



CODE BULLETIN C-57

American Chemistry Council Product Approval Code of Practice December 2010 Edition

**To: Practitioners of the American Chemistry Council
Product Approval Code of Practice and Interested Parties**

**Original
Issue date: November 3, 2017**

**Effective
Date: December 3, 2017**

**Re: Appendix H and I Revisions – Inclusion of the Sequence VIF and IX
Product Approval Code of Practice – December 2010 Edition**

The American Chemistry Council's (ACC) Product Approval Protocol Task Group (PAPTG) reached consensus to revise Appendix H and Appendix I for the purpose of accepting the Sequence VIF and the Sequence IX into the ACC Product Approval Code of Practice Appendix H specific guidelines and Appendix I guidelines. Existing text and proposed edits to Appendix H and Appendix I are provided below.

Existing Text on Page H-1 through H-3

General Guidelines

Guidelines for minor formulation modifications allow the formulator to make small adjustments in the candidate formulation during the conduct of a test program so that a failed test(s) does not force discarding passing results for previously run test types. Such minor modifications are made with the intent that they result in a discernible improvement in performance. Minor formulation modifications made during the conduct of a Program are based on fundamental formulation knowledge and can include but are not limited to those modifications described in "Guidelines for Specific Engine tests."

If minor formulation modifications are used during the conduct of an engine test program, such minor modifications are permitted with the expectation that the final formulation contain all modifications and will pass all the engine and chemical & physical tests required by the performance claim. Supporting data will be required to ensure that minor modifications will not deteriorate performance in tests previously passed.

All minor modifications and support data will be disclosed to and agreed to by the customer and included in the Candidate Data Package (Appendix E).

The General Guidelines for minor modifications apply to all of the tests accepted into the

ACC Code of Practice. Specific guidelines are provided for the following engine test Sequences IIIF, IIIG, IIIH, IVA, VG, VIB, VID, VIE and VIII and are listed in the section titled “Guidelines for Specific Engine Tests”.

Guidelines for Specific Engine Tests

The numbered guidelines listed here are applicable only to Sequence IIIF, IIIG, IIIH, IVA, VG, VIB, VID, VIE and VIII engine tests. Specific tests have been included in these guidelines based on a thorough review by the Minor Formulation Modification Working Group and acceptance by the Petroleum Additives Product Approval Protocol Task Group. These tests have been judged to respond either beneficially or without harm to formulation changes allowed by the numbered guidelines. This judgment is based on collective internal company data, previous generation tests and on basic formulation knowledge.

No guideline is driven by individual company data.

New tests may be considered for inclusion in these Specific Guidelines if:

- The test has been added to a new or revised API Category
- The engine test has been accepted into the Code of

Practice Engine tests may be considered for removal from these Specific guidelines if:

- The test becomes obsolete or is removed from the COP
- Changes in test hardware or procedures indicate that the engine test no longer responds to changes in additive chemistry

Common industry terminology is used to describe ingredients in the candidate formulation impacted by the numbered guidelines.

Additive treatment levels in the following guidelines are in percent mass. Major components are those included as part of the performance additive package at a treatment level of >1.0% in the formulation to be tested. Decrease in the treatment level of components of the performance additive package other than for rebalances (Guidelines 5 and 6), is not allowed. All modifications are relative except those that are noted as absolute. Definitions for Level 1 and Level 2 support are found in Tab 1.

1. An increase in the treatment level of the performance additive package, exclusive of viscosity modifier and pour point depressant, is acceptable.
 - a) $\leq 20\%$ with Level 1 support.
 - b) $> 20\%$ to $\leq 30\%$ with Level 2 support.
2. An increase in the treatment level of a single component of the performance additive package present at greater than 1.0% (major component) in the formulation to be tested is acceptable:
 - a) $\leq 20\%$ with Level 1 support.
 - b) $> 20\%$ to $\leq 30\%$ with Level 2 support.
3. An increase in the treatment level of a single component of the performance additive package present at 1.0% or less in the formulation to be tested is acceptable:



- a) $\leq 0.3\%$ $\leq 100\%$ with Level 1 support; $> 100\%$ to 200% (maximum 0.6% in formulation to be tested) with Level 2 support.
 - b) $> 0.3\%$ to $\leq 0.6\%$ $\leq 50\%$ with Level 1 support; $> 50\%$ to 100% with Level 2 support.
 - c) $> 0.6\%$ to $\leq 1\%$ $\leq 30\%$ with Level 1 support; $> 30\%$ to 100% (maximum 1.3% in formulation to be tested) with Level 2 support).
4. With Level 2 support, one new component not present in the original formulation may be added. The new component may not exceed 10% of the total performance additive package (original package plus added component).
5. Variations in zinc dithiophosphate (ZDP) type and treatment level are acceptable changes with appropriate Level 1 or Level 2 support.
- a) Rebalance among zinc dithiophosphate (ZDP) is allowed while maintaining a constant formulation phosphorus level with Level 2 Support. This may include introduction of a new ZDP; only one new ZDP introduction is allowed. Such a rebalance counts as one minor modification. Only one ZDP rebalance is allowed.
 - b) An increase in treatment level of zinc dithiophosphate (ZDP), in a formulation where the phosphorus level from ZDP is greater than 0.04% , up to a maximum of 0.12% phosphorus from ZDP is acceptable with Level 2 support for the Sequence VIB and/or VID and Level 1 support for all other engine tests. For increases above 0.12% P from ZDP, Level 2 support is required for all engine tests. Alternatively, Guideline H2 or H3 could be used if applicable.
6. A rebalance of metallic detergents is acceptable with Level 2 support provided that the sulfated ash remains constant and the metallic detergent soap is not decreased. For any individual detergent soap type, the increase in soap level is limited to 30% maximum. Only one detergent rebalance is allowed.
- The detergent rebalance may be effected simultaneously with the addition of a new metallic detergent component in line with the requirements of Guideline 4. In the specific instance where the soap and metal type of the new component are already present in the formulation, the rebalance counts as one modification. In other cases, the simultaneous rebalance/addition counts as two minor modifications.
7. There is a limit to the number of minor modifications allowed during the conduct of a Core Program (see below). This limit applies to Guidelines 1 through 6 only. For Guidelines 1 through 4, if the same minor modification guideline is applied more than once and the sum falls within the guideline parameters, this is considered to be only one minor modification. The sum of all modifications shall not result in an increase in treatment level of any major component of the performance additive package of greater than 30%.
- a) When using a non-matrix approach, no more than three minor modifications, made either individually or simultaneously, may be incorporated in the core dataset.
 - b) When using a matrix approach, a maximum of four minor modifications may be used.
8. Base stock ratio and viscosity modifier treatment level (not type) are acceptable changes with Level 1 support.
- a) A 15% absolute change in base stock ratio within the same base stock slate (+ or - 15% compared to the wt. % of the base oil blend) is allowed with Level 1 support. This change can include the addition of a new base stock cut that is part of the original base



- stock slate.
- b) If a new base stock is added and is in a different base stock slate and that slate is either API Group I, Group II, Group III or Group IV the change is limited to a maximum of 10% of the formulation (the finished blend of base stocks and additives).
 - c) Viscosity modifier (either dispersant or non-dispersant type) treatment level may change no more than 15% relative to its treat rate.
["Type" means a specific molecular structure with a specific shear stability characterized by a specific trade name, stock or code number.]
 - d) Base stock ratio and/or viscosity modifier level changes greater than those cited above in 8a, 8b or 8c are allowed with Level 1 support as permitted by the API BOI/VGRA guidelines as defined in API 1509 for a given test.
9. Variations in pour point depressant and/or foam inhibitor type or treatment level are acceptable changes with Level 1 support. When changing foam inhibitor type or treatment level in the Caterpillar engine Oil Aeration Test (COAT), Level 1 support alone is not adequate; fundamental formulation knowledge support must exist to ensure performance is not deteriorated in this test.
10. The performance additive package commercialized for sale must include all permitted minor modifications in accord with Guideline 7. The package plus any other minor modifications made under Guidelines 8 and 9 define the final formulation.

Proposed Text on Page H-1 through H-3

General Guidelines

Guidelines for minor formulation modifications allow the formulator to make small adjustments in the candidate formulation during the conduct of a test program so that a failed test(s) does not force discarding passing results for previously run test types. Such minor modifications are made with the intent that they result in a discernible improvement in performance. Minor formulation modifications made during the conduct of a Program are based on fundamental formulation knowledge and can include but are not limited to those modifications described in "Guidelines for Specific Engine tests."

If minor formulation modifications are used during the conduct of an engine test program, such minor modifications are permitted with the expectation that the final formulation contain all modifications and will pass all the engine and chemical & physical tests required by the performance claim. Supporting data will be required to ensure that minor modifications will not deteriorate performance in tests previously passed.

All minor modifications and support data will be disclosed to and agreed to by the customer and included in the Candidate Data Package (Appendix E).

The General Guidelines for minor modifications apply to all of the tests accepted into the ACC Code of Practice. Specific guidelines are provided for the following engine test Sequences IIIF, IIIG, IIIH, IVA, VG, VIB, VID, VIE, **VIF**, VIII, **and IX** and are listed in the section titled "Guidelines for Specific Engine Tests".

Guidelines for Specific Engine Tests

The numbered guidelines listed here are applicable only to Sequence IIIF, IIIG, IIIH, IVA, VG, VIB, VID, VIE, **VIF**, VIII **and IX** engine tests. **Guideline 11 must be consulted when applying these guidelines to the Sequence IX test as indicated by footnote 1 in this section.** Specific tests have been included in these guidelines based on a thorough review by the Minor Formulation



Modification Working Group and acceptance by the Petroleum Additives Product Approval Protocol Task Group. These tests have been judged to respond either beneficially or without harm to formulation changes allowed by the numbered guidelines. This judgment is based on collective internal company data, previous generation tests and on basic formulation knowledge.

No guideline is driven by individual company data.

New tests may be considered for inclusion in these Specific Guidelines if:

- The test has been added to a new or revised API Category
- The engine test has been accepted into the Code of

Practice Engine tests may be considered for removal from these Specific guidelines if:

- The test becomes obsolete or is removed from the COP
- Changes in test hardware or procedures indicate that the engine test no longer responds to changes in additive chemistry

Common industry terminology is used to describe ingredients in the candidate formulation impacted by the numbered guidelines.

Additive treatment levels in the following guidelines are in percent mass. Major components are those included as part of the performance additive package at a treatment level of >1.0% in the formulation to be tested. Decrease in the treatment level of components of the performance additive package other than for rebalances (Guidelines 5 and 6), is not allowed. All modifications are relative except those that are noted as absolute. Definitions for Level 1 and Level 2 support are found in Tab 1.

1. An increase in the treatment level of the performance additive package, exclusive of viscosity modifier and pour point depressant, is acceptable.
 - a) $\leq 20\%$ with Level 1 support¹.
 - b) $> 20\%$ to $\leq 30\%$ with Level 2 support.
2. An increase in the treatment level of a single component of the performance additive package present at greater than 1.0% (major component) in the formulation to be tested is acceptable:
 - a) $\leq 20\%$ with Level 1 support¹.
 - b) $> 20\%$ to $\leq 30\%$ with Level 2 support.
3. An increase in the treatment level of a single component of the performance additive package present at 1.0% or less in the formulation to be tested is acceptable:
 - a) $\leq 0.3\%$ $\leq 100\%$ with Level 1 support¹; $> 100\%$ to 200% (maximum 0.6% in formulation to be tested) with Level 2 support.
 - b) $> 0.3\%$ to $\leq 0.6\%$ $\leq 50\%$ with Level 1 support¹; $> 50\%$ to 100% with Level 2 support.
 - c) $> 0.6\%$ to $\leq 1\%$ $\leq 30\%$ with Level 1 support¹; $> 30\%$ to 100% (maximum 1.3% in formulation to be tested) with Level 2 support).

Footnote:

1. See guideline 11 for the Sequence IX test



4. With Level 2 support, one new component not present in the original formulation may be added. The new component may not exceed 10% of the total performance additive package (original package plus added component).
5. Variations in zinc dithiophosphate (ZDP) type and treatment level are acceptable changes with appropriate Level 1 or Level 2 support.
 - a) Rebalance among zinc dithiophosphate (ZDP) is allowed while maintaining a constant formulation phosphorus level with Level 2 Support. This may include introduction of a new ZDP; only one new ZDP introduction is allowed. Such a rebalance counts as one minor modification. Only one ZDP rebalance is allowed.
 - b) An increase in treatment level of zinc dithiophosphate (ZDP), in a formulation where the phosphorus level from ZDP is greater than 0.04%, up to a maximum of 0.12% phosphorus from ZDP is acceptable with Level 2 support for the Sequence VIB, VID, **VIE and/or VIF** and Level 1 support for all other engine tests. For increases above 0.12% P from ZDP, Level 2 support is required for all engine tests. Alternatively, Guideline H2 or H3 could be used if applicable.
6. A rebalance of metallic detergents is acceptable with Level 2 support provided that the sulfated ash remains constant and the metallic detergent soap is not decreased. For any individual detergent soap type, the increase in soap level is limited to 30% maximum. Only one detergent rebalance is allowed.

The detergent rebalance may be effected simultaneously with the addition of a new metallic detergent component in line with the requirements of Guideline 4. In the specific instance where the soap and metal type of the new component are already present in the formulation, the rebalance counts as one modification. In other cases, the simultaneous rebalance/addition counts as two minor modifications.

7. There is a limit to the number of minor modifications allowed during the conduct of a Core Program (see below). This limit applies to Guidelines 1 through 6 only. For Guidelines 1 through 4, if the same minor modification guideline is applied more than once and the sum falls within the guideline parameters, this is considered to be only one minor modification. The sum of all modifications shall not result in an increase in treatment level of any major component of the performance additive package of greater than 30%.
 - a) When using a non-matrix approach, no more than three minor modifications, made either individually or simultaneously, may be incorporated in the core dataset.
 - b) When using a matrix approach, a maximum of four minor modifications may be used.
8. Base stock ratio and viscosity modifier treatment level (not type) are acceptable changes with Level 1 support.
 - a) A 15% absolute change in base stock ratio within the same base stock slate (+ or - 15% compared to the wt. % of the base oil blend) is allowed with Level 1 support. This change can include the addition of a new base stock cut that is part of the original base stock slate.
 - b) If a new base stock is added and is in a different base stock slate and that slate is either API Group I, Group II, Group III or Group IV the change is limited to a maximum of 10% of the formulation (the finished blend of base stocks and additives).
 - c) Viscosity modifier (either dispersant or non-dispersant type) treatment level may change no more than 15% relative to its treat rate.



["Type" means a specific molecular structure with a specific shear stability characterized by a specific trade name, stock or code number.]

- d) Base stock ratio and/or viscosity modifier level changes greater than those cited above in 8a, 8b or 8c are allowed with Level 1 support as permitted by the API BOI/VGRA guidelines as defined in API 1509 for a given test.
9. Variations in pour point depressant and/or foam inhibitor type or treatment level are acceptable changes with Level 1 support. When changing foam inhibitor type or treatment level in the Caterpillar engine Oil Aeration Test (COAT), Level 1 support alone is not adequate; fundamental formulation knowledge support must exist to ensure performance is not deteriorated in this test.
10. The performance additive package commercialized for sale must include all permitted minor modifications in accord with Guideline 7. The package plus any other minor modifications made under Guidelines 8 and 9 define the final formulation.
11. Guidelines 1 through 6 can be used with the Sequence IX test, however, all modifications which involve a metallic detergent (e.g. performance additive package treat rate increase, metallic detergent increase, metallic detergent rebalance, or new metallic detergent introduction) requires Level 2 support for the Sequence IX .



Existing Text on Page I-1

Purpose

Program Guidelines are provided to promote cost effective testing when developing programs built on existing Core Data Sets developed under the ACC Code. Supporting data are required to ensure that any modifications made to the formulation will not deteriorate performance in tests previously passed. Engine test data are required to support any booster attributes, and Level 2 support, where applicable, (see Tab 1) must exist for all other test types. In the absence of Level 2 support, the actual engine tests must be run. Information should be included in the candidate data package specifying those guidelines utilized and the performance represented for each oil grade.

- 1) An increase in treatment level of the total performance additive package, exclusive of viscosity modifier and pour point depressant, of <20% is acceptable with Level 1 support. Additives already present or additives which were not present in the original tested formulation may be used as boosters to the system such as for TBN, performance, fuel economy, etc. The amount of the resultant up-treat is not restricted. Engine test data are required to support any booster attributes, and Level 2 support must exist for all other test types. In the absence of Level 2 support, the actual engine tests must be run.

Proposed Text on Page I-1

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- 1) **a)** An increase in treatment level of the total performance additive package, exclusive of viscosity modifier and pour point depressant, of <20% is acceptable with Level 1 support, **except for the Sequence IX which requires Level 2 support.**
b) Additives already present or additives which were not present in the original tested formulation may be used as boosters to the system such as for TBN, performance, fuel economy, etc. The amount of the resultant up-treat is not restricted. Engine test data are required to support any booster attributes, and Level 2 support must exist for all other test types. In the absence of Level 2 support, the actual engine tests must be run.

The Code is available online at <http://www.americanchemistry.com/paptg>. Comments to this Code Bulletin (C-57) should be sent to the PAPTG Manager, [W.D. \(Doug\) Anderson](#) prior to December 3, 2017.

