



March 28, 2022

MEMORANDUM: Concrete Mix Design 2022 Construction Season Requirements Memo

Background:

Bureau of Technical Services (BTS) in conjunction with Concrete Pavement Technical Committee (CPTC) performed a major overhaul on the concrete 2022 Standard Specifications for Wisconsin. One of the areas that was revised was in relation to the mix design process/submittal. This change in process was fortunate to coordinate with the incorporation of the new Portland Limestone Cements (PLC). For 2022 projects, there is a requirement to use DT2220 for Combined Aggregate Gradation Mix Designs and DT2221 Optimized Aggregate Gradation Mix Designs.

The DT2220 and DT2221 are newly created forms for 2022 construction. The forms were available in February 2022, after many companies have already been spending months on creating new mix designs incorporating PLC. In addition, since the release of the DT forms, there has been feedback as to improvements that need incorporation. Work is currently underway on the DT2220 and DT2221. The spreadsheets will be posted to Forms website by June 1, 2022 or earlier.

2022 Mix Design Process:

A. Combined Aggregate Gradation Concrete Mix Design Submittal:

- Option 1 – Company Established Gradation Worksheet
 - Complete mix design process using previously company established gradation worksheets for combined gradation.
 - Submit WS5014 Concrete Mix Design Certification
 - Form is located in Pantry at:
 - Pantry → Statewide Forms → WS Forms → Concrete Mix Design WS5014
 - <https://awpkb.dot.wi.gov/Content/constr/Pantry/Pantry.htm>
 - Clarify in QMP plan which items will be accepted by combined gradation.
 - Include documentation requirements of applicable standard specification 715 and/or 716.
- Option 2 – DT2220 Form
 - Complete mix design process using:
 - DT2220 - Concrete Mixture Design – Combined Aggregate Gradation
 - Clarify in QMP plan which items will be accepted by combined gradation.
 - Include documentation requirements of applicable standard specification 715 and/or 716.

B. Optimized Aggregate Gradation Concrete Mix Designs:

- Option 1 – Optimized PCC Spreadsheet Version 4.5
 - This spreadsheet was used last year for Optimized Aggregate Gradation Mix Designs. This spreadsheet is allowed for use during the 2022 construction season.
 - Form is located in Pantry at:
 - Pantry → Pantry Oversight → Pantry Statewide Spreadsheet Changes → 2022
 - Pantry → Statewide Spreadsheets
 - <https://awpkb.dot.wi.gov/Content/constr/Pantry/Pantry.htm>
 - Submit WS5014 Concrete Mix Design Certification
 - Form is located in Pantry at:
 - Pantry → Statewide Forms → WS Forms → Concrete Mix Design WS5014
 - <https://awpkb.dot.wi.gov/Content/constr/Pantry/Pantry.htm>
 - Clarify in QMP plan which items will be accepted by optimized gradation.
 - Include documentation requirements of applicable standard specification 715 and/or 716.
- Option 2 – DT2221 Form
 - Complete mix design process using:
 - DT2221 - Concrete Mixture Design – Optimized Aggregate Gradation
 - Clarify in QMP plan which items will be accepted by optimized gradation.
 - Include documentation requirements of applicable standard specification 715 and/or 716.

2023 Mix Design Process:

A. Combined Aggregate Gradation Concrete Mix Design Submittal:

- How was mix design submitted in 2022?
 - Option 1 - Company Established Gradation Worksheet & WS5014
Follow this procedure for BOTH Standard and 100% Passing 1-inch Sieve
 1. Copy/transfer information from company worksheet to DT2220 form.
<https://wisconsindot.gov/Pages/global-footer/formdocs/default.aspx>
 2. In DT form remarks section include this statement:
 - Mix design was completed using company established gradation worksheet for 2022 construction. All trial batching was completed and accepted in 2022. All supporting documentation is from 2022 mix design submittal.
 3. Include all documents of 2022 mix design submittal including the company established gradation worksheet.
 4. If mix design total aggregate weight in the DT2220 is within +/- 5.0% of the total weight of aggregate in the company established gradation worksheet, design is acceptable for 2023 use.
 - Calculation for % Difference of Total Weight of Aggregate Example:
 - a. Tot. Aggregate Wt. from old spreadsheet = 3500 lbs.
 - b. Tot. Aggregate Wt. from DT2220 = 3620 lbs.
 - c. $[1 - (3500 \text{ lbs.} / 3620 \text{ lbs.})] \times 100 = 3.3\%$
 - d. ROUND TO THE NEAREST TENTH (0.1%)
 - e. $3.3\% < 5.0\%$, Mix Design is **acceptable** for 2023
 - If total aggregate weight is not within the +/- 5.0% tolerance, contact BTS Concrete Unit for troubleshooting.
 - Option 2 – DT2220 Form
 1. Provide project staff with all documentation from 2022 construction mix design submittal.

B. Optimized Aggregate Gradation Concrete Mix Design Submittal:

- How was mix design submitted in 2022?
 - Option 1 - Optimized PCC Spreadsheet Version 4.5 & WS5014
 1. Copy/transfer information from Optimized PCC Spreadsheet Version 4.5 to DT2221 form.
<https://wisconsindot.gov/Pages/global-footer/formdocs/default.aspx>
 2. In DT form remarks section include this statement:
 - Mix design was completed using Optimized PPC Spreadsheet Version 4.5 for 2022 Construction. All trial batching was completed and accepted. All documentation is from 2022 mix design submittal.
 3. Include all documents of 2022 mix design submittal including the Optimized PCC Spreadsheet Version 4.5.
 4. If each individual sieve retained volumetric in the DT2221 is within +/- 2.0% of the individual sieve retained volumetric in the Optimized PCC Spreadsheet Version 4.5, design is acceptable for 2023 use.
 - Calculation for % Difference of Retained Volumetric of a Sieve Example:
 - a. % Retained Volumetric (Sieve: 1") from DT2221 = 9.9%
 - b. % Retained Volumetric (Sieve: 1") from Optimized PCC Spreadsheet Version 4.5 = 10.5%
 - c. $9.9\% - 10.5\% = -0.6\%$
 - d. ROUND TO THE NEAREST TENTH (0.1%)
 - e. $-0.6\% > -2.0\%$, Mix Design is **acceptable** for 2023
 - If any sieve is not within the +/- 2.0% tolerance, contact BTS Concrete Unit for troubleshooting.
 - Option 2 – DT2221 Form
 1. Provide project staff with all documentation from 2022 construction mix design submittal.