

## How to Fill Out Form 312U

The contractor/concrete producer submits the mix design to the North Carolina Department of Transportation, Structural Materials Laboratory, on the Materials and Test Form 312U at [Concretedesigns@ncdot.gov](mailto:Concretedesigns@ncdot.gov) . The form must be completely filled out and submitted with required data to avoid unnecessarily delays. Instructions on how to fill Form 312U correctly and completely are as follows:

- 1.) Fill in the Producer's Mix ID located at the top of the Form. Please **NOTE** that this ID cannot be more than nine (9) characters and it is generated by the Concrete Producer and not NCDOT.

**Example:** The producer's mix ID is 856ABC919

<b>Producer's Mix ID</b>	8	5	6	A	B	C	9	1	9
Form 312U									
08-17									
<b>North Carolina Department of Transportation, Division of Highways, Materials and Tests Unit Statement of Concrete Mix Design and Source of Materials</b>									

- 2.) In the second table on the form:
  - a. Select the Class of Concrete, Yes or No for Vibration Status and Air Entrainment Status. Enter the Concrete Producer Name, the NCDOT Plant No. including the prefix which indicate the type of plant e.g. RM25 for ready-mix plant 25 or PS25 for prestress plant 25, the date the form is completed, and the compressive strength at 7 days and 28 days. Submit the rest of the test data with Form 312U.

**Example:** A vibrated and air entrained class AA mix produced at NCDOT Plant No. RM777 by Awesome Concrete Inc. with a 7 day and 28 day strength results of 3000 psi and 7000 psi respectively is submitted on January 1<sup>st</sup>, 2018.

Class of Concrete	Class AA	Concrete Producer Name	Awesome Concrete Inc.	
Vibrated (Yes or No)	Yes	NCDOT Plant No.	RM 777	
Air Entrained (Yes or No)	Yes	Date Requested	1/1/2018	
Reference Mix Design No.	n/a	7/28 Day Break Data (psi)	3000	7000

- b. If the mix design being submitted is identical to another NCDOT approved mix design at another Plant, write/type the identical mix design number in the Reference Mix Design No. field. Please note that if you are submitting a mix design identical to one already approved, you do not need to submit the break data.

Example: If mix design is IDENTICAL to another approved mix design (8882VF856ABD919E) at RM888

Class of Concrete	Class AA	Concrete Producer Name	Awesome Concrete Inc.	
Vibrated (Yes or No)	Yes	NCDOT Plant No.	RM 777	
Air Entrained (Yes or No)	Yes	Date Requested	1/1/2018	
Reference Mix Design No.	8882VF856ABD919E	7/28 Day Break Data (psi)	3000	7000

3.) In the third table on the form:

Enter the Producer, Source, and quantities of all the materials used in the mix design.

Please note that all quantities must be reported in **English Units** as indicated on the form. Dosages for admixtures will be as recommended by the manufacturers and you must indicate the **BRAND** of any admixture used in the mix.

**Example:** 560 lbs. of cement is produced by NCDOT and comes from Greensboro, NC Facility 3 and an AE-RGC brand of air entraining agent produced by Air Entraining Inc. are used for this mix.

Mix Design Proportions Based on SSD Mass of Aggregates				
Material	Producer	Source	Qty. per Cu. Yd.	
Cement	NCDOT	Facility 3, Greensboro, NC	560	lbs.
Pozzolan				lbs.
Other Pozzolan				lbs.
Fine Agg.+ M				lbs.
Coarse Agg.+ M				lbs.
Other Agg.+ M				lbs.
Total Water				gals.
Material	Producer	Admixture Brand	Qty. per Cu. Yd.	
Air Entraining Agent	Air Entraining Inc.	AE-RGC	As Recomm.	
Retarding Agent			As Recomm.	
Water Reducing Agent			As Recomm.	
Superplasticizer			As Recomm.	
Corrosion Inhibitor				gals.
Latex Modifier				gals.

4.) In the fourth table on the form:

- a. Enter the Slump, Mortar Content, Air Content, and Maximum Water. Note that the Max W/C Ratio is calculated using the Max. Water weight and the total cementitious material weight:

$$\text{Max Water/Cement Ratio} = \frac{\text{Weight of Max Water}}{\text{Weight of Cementitious Material}}$$

**Example:** For a given mix design, the Slump is 3.5 inch, Mortar Content is 16.7 cu. Ft., Max. Water is 33.5 gals, Air Content is 6%, Cement is 560 lbs., and Pozzolan is 100 lbs.

W/C ratio =  $(33.5 \times 8.33) / (560 + 100) = 0.423$  (note that this ratio is automatically calculated based on your input values )

<b>Mix Properties and Specifications</b>			
Slump (inches)	3.5	Mortar Content (ft <sup>3</sup> )	16.7
Max W/C Ratio	0.423	Air Content (%)	6.0
Max. Water (gals)	33.5	Design Volume (ft <sup>3</sup> )	27

5.) In the last table on the form:

- a. Select or enter the Types or Sizes, the Specific Gravities, percent Absorptions, Unit Mass, and Fineness Modulus of the materials where applicable.

**Example:** Fine aggregate is type 2S with Specific Gravity of 2.65, % Absorption of 0.40 and Fineness Modulus of 2.56; Coarse aggregate is size 78M with Specific Gravity of 2.72, Absorption of 0.6, angular shape, and Dry-rodded Unit Weight (Unit Mass) of 98.97; Pozzolan is Class F fly ash with Specific Gravity of 2.23 and Cement is type II.

Aggregate and Cementitious Data						
Material	Type / Size	Coarse Agg. Shape	Specific Gravity	% Absorption	Unit Mass	Fineness Modulus
Fine Aggregate	2S	N/A	2.65	0.4	N/A	2.56
Coarse Aggregate	#78M	Angular	2.72	0.6	98.97	N/A
Other Aggregate						N/A
Pozzolan	F Fly Ash	N/A	2.23	N/A	N/A	N/A
Other Pozzolan		N/A		N/A	N/A	N/A
Cement	Type II	N/A	3.15	N/A	N/A	N/A

6.) Please indicate appropriately if the mix design is governed by **Special Provisions**; and if so, please submit a copy of a **page or pages** showing the Special Provisions in question.

7.) Lastly, enter your **name** and **title/position** as well as your **certification number** or **PE stamp/number**. Sign the completed form.

Email the completed and signed form with your break data and special provisions pages (if applicable) to [concretedesigns@ncdot.gov](mailto:concretedesigns@ncdot.gov).

The approved 312U form will include the name of the technician and their Mix Design Certification number or name of the licensed engineer and their PE number. Mix designs submitted without the following will be rejected as incomplete:

- Producer's mix ID number
- Class of concrete
- Vibration and air entrainment status
- Laboratory test results of 7 and 28 day compressive strength

- Maximum water, slump, material properties, e.g. types/sizes, specific gravities etc.
- Name and certification number of person who designed the mix

Mix designs submitted using outdated 312U forms will be returned for resubmission. Please also note that mix designs in terms of saturated surface dry weights must be submitted for review and approval at least 35 days before proposed use (Section 1000-4 of NCDOT Standard Specifications).

**Items to check:**

1. Always use at least the minimum cement for that particular class of concrete.
2. Make certain that the W/C ratio and the maximum water have not been exceeded.
3. Be certain that the correct design air content is used.
4. Make sure that all materials used are state approved. Verify the specific gravity and the fineness modulus of the material.
5. Be sure to use the ACI method of design in the mix procedure.
6. Make sure the mix design produces 27.0 +/- 0.3 cu. ft.
7. Check that all the admixtures are on the approved list.

**Changes to Mix Designs**

Changes to an approved mix design are not permitted. If any change is made to the mix design, submit a new mix design. Form 312M is a Mass Change Request form that is used to make a change of producers or sources of materials in previously approved mix designs. This form applies to minor changes only: sources/brands of admixtures and sources of the same type of cement/pozzolan. If a major change needs to be made, Form 312U must be used and compressive strength test data must be submitted for review (Section 1000-1 of NCDOT Standard Specifications).

## How to Fill Out Form 312M

Form 312M must be filled completely and submitted to the Materials and Tests Unit Physical Lab at [Concretedesigns@ncdot.gov](mailto:Concretedesigns@ncdot.gov) to avoid unnecessarily delays. Instructions on how to fill Form 312M correctly and completely are as follows:

1.) In the first table on the form:

Write/type the Name of the Concrete Producer, Plant Location and NCDOT Plant No. e.g. RM25, PS25, CP25, VM10, or PC5, and the date the form is completed.

**Example:** A mass change for mixes produced at NCDOT Plant No. RM777 by Awesome Concrete Inc. is requested on January 1<sup>st</sup>, 2018.

Concrete Producer Name	Awesome Concrete Inc.
NCDOT Plant No.	RM 777
Date Requested	1/1/2018

2.) In the second table on the form:

- a. Provide the Old Producer's Mix ID and the corresponding New Producer's Mix ID.

**Example:** Five mixes; 856ABC919, 856ABD919, 856ABE919, 856ABF919, and 856ABG919 will have the same mass change at the given Plant and their new mix IDs will be 856ABC336, 856ABD336, 856ABE336, 856ABF336, and 856ABG336 respectively.

Old Producer's Mix ID	New Producer's Mix ID	Old Producer's Mix ID	New Producer's Mix ID	Old Producer's Mix ID	New Producer's Mix ID
856ABC919	856ABC336				
856ABD919	856ABD336				
856ABE919	856ABE336				
856ABF919	856ABF336				
856ABG919	856ABG336				

- b. Please note that the Producer's ID **CANNOT** be more than **nine (9) characters** and you can make a mass change for up to fifteen (15) mix designs per form. If you have more than fifteen mix designs to change, please use another form.

3.) In the third table on the form:

Write/type the New Producer and New Source of the materials in the mix design.

**Example:** For the given mass change, Awesome Concrete Inc. would like to change the source of the cement produced by NCDOT from Facility 3 Greensboro, NC to Facility 1 High Point, NC, and the admixture brand produced by Air Entraining Inc. from AE-RGC to AE-GSO.

**Producers and Sources of Materials**

<b>Material</b>	<b>New Producer</b>	<b>New Source</b>
Cement	NCDOT	Facility 1 High Point, NC
Pozzolan		
<b>Material</b>	<b>New Producer</b>	<b>New Admixture Brand</b>
Air Entraining Agent	Air Entraining Inc.	AE-GSO
Retarding Agent		
Water Reducing Agent		
Superplasticizer		
Corrosion Inhibitor		

Please **NOTE** that although the producer for cement and admixture did not change, their names must still be included in this form as shown in the above example.

4.) In the fourth/last table on the form:

Fill in the new type and/or specific gravity of the material being changed if applicable.

**Example:** The producer would like to change the type of pozzolan from Class F Fly Ash to Ground Granulated Blast Furnace (GGBF) Slag; the corresponding specific gravity for Slag is 2.28.

**Cementitious Data**

<b>Material</b>	<b>New Type</b>	<b>New Specific Gravity</b>
Pozzolan	GGBF Slag	2.28
Cement		3.15

5.) Finally write/type your name/signature, your title/position as well as your certification number or PE stamp/number.

Email your completed form to Materials and Tests Unit Physical Lab at [concretedesigns@ncdot.gov](mailto:concretedesigns@ncdot.gov) . After changes have been made and new mix designs have



been created, you will receive an email response with copies of new mix designs for your verification and record.