

350 CEMENT CONCRETE PAVEMENT SPECIFICATION
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

John Westphal
John.westphal@dot.state.fl.us
850-414-4141

Comments: (Internal 12/4/19)

350-2

For concrete pavement placed using the slip-form method of construction, utilize ~~Cconcrete Class I (Pavement) with a target slump of 2 inches.~~ For concrete pavement placed by hand in constructed forms, utilize ~~Cconcrete Class I with a target slump of 2 or 3 inches for Concrete Class I (Pavement).~~ LOT size for the use of either material shall be as stated in Section 346 for Concrete Class I (Pavement).

Westphal, John
What is the slump tolerance?

350-3.4

Use a monitoring device with a readout display visible to the paver operator and the Engineer while paving. Display all vibrator frequencies with manual or automatic sequencing among all individual vibrators. Record the clock time, station location, paver track speed, and operating frequency of individual vibrators. Provide an electronic record of the data to the Engineer daily for the first 3 days of paving and weekly thereafter. ~~The Engineer may adjust the frequency submission if necessary.~~

Westphal, John
Why might it become necessary? Revise language to put this on the Contractor to request rather than the Engineer to decide.

~~If the electronic monitoring and recording devices fail to operate properly, immediately check the vibrators manually. If the vibrators are functioning properly, paving may continue. Correct the malfunction within 3 days.~~ Mount spud vibrators such that the free tip trails, and space spud vibrators at a maximum interval of 30 inches.

Westphal, John
Suggest deleting. Instead could have backup equipment on standby.

350-12

~~350-11-12 Curing.~~
~~350-11-12.1 General: After completing the finishing operations and as soon as the concrete has hardened sufficiently to not mar the surface, cover and cure the entire surface and, when the slip-form method is used, cover and cure the edges of the newly placed concrete. Do not leave freshly placed concrete exposed for in accordance with one or more than of the methods described below. In cases where curing requires the use of water, ensure that curing has prior~~

Westphal, John
Suggest making this a requirement under 350-12.2 such as "Apply curing compound within 30 minutes of placement."

Response: Change was made prior to Industry review.

Action: No changes needed.

Anath Prasad
aprasad@ftba.com
850-942-1404

Comments: (12/9/19 Internal)

Delivery ticket requirement from Spec 346 requires a batch plant operator signature on each ticket. This is impractical and quite dangerous to pull off in execution. Our plant operators generate a ticket for each load that the truck drivers can pull off a printer box through their cab windows without plant personnel or driver ever having to be on foot around the mixer and all the truck traffic. The activity and production levels at a paving plant are much higher than any ready-mix plant. What we have been doing on all our FDOT projects over the last 4 years or so is delivering a copy of each delivery ticket that was delivered to the CEI testers on the grade at the end of each paving day along with an affidavit listing all the daily ticket numbers along with the signature of the plant operator attesting to the accuracy and conformance of each load represented by a ticket. This system has worked well and safely for both sides.

Response: Change was made prior to Industry review.

Action: No changes needed.

Section 350-13.6 is impractical and a waste of money in my view. I have argued this in the RPC previously. In addition to conflicting evidence that dirt and other fine materials that may get into sawed joints actually causing joints to crack or spall, I think this wording is too open-ended and will cause frenetic and inexperienced CEI personnel to require all joints to have backer rod installed even for light duty traffic such as foreman, project manager, and CEI pickup trucks that typically ride the pavements prior to grinding and sealing. What damages joints is small stone materials sitting on the joint and being run over by heavy traffic, and especially steel drum rollers (asphalt guys). This requirement should be only for opening the pavement to public traffic and the use of the new pavement by heavy construction traffic and trucking prior to final grinding and sealing. As written, I can envision that basically every sizable piece of concrete pavement will have to have backer rod installed for a temporary period. I don't think the evidence is there to require this.

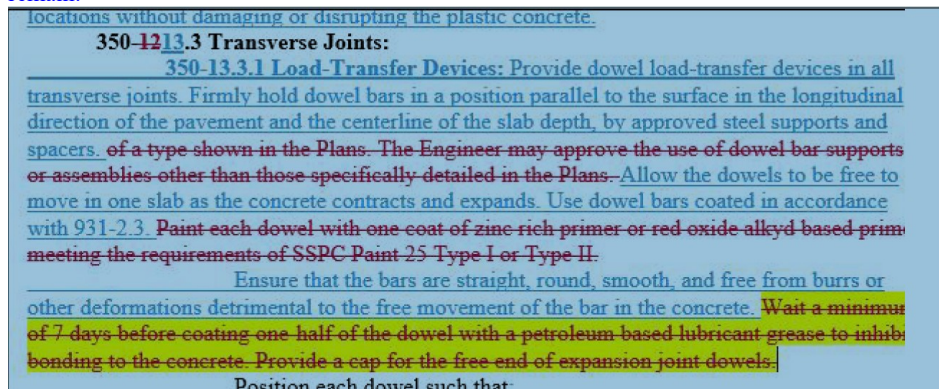
Response: Change was made prior to Industry review.

Action: No changes needed.

Richard Hewitt
Richard.Hewitt@dot.state.fl.us
386-943-5305

Comments: (12/9/19 Internal)

In 350-13.3.1 Load Transfer Devices, they are proposing to eliminate the Spec language that requires greasing (lubricating) half of each dowel bar. I recommend we allow that requirement to remain. My reasoning is that it is important for the slabs to be able to expand and contract independent of one another and greasing the dowel bars helps ensure this occurs. There are other requirements regarding bar alignment that also helps, but greasing half the bar ensures only one half of the bar could possibly be constrained in a slab while the other end is free to move. Please see the screenshot below, I believe the Spec language they are proposing to delete (that I have highlighted in yellow) should not be deleted from the Specifications, this language should remain.



Response: We concur with Rich's comments below to keep the highlighted / strike though language in the proposed specification. Change was made prior to Industry review.

Action: No changes needed.

Dan Hurtado
Dan.hurtado@dot.state.fl.us
850-414-5203

Comments: (12/3/19 Internal)

350-2: "Notify the Engineer if any of the component quantities are adjusted. If any material sources change, resubmit the mix design to the Engineer for approval prior to use." So, the contractor can adjust the mix design with just a notification to the Engineer but, if he changes sources he has to resubmit for approval? Seems backwards.

350-6: 3rd sentence, strike, "accordance to" The correct wording is "...in lieu of the temperature requirements in Section 346..."

350-9.1: 1st sentence. Change wording to, "Meet the requirements of 346-8..."

350-9.2.2: 1st sentence. Change wording to, "...for each mix design in accordance with 346-8."

350-12.2: 1st paragraph. By capitalizing "The" in "The surfaces to be cured", you've created a sentence with no verb. This paragraph should be one sentence. Strike the period after "Section 925" and make the "t" lower case.

350-13.3.3: 1st sentence. Change wording to, "...in accordance with..."

Response: These have been addressed. Change was made prior to Industry review.

Action: No changes needed.

Name: Roy Arias
3052829272
royarias@concreteservices.net

Comments: (12/19/19 Industry)

350-1 The immediate remove and replace is problematic. The spec should provide an avenue for spall repairs.

Answer: Disagree. The language is appropriate for the contract documents.

Action: No change is needed.

350-2 There should be no need for a target slump. If you are using a concrete paver, you will make sure your concrete is standing. There is a bigger problem with a target slump of 2 or 3 inches for hand paving which sometimes requires higher slump ranges in tight spots, allowing the concrete to get off the chute easier and reach its intended location without using a vibrator.

Answer: Agree.

Action: Specification language was modified as follows:

For concrete pavement placed using the slip-form method of construction, utilize concrete with a target slump of 1.5 inches plus or minus 1 inch. For concrete pavement placed by hand in constructed forms, utilize concrete with a target slump of 3 inches plus or minus 1.5 inches.

350-3 Forms don't need to be mortar tight. This is an unrealistic requirement.

Answer: Disagree. The language is existing specification language and is not part of the proposed change. Any proposed new changes should be part of the existing Specification submittal and review process.

Action: No change is needed.

350-3.4 It should be specified that vibratory monitoring equipment is required when only when using a paver.

Answer: Disagree. The language is existing specification language and is not part of the proposed change. Any proposed new changes should be part of the existing Specification submittal and review process.

Action: No change is needed.

350-3.5 It should be specified that self-propelled curing equipment is required when only when using a paver.

Answer: Agree.

Action: Specification language was added back into this section:

Power-spray equipment may be used to apply curing compound to areas where it is impracticable to operate the self-propelled equipment.

350-10.2.3 It seems spec was changed to broom finish in hand form section. It should give the contractor option of either broom or burlap finish.

Answer: Agree.

Action: Specification language was modified to allow the use of burlap finish.

350-12 Curing: A lot of times the pavement is still too wet to apply cure, or even finish concrete, after 30 minutes. The spec used to read that the cure had to be applied before concrete loses its sheen. 30 minutes is too restrictive and will have an opposite effect of making the curing compound get watered down and not seal.

Answer: Disagree. The language is existing specification language and is not part of the proposed change. Any proposed new changes should be part of the existing Specification submittal and review process.

Action: No change is needed.

350-12.2 Why can't the curing compound be clear? Clear is acceptable in many other concrete applications.

Answer: Disagree. The language is existing specification language and is not part of the proposed change. Any proposed new changes should be part of the existing Specification submittal and review process.

Action: No change is needed.

350-13.2.1 There is no need to require a tie-bar with 90 degree bend. We put in straight bars all the time and eliminate the need for straightening. Contractors should have the option to use either.

Answer: Disagree. The language is existing specification language and is not part of the proposed change. Any proposed new changes should be part of the existing Specification submittal and review process.

Action: No change is needed.

350-13.5.1 It should be clarified that pressure washing is necessary after the final saw cut, not initial saw cut.

Answer: Agree.

Action: Specification language was modified as follows:

350-13.5.1.1 Sawed Joints: Immediately after **the final saw cut**, completely remove the resulting slurry from the joint and the immediate area by flushing with a pressure washer and by using other tools as necessary.

350-13.5.2 I can't understand the practicality of sandblasting 1/4" joints.

Answer: N/A. Specification language was previously deleted.

Action: No changes needed.

Anath Prasad
aprasad@ftba.com
850-942-1404

Comments: (12/17/19 Internal)

350-3.54 Device for Application of Membrane Curing Compound Application Equipment: Provide Use equipment for applying membrane curing compound that is self-propelled and capable of uniformly applying the curing compound at the specified rate. Use mechanical spray equipment that continuously stirs the curing compound, by effective mechanical means. Thoroughly atomize, and that thoroughly atomizes the curing compound during the spraying operation so that the finished surface of the fresh concrete will not be marred. Cover the entire surface of the pavement and, with slip-form type paving, the vertical faces by a single pass of the machine. Only use spray nozzles that are equipped with appropriate wind guards to ensure uniform application.

~~Power spray equipment may be used to apply curing compound to areas where it is impracticable to operate the self-propelled equipment.~~

~~350-3.5 Equipment for Paving Small or Narrow Areas: For variable width areas, other than mainline, ramps, and shoulders, the Engineer will not require the full paving train as specified for the standard run of paving. Use such equipment that is approved by the Engineer.~~

~~350-3.6 Hand Finishing Tools: Provide straightedges that have a blade length of 10 feet. Use long handled floats that have flat blades, approximately 4 feet long by 5 to 8 inches wide, and that are designed so as to remain straight and true. Use a handle for both types of tool with a length that exceeds 1/2 the width of the strip being placed by 3 feet.~~

Commented [RJJ1]: Need to remain for irregular areas or areas not accessible by concrete paving train or clarify how those areas are to be handled.

350-8 Placing Concrete.

350-8.1 Distribution: Place Distribute the concrete to meet on the subgrade to such depth that, when it is consolidated and finished, the slab thickness shown in required by the Plans after consolidation, finishing and grinding will be obtained at all points. The surface will at no point be below the grade specified for the finished surface. Place the concrete on the subgrade in a manner which will require as little rehandling as possible.

~~Place concrete as near to expansion and contraction joint assemblies as possible without disturbing them. Ensure that workers do not walk in the freshly placed concrete is not contaminated with soil their boots or shoes coated with earth or other deleterious substances.~~

Use hand-operated spud-type vibrators to thoroughly consolidate concrete on both sides of all joint assemblies against the faces of forms, and along the full length. Do not allow vibrators to come in contact with joint assemblies, reinforcement, subgrade or side forms.

350-8.2 Use of Spreader: Place concrete on the subgrade by an approved spreading device. Do not place concrete from the discharge bucket or hopper onto an assembly without centering the bucket or hopper directly over the assembly.

~~A spreader is not required in areas where the width of slab varies, intersections, and small or isolated areas where it would be impractical to use a spreader. Perform the necessary hand spreading with shovels (not with rakes or hoes).~~

Commented [RJJ2]: Is the intent to combine 350-8 with 350-7? This is not clear. If so, would the title of 350-7 need to be changed?

Commented [RJJ3]: Considering the paving machine performs vibration, this should be modified to indicate a requirement of "hand operated spud-type vibrators" for non-paving machine or irregular areas. Another solution since this is included in Hand Methods section would be to strike here.

350-11.12.2.2 White-Pigmented Curing Compound: ~~Under this method, U~~ uniformly apply a Type 2 white-pigmented curing compound meeting the requirements of Section 925. to T the surfaces to be cured, including the edges of slip-form produced paving, in a single coat of continuous film, at the minimum rate of 1 gallon per to every 200 ft² square feet, by a mechanical sprayer.

At the time of use During application, thoroughly mix the compound in accordance with the manufacturer's recommendation.

Do not apply curing compound during periods of rainfall. Do not apply curing compound to the inside faces of joints to be sealed. Should the film become damaged from any

Commented [RJJ4]: Not a sentence.

cause within the required curing period, repair the damaged portions immediately with additional compound. If using ~~side~~ forms, upon their removal, immediately coat the sides of the slabs exposed to provide a curing treatment equal to that provided for the surface.

~~350-11.3 Burlap Mats: Thoroughly saturate the mats with water before placing them. Use mats of such dimensions that as laid they extend to at least 2 feet beyond the edges of the strip of concrete placed. Place and weigh down the mats throughout the curing period to ensure contact with the surface being cured. Maintain the mats fully moist and in position for the entire portion of the required curing period.~~

~~350-14~~**15.2 Method of Calculating Average Thickness:** The ~~Department~~ Engineer will determine the average thickness of the pavement by using the following method of calculation:

- ~~1. The Department will not take into account in the calculation, any areas of pavement which are left in place, but for which no payment will be made, will not be taken into account.~~
- ~~2. The specified thickness plus 1/2 inch will be considered in the calculation w~~When the thickness of the pavement is more than 1/2 inch greater than the specified thickness, ~~the Department will consider it in the calculation as the specified thickness plus 1/2 inch.~~
3. The ~~Department will calculate the~~ average thickness for the entire job will be calculate as a unit.

Commented [RJJ5]: Typo.

Response: Change was made prior to Industry review.

Action: No changes needed.

Karen Byram
850-570-7389
Karen.byram@dot.state.fl.us

Comments: (12/30/19 Industry)

In section 350-12.2 Type 2 has been specified. Does this eliminate the use of Type 1?

Answer: Correct. Type 2 is the only product allowed in concrete paving.

Action: No change is needed.

In section 350-13.6 the term Hot-Pour is used. There is no Hot-pour reference in specification 932.

Answer: Correct. Joint Seal from Section 932 is referenced in the materials section of this specification.

Action: No change is needed.

In section 932-1.2 it is called joint Sealer In section 350-13.6 Type A is referred to as (non-self-leveling silicone sealant). This is inconsistent with the 932-1.3.1 which refers to Type A as non-sag.

Answer: Agree.

Action: Reword current specification language to match Section 932.

350-13.6.2 Low Modulus Silicone Sealant: Use low modulus silicone sealant of either Type A **non-sag (non-self-leveling)**,

Name: Sam Joiner
904-803-9408
sjoiner@ajaxpaing.com

Comments: (1/6/20 Industry)

350-2 Does the requirement “Do not place concrete with a slump more than plus or minus 1.5 inches from the target slump value” refer only to hand placement? It should, otherwise a concrete with slump of up to 3.5 inches would be permissible for slipform paving. If this is not revised, advise adding a spec for Edge-Slump, similar to the FAA and USACOE specs.

Answer: Agree.

Action: Specification language was modified as follows:

For concrete pavement placed using the slip-form method of construction, utilize concrete with a target slump of **1.5 inches plus or minus 1 inch**. For concrete pavement placed by hand in constructed forms, utilize concrete with a target slump of 3 inches **plus or minus 1.5 inches**.

350-3.3 Do not specify operating vibrators up to 10,000 vpm. This is unnecessary and will cause over-vibration of the mix and could lead to over-spacing of internal vibrators. As mentioned numerous times, recommend a vibrator operating range of no more than 8,000 vpm.

Answer: Agree.

Action: Specification language was modified, 10,000 VPM was replaced by 8,000 VPM.

350-3.3 Remove “For internal vibrators, set the depth of penetration into mid slab, or as deep as possible while passing above any dowels and dowel baskets”. Internal vibrators are never set at mid slab. Typically internal vibrators are placed in the slipform paver grout box at a depth at, or just below the paver screed pan. Placing at mid slab will displace dowel baskets, cause issues with embedded structures, disturb granular base, and is not needed to achieve full consolidation to the bottom of the slab. Many cores on many projects verifies this.

Answer: Agree.

Action: Specification language was modified as follows:

For internal vibrators, set the depth of penetration **at the paver screed pan or below** while passing above any dowels and dowel baskets. Use an operating position locking device so that no part of the vibrating unit will be in contact with reinforcing steel or tie bars while paving.

350-3.4 Modify “All projects with concrete paving over 50,000 square yards in area, or 600 linear feet in length, must use an electronic vibrator monitoring device”. 50,000 SY and 600 LF are wildly disparate quantities of paving. In fact, any paving close to the 600 LF quantity is likely hand paving. I suggest eliminating the 600 LF requirement and specify only “over 50,000 SY”, or some quantity nominally less than that.

Answer: Agree.

Action: Specification language was modified as follows:

350-3.4 Vibratory Monitoring Equipment: All projects with concrete paving over 15,000 square yards in area, or 1 mile in length, must use an electronic vibrator monitoring device displaying the operating frequency of each individual internal vibrator.

350-6 Modify “1. During the cold weather paving, protect concrete from temperatures below 50°F until the concrete reaches a minimum compressive strength of 1,500 psi.”. Suggest “..., maintain concrete internal temperature above 50 degrees F until concrete reaches a minimum ...”.

Answer: Agree.

Action: Specification language was modified as follows:

350-6 Protection from Weather.

Protect unhardened concrete from effects of inclement weather. Cease production and paving operations in rain. The following will apply during paving in cold and hot weather:

1. During the cold weather paving, do not mix or place concrete when the air temperature is below 40°F. Protect the fresh concrete from freezing in accordance with Section 400 until the concrete reaches a minimum compressive strength of 1,500 psi.

350-7.1 The Placing Concrete verbiage from the former spec has been combined with the General requirements of Placement of Reinforcement. In addition, the added language beginning with “Use hand-operated spud-type vibrators ...” should be eliminated. It doesn’t make much sense and is needlessly over prescriptive.

Answer: Agree.

Action: Specification Subarticle 350-7 was deleted as requested at the Rigid Pavement Committee meeting.

350-13 Section 13.2 and 13.3.3 specify two different dimensions for initial sawcuts, with 13.2 specifying a ¼ inch initial sawcut for longitudinal joints and 13.3.3 specifying a 1/8 inch initial sawcut for transverse contraction joints. The pilot project constructed on I-275 in Hillsborough demonstrated the success of a 1/8 inch initial sawcut and a ¼ inch widening sawcut. Recommend Contractor have option to seal the ¼ inch sawcut or widen and seal a 3/8 inch reservoir. Section 13 needs some general re-work.

Answer: Agree.

Action: Under 350-12.213.2 Longitudinal Joints, the referenced language to 1/4 inch cut was deleted.

350-20.2 We have seen projects where the joints are paid as a pay item, and we have seen projects where the joints are subsidiary to the concrete pavement. Because FDOT and designers are either not clear, or not adept, at designing the best locations for contraction joints, and joint locations invariably need to be adjusted in the field, the proper method of payment for joints is by Pay Item. In projects with a Pay Item for joints, we have seen some Pay Items that include the 3/4 inch expansion joints, such as between pavement slab and curb and gutters, in the Pay Item Quantity and some Pay Items that do not include these joints. FDOT needs to be both accurate and consistent.

Answer: N/A.

Action: No change – this was not part of the proposed Specification 350 changes.

Name: Alan McMillan
386-801-8231
alan.mcmillan@dot.state.fl.us

Comments: (1/15/20 Industry)

Section 350-2, 1st paragraph states "Notify the Engineer if any of the component quantities are adjusted..." There are minor adjustments made to material quantities as a matter of routine batching. Traditionally, they can deviate by a certain percentage depending on the type of material. With this in mind, the current verbiage would seem to indicate that the producers should contact the Engineer for every truck sent out. There does not seem to be any mention of chlorides.

Answer: Disagree – this notification to the Engineer would be for significant adjustments outside of normal batching tolerance specified in the Materials Manual. Concrete pavement is not considered reinforced concrete therefore chloride evaluation is not applicable.

Action: No change is needed.

Section 350-9.1 would seem to indicate that there should be no testing for slump or air. Is this the intent?

Answer: Agree.

Action: Specification language was modified.

Section 350-9.2.2, second paragraph "All QC activities, calculations and inspections will be randomly confirmed by the Engineer." The use of "all" with the phrase "will be" can be interpreted as meaning that Department staff will confirm every activity performed for QC. That is, by definition, not random, and it's probably not feasible with current staffing levels.

Answer: Agree.

Action: Specification language was modified.

Section 350-13.2, third paragraph "Complete sawing as soon as possible but in no case longer than 72 hours after placing the concrete." Longer should be later.

Answer: N/A.

Action: Specification language was removed as requested by the Rigid Pavement Committee.

Section 350-15.2 references "the following method of calculation" but does not include said method of calculation. What follows is three rules concerning the unspecified calculation.

Answer: N/A - Method of calculation is part of the existing specification language.

Action: No change.

Section 350-19 "Acceptance will be based on compressive strength of cylinders at placement in accordance with Section 346 and pavement thickness." Pavement thickness should point to the actual rule in the 350 specification.

Answer: Agree.

Action: Specification language was modified.

