript “n” refers to the carbon number of the largest hydrocarbon molecule expected in the sample. For example, if dodecane (C₁₂) is the largest hydrocarbon molecule, then “n” would be “12”.

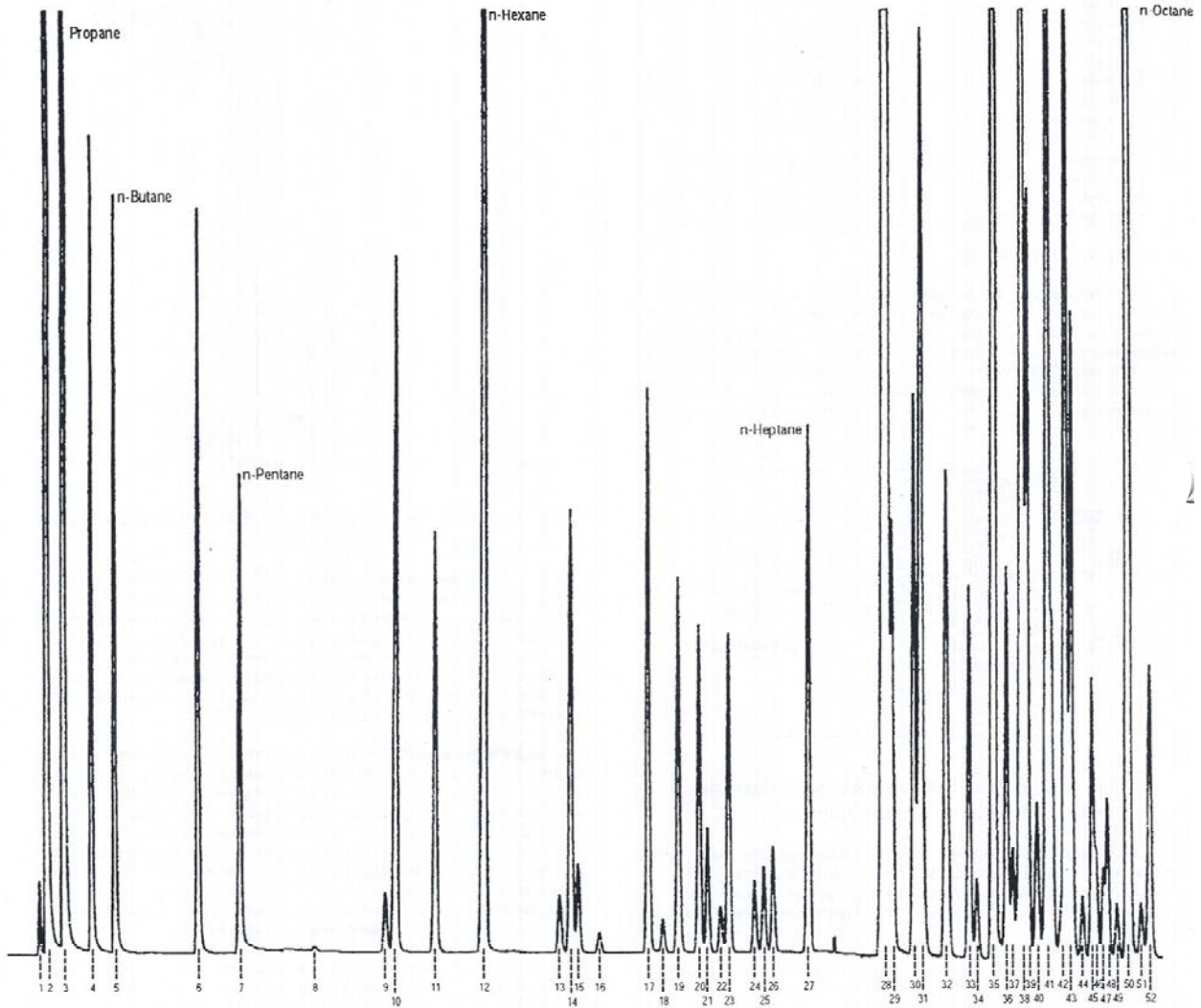


Figure 2A – Chromatogram of Natural Gas Liquid Blend Using a Capillary Column