Production, testing and compaction details for use in NY State

This document gives some guidelines to help Cecabase RT user to find the best conditions to produce and apply warm mix asphalt. All cases can’t be covered with such a document and discussion with a representative in order to amend this document is recommended if conditions of use that are not disclosed in this document are under consideration.

**General Information**

Cecabase RT is a surfactant type, water free additive used to produce Warm mix asphalt. Mixed in the binder prior to contact with the aggregates, Cecabase RT enables to reduce production, lay down and compaction temperature by up to 40ºC (70ºF), keeping properties of the final mix at least equal to standard Hot Mix Asphalt.

Cecabase RT can be added in the binder wherever it is convenient: in storage tank, in the trailer or in the binder injection line before the mixer at the production plant. It is readily soluble in Asphalt binder and doesn’t require premix. Standard dosage rate is between 0.2 and 0.5% based on binder weight (4 to 10 lbs per ton of binder).

**At the PG binder primary source**

**Blending**

There is no need for special or complicated equipment to mix the additive with the binder at the liquid asphalt terminal. There are mainly two options to blend it there:

- *Blending in the storage tank*: One just need a mean to measure weight of asphalt binder that is in the tank and then an equipment to insure that the right amount of additive is introduced in the tank. Capability of the equipment required is a function of tank size. 5% error on the amount of additive added can be accepted without any risk for the properties of the mix. Providing for the right amount of additive can be done on a weight base (recording weight loss of the drum during introduction) or on a volumetric base using 8.3 lbs/gal as a conversion factor (pump with volumetric flowmeter).
  A convenient way to introduce and mix simultaneously the additive in the binder tank is to introduce it in the recirculation loop with the recirculation pump on. If the additive is added directly in the tank, then an agitation is needed to help blending quicker (one or two hours of standard agitation is sufficient to insure good blending). If there is no agitator in the tank, then 2 hours of recirculation are required to complete blending of the additive with the binder.

- *Blending in the trailer before delivery to the user*: It can be done by in-line injection in the transfer line or directly in the trailer through the manhole. In all cases, one need to know the binder weight loaded in the trailer to define the quantity of additive to be added. Providing for the right amount of additive can be done on a weight base (recording weight loss of the drum during introduction...
introduction or weighing what is added) or on a volumetric base using 8.3 lbs/gal as a conversion factor (pump with volumetric flowmeter or use of a calibrated bucket). Agitation during hauling is enough to ensure good mixing, there is no need for additional agitation before use.

**Handling:**

Like most of the chemicals used in paving industry, Cecabase RT is a hazardous material and must be handled cautiously with all adequate safety equipment (gloves, goggles, long sleeves...) to avoid chemical burns in case of contact. However, when used with recommended dosage, this product doesn’t change the binder classification regarding health and safety regulation.

**Storage:**

The PG binder containing the additive should be stored at the temperature required normally for the grade used.

Cecabase RT is stable in Hot Asphalt binder (320ºF) for up to 7 days. If a longer storage is necessary, discussion with representative is required as it could be necessary to make some adaptation in dosage.

Cecabase RT is stable for months (even years) when stored at room temperature in its closed original packaging.

Even if it doesn’t cause any deterioration of the product, it is better to avoid submitting Cecabase RT to very low temperature (below -10ºC or 14ºF) as it can cause partial crystallization. If it happens, product would just need to be heated and homogenized before being used.

**Dosage:**

Cecabase RT is used between 0.2% and 0.5% based on asphalt binder weight. Binder stiffness, amount of RAP and moisture sensitivity of the mix (TSR results) should be taken into account for determination of the optimal dosage.

Recommended dosage rate is 0.3% by total weight of Asphalt binder for a mix containing up to 10% RAP and 0.4% when 15% or more RAP are used.

Cecabase RT dosage has to be calculated on total asphalt binder weight. That means that binder content of the RAP must be taken into account. For example, if total binder content of the design is 5.6% (ie 112 lb / t of mix) and 15% RAP @ 3.5% binder content is used, that means that RAP binder contributed to 10.5 lb per ton of mix. We need then to add only 101.5 lb of Virgin binder per ton of mix. As Cecabase RT needs to be added at 0.4% based on Total binder, we need finally 0.44% of Cecabase RT in the virgin binder to take RAP binder into account.

As Cecabase RT presents also some anti-strip properties, when minimum TSR value is required, additive dosage should be adapted to fulfill this requirement. If TSR minimum requirement can’t be achieved with 0.5% Cecabase RT, additional standard liquid anti-strip can be used (even though Cecabase RT is compatible with most of the liquid anti-strip sold on the american market, discussion with representative is recommended to check compatibility).
At the HMA producers facility

Additive pre-blended into PG Binder

Storage and handling:
No changes are required concerning storage and handling compared to what would be done with the same PG binder without additive.
It is just necessary to take care of the storage time of the binder containing the additive. Cecabase RT is stable in Hot Asphalt binder (320°F) for up to 7 days. If a longer storage is necessary, discussion with representative is required as it could be necessary to make some adaptation in dosage.

Dosage:
Concerning determination of dosage when ordering pre-blended PG binder, the following parameters should be taken into account:

Cecabase RT is used between 0.2% and 0.5% based on asphalt binder weight. Binder stiffness, amount of RAP and moisture sensitivity of the mix (TSR results) should be taken into account for determination of the optimal dosage.

Recommended dosage rate is 0.3% by total weight of Asphalt binder for a mix containing up to 10% RAP and 0.4% when 15% or more RAP are used. Cecabase RT dosage has to be calculated on total asphalt binder weight. That means that binder content of the RAP must be taken into account. For example, if total binder content of the design is 5.6% (ie 112 lb / t of mix) and 15% RAP @ 3.5% binder content is used, that means that RAP binder contributed to 10.5 lb per ton of mix. We need then to add only 101.5 lb of Virgin binder per ton of mix. As Cecabase RT needs to be added at 0.4% based on Total binder, we need finally 0.44% of Cecabase RT in the virgin binder to take RAP binder into account.

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If something unexpected occurs during the production that would require a change in additive dosage, two types of situation should be considered:
- Amount of additive in the binder is superior to what it should be considering the new mix formula (ex: no RAP due to RAP belt break-down): There is no technical adverse effect of such excess dosage and contractor can even try to drop production temperature down by 10°F, as the situation is now much easier than what was expected (no RAP and more additive).
- Amount of additive in the binder is inferior to what it should be considering the new mix formula (ex: Pre-blended binder has been ordered for a job without RAP and contractor want to use the remaining binder in the tank with RAP): Some additive can be added in the tank at the plant to raise the dosage to what it should be (allowing 2 hours of recirculation or agitation to homogenize
the new mixture) or binder can be used as it is but with an intermediate mix
temperature between standard hot mix and warm mix.

Mixing temperature:
Recommended plant production temperatures range is 240°F to 260°F for standard
WMA with less than 20% RAP and 260°F to 270°F for WMA with stiff asphalt
(polymer modified, rubberised) or high RAP content.
It represents generally a drop of 70°F from the HMA standard mixture.

Additive blended into the PG Binder at the HMA plant

Handling of the additive:
Like most of the chemicals used in paving industry, Cecabase RT is a hazardous
material and must be handled cautiously with all adequate safety equipment (gloves,
goggles, long sleeves...) to avoid chemical burns in case of contact. However, when
used with recommended dosage, this product doesn't change the binder
classification regarding health and safety regulation.

Storage of the additive:
Cecabase RT is stable for months (even years) when stored at room temperature in
its closed original packaging.
Even if it doesn’t cause any deterioration of the product, it is better to avoid
submitting Cecabase RT to very low temperature (below -10°C or 14°F) as it can
cause partial crystallization. If it happens, product would just need to be heated and
homogenized before being used.

Blending of the additive in the PG binder:
There is no difference if it is a batch plant or a drum plant because the additive is
introduced in the binder prior to the mixing step.
There are different ways of getting the additive in the binder at the mix plant, mix
producer can chose whatever is more convenient and best corresponds to the
equipment available:

- In-line injection in binder supply line: This is the most convenient way to get
  the additive in the binder when one want to be able to switch easily from HMA
to WMA and vice versa. It is also a good way to process when one wants to be
able to change rapidly the dosage if mix production conditions change. But it is
also the way that requires the most complicated equipment as one need a
calibrated metering servopump linked to the binder flowrate. Considering
standard additive dosage and mix production rate around 200 t/h, pump must
be able to deliver precisely between 0.1 and 0.2 gpm. Liquid anti-strip
metering pump are particularly suited for this application. There is no need for
a static mixer in the binder line after injection point and no minimum pipe
length is required before the drum (or pug mill). For drum plant running at fixed
production rate, a simple calibrated metering pump can be used instead of a
servopump linked to the binder flowrate.

- In-line injection during transfer of the binder from trailer to plant tank: This can
  be easily done using any pump or Venturi device. Knowing the total amount of
  binder that is transferred from the trailer, one just need to calculate the total
amount of additive to be introduced. The amount introduced can be measured by using any weighing or volume measuring device. Once everything is transferred in the tank, mixture must be agitated for one to two hours or recirculated if tank is not equipped with an agitator.

- **Introduction in the tank**: This is the easiest way to do and the one that required less equipment. One just need a mean to measure how much weight of asphalt binder is in the tank (can be known from record of delivery) and then an equipment to insure that the right amount of additive is introduced in the tank. A balance is generally the most accurate way to measure it and capability of the equipment required is a function of tank size and range of weight to measure (depends if one measure the weight loss of a 55 gal drum or the weight of the 3 gal bucket used to transfer product). 5% error on the amount of additive added can be accepted without any risk for the properties of the mix. Providing for the right amount of additive can be done on a weight base (recording weight loss of the drum during introduction or weighing what is added) or on a volumetric base using 8.3 lbs/gal as a conversion factor (pump with volumetric flowmeter or use of a calibrated bucket). A convenient way to introduce and mix simultaneously the additive in the binder tank is to introduce it in the recirculation loop with the recirculation pump on. If the additive is added directly in the tank, then an agitation is needed to help blending quicker (one or two hours of standard agitation is sufficient to insure good blending). If there is no agitator in the tank, then 2 hours of recirculation are required to complete blending of the additive with the binder.

For recordation of additive dosage rate required by NYSDOT, calibration certificate of equipment used should be the guaranty when in line injection during production is used. For all other ways of getting the additive in the PG binder, recording of weight of Binder and weight (or volume) of Cecabase RT added should be enough to guaranty the dosage rate used.

**Dosage**:

Cecabase RT is used between 0.2% and 0.5% based on asphalt binder weight. Binder stiffness, amount of RAP and moisture sensitivity of the mix (TSR results) should be taken into account for determination of the optimal dosage.

Recommended dosage rate is 0.3% by total weight of Asphalt binder for a mix containing up to 10% RAP and 0.4% when 15% or more RAP are used. Cecabase RT dosage has to be calculated on total asphalt binder weight. That means that binder content of the RAP must be taken into account. For example, if total binder content of the design is 5.6% (ie 112 lb / t of mix) and 15% RAP @ 3.5% binder content is used, that means that RAP binder contributed to 10.5 lb per ton of mix. We need then to add only 101.5 lb of Virgin binder per ton of mix. As Cecabase RT needs to be added at 0.4% based on Total binder, we need finally 0.44% of Cecabase RT in the virgin binder to take RAP binder into account.

As Cecabase RT presents also some anti-strip properties, when minimum TSR value is required, additive dosage should be adapted to fulfill this requirement. If TSR minimum requirement can’t be achieved with 0.5% Cecabase RT, additional standard liquid anti-strip can be used (even though Cecabase RT is compatible with most of
the liquid anti-strip sold on the american market, discussion with representative is recommended to check compatibility).

If additive variable in-line injection device is not used and something unexpected occurs during the production that would require a change in additive dosage, two types of situation should be considered:

- Amount of additive in the binder is superior to what it should be considering the new mix formula (ex: no RAP due to RAP belt break-down): There is no technical adverse effect of such excess dosage. Contractor can even try to lower production temperature by 10°F, as the situation is now much easier than what was expected (no RAP and more additive).

- Amount of additive in the binder is inferior to what it should be considering the new mix formula (ex: Binder has been prepared for a job without RAP and contractor want to use the remaining binder in the tank with RAP): Some additive can be added in the tank at the plant to raise the dosage to what it should be (allowing 2 hours of recirculation or agitation to homogenize the new mixture) or binder can be used as it is but with an intermediate mix temperature between standard hot mix and warm mix.

**Mixing temperature:**
Recommended plant production temperatures range is 240°F to 260°F for standard WMA with less than 20% RAP and 260°F to 270°F for WMA with stiff asphalt (polymer modified, rubberized) or high RAP content. It represents generally a drop of 70°F from the HMA standard mixture.

**Mixture design and QC/QA testing requirements**
Mix design and QC/QA testing should be done the same way as for a hot mix. Same rules and operating procedures as those used for Hot Mix must be followed. Only mixing temperature and compaction temperature are different and should be representative of real operating temperatures. A temperature drop of 20°F from the mixing temperature should be considered for setting compaction temperature for laboratory specimens. Asphalt mix containing Cecabase RT can be cooled and reheated without loss of additive effect.

**Information for the contractors (laydown crews)**

**Hauling:**
Asphalt warm mix with Cecabase RT arrives generally on the field at temperature between 10 and 40°F less than the Mixing temperature depending on hauling time. Cooling rate is lower with WMA starting from 250°F than with HMA starting at 300°F or over. A drop of 20°F is generally observed during first hour of hauling and then 12°F/h for remaining hauling time.

**Laydown and compaction:**
For guidance, temperature over 230°F for laydown and 210°F for breakdown can be considered totally safe for a mix with less than 20% RAP. For mix with 20% RAP and more, these temperatures should be raised to 250°F for laydown and 230°F for breakdown.
However, working below these temperatures is possible but requires more care for laydown and more energy for compaction. In many cases, we have observed acceptable compactability of the WMA with Cecabase RT at 190°F. WMA is always a bit stiffer for handwork than HMA. If a lot of handwork is forecast on a project, it is recommended to produce 10°F hotter than one would do for a standard paver job with WMA.

**Miscellaneous:**

Rules for returning traffic to the road or placing a second lift on top of the first should be considered the same as those used for HMA.

Mixes produced with Cecabase RT are known to be particularly non sticky to metallic equipment and clean up of equipment is generally easier and shorter than with HMA.