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# 7

## Automated Data Processing of Concrete

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The purpose of the data system for which these instructions were prepared is to provide descriptive information about the materials used in highway work. Independent Assurance and concrete control tests shall be handled under the conventional method and using conventional forms.

Basically, the system is designed for coding test reports. For instance, in lieu of recording the Contractor's name and location, only a code is needed. The printout will show the Contractor's name and location. Code sheets have been included in this chapter for class purposes only. A complete list of codes may be obtained from the District Materials Section.

It is **very** important that all data entered on the Data Processing Forms be **correct**, in the proper blanks, and, most of all **legible**. Attached you will find a coding guide to be used for numeric and alphabetic characters. As a rule, numeric characters are recorded from the right to left, and alphabetic from the left to right. Please adhere to these standards.

### Form TL-28A Coding Form - Concrete Batch Report

The Hydraulic Cement Concrete Coding Form TL-28A contains three (3) records, A, B, and C. The plant record, A and B, is completed by the Producer's Technician, and the site record, C, is completed by the Project Inspector. The TL-28A is to accompany the first load of concrete delivered to the project. The load should not be tested or accepted until the TL-28A is received.

Under the job heading (Column 2), the Producer's Technician chooses a numerical (1-9) or alphabetical (A-Z) code for each day beginning with 1 or A, and then changes only if any item in A or B record changes (ex. yards<sup>3</sup>/meter<sup>3</sup> or pounds/kg of free water changes). If all the loads are identical, then the Producer's Technician would fill in the A & B record only once. The Project Inspector would continue recording the project data in record C, until he receives another TL-28A coding form from the Producer's Technician. The time batched would have to be shown on the producer's ticket.

On the next day, the Technician should restart with 1 or A. The codes that are needed for completing record C are attached. On record A the water is in pounds (kilograms), and on record B the water is in gallons (liters).

If the plant is a central-mix plant, mark an “X” in Section B, Column 71. If the plant is a ready-mix plant, leave Section B, Column 71 blank. The Producer’s Technician signs the TL-28A coding form in the upper right corner.

Always record from the right to left. For miscellaneous concrete, the TL-28A will not be required unless cylinders are cast. If cylinders are cast, it will be required to obtain information that is not included on Forms TL-13 or TL-26A. Independent Assurance samples are not to be recorded on the TL-28A.

The remaining spaces on the form are self-explanatory.

The Project Inspector submits the TL-28A to the District Materials Section for review and data entry. The District Materials Office retains the original and the Project Inspector retains a copy.

## TL-13 Notice of Shipment of Concrete Cylinders

The TL-13 is to be filled out by the person molding the cylinders and it shall be submitted with each cluster of acceptance cylinders. Under the cylinder column, the cylinder number should be the same as shown on the TL-28A, (ex. if it is listed in the 1st column, the last 2 spaces on the TL-28A, list it the same way on the TL-13). **Mark the sample number, project number, class of concrete and date cast on the cylinders.** The District Materials Office will pick up the cylinders.

## Form TL-26A - Report of Structural Concrete

Form TL-26A is to be filled in by the District Materials Section to record the compressive strengths of the cylinders.

The District Materials Office retains the original and the Project Inspector retains a copy. The Project Inspector sends a copy to the Contractor if a sample fails.

CODING OF CHARACTERS  
FOR DATA PROCESSING INPUT DATA

Alphabet Characters  
Capital Letters Only

<b>A</b>	Squared top not acceptable	<b>N</b>	Parallel sides
<b>B</b>	Overhang top and bottom to avoid confusion with numerals 8 or 13. Center division required to avoid similarity with the letter D.		Loop added at top to avoid confusion with numeric zero
<b>C</b>	Deep Curves to avoid similarity with parenthesis.	<b>P</b>	Overhang at top added for consistency with letters B, D, R
<b>D</b>	Overhang top and bottom to reduce confusion with the number zero.	<b>Q</b>	No Special convention
<b>E</b>	Straight leg	<b>R</b>	Overhang at top added for consistency with letters B, D, P
<b>F</b>	Straight leg	<b>S</b>	Serif added at top only to distinguish from the numeral 5
<b>G</b>	Emphasized serif reduces confusion with letter C or numerals six and zero.	<b>T</b>	No Special convention
<b>H</b>	Parallel sides	<b>U</b>	Parallel side to distinguish from letter V.
<b>I</b>	Serifs top and bottom are required	<b>V</b>	No Special convention
<b>J</b>	Top serif reduces confusion with letter U.	<b>W</b>	Center division extends to top of letter. Rounded bottom should be avoided.
<b>K</b>	Slanting legs are joined at the center	<b>X</b>	No Special convention
<b>L</b>	No special convention	<b>Y</b>	Vertical leg bisects angle framed by top legs to avoid confusion with numeral 4.
<b>M</b>	Legs spread at bottom center		Horizontal bar is standard

CODING OF CHARACTERS  
FOR DATA PROCESSING INPUT DATA

Numeric Characters

<b>0</b>	Closed circle	<b>5</b>	Vertical and top lines joined at right angle
<b>1</b>	Single vertical Bar	<b>6</b>	Loop closed at bottom to avoid confusion with zero or lower case b .
<b>2</b>	No loop at bottom	<b>7</b>	Crossed bar considered confusing with letter Z .
<b>3</b>	Curved lines, no straight top line	<b>8</b>	Made with two circles adjoining vertically to avoid confusion with special character ampersand and dollar sign
<b>4</b>	Open top to reduce confusion with 9.	<b>9</b>	Straight Leg

## CODE LIST FOR CURING METHODS

<u>CODE NO.</u>	<u>METHOD</u>
1	Liquid Membrane Seal
2	Polyethylene Sheeting
3	Burlap
4	Burlene
5	Wet Sand
6	Water Ponding
7	Steam
8	Heater Blanket

## CODE LIST FOR TYPE OF STRUCTURE

<u>CODE NO.</u>	<u>TYPE STRUCTURE</u>
1	Box Culvert and/or Appurtenances
2	Bridge (except deck)
3	Bridge Deck
4	Parapet Wall
5	Approach Slab
6	Retaining Wall
7	Curb and Gutter
8	Slope Paving
9	Ditch Paving
10	Sidewalk
11	Precast Piling
12	Precast Beams
13	Precast Miscellaneous
14	Sidewalk or Driveway
15	Miscellaneous
16	Pier Stem
17	Paving
18	Tunnel

**NOTES FOR MATERIALS DIVISION PERSONNEL  
CODES NOT ON MASTER CODE LIST  
CONCRETE CLASSIFICATIONS**

<u>CONCLASS</u>	<u>CODE</u>	<u>NUMERIC EQUIVALENT</u>
A3	1	1
A4	2	2
A5	3	3
B2	4	4
C1	5	5
T3	6	6
SPECIAL	7	7
PAVEMENT	8	8
A4 TUNNL	9	9
B2 TUNNL	A	10
E1 TUNNL	B	11
Y TUNNL	C	12
A3 FLYASH	D	13
A4 FLYASH	E	14
A5 FLYASH	F	15
B2 FLYASH	G	16
C1 FLYASH	H	17
T3 FLYASH	I	18
SPECFA	J	19
PAVEFA	K	20
A 4000	L	21
A 4000F (FLYASH)	M	22
*	N	23
*	O	24
A3SLAG	P	25
A4SLAG	Q	26
A5SLAG	R	27
B2SLAG	S	28
C1SLAG	T	29
T3SLAG	U	30
SPEC SG	V	31
PAVSG	W	32
A6	X	33
A 4000S (SLAG)	Y	34
*	Z	35

**CEMENT CLASSIFICATIONS**

<u>CEMENT</u>	<u>NUMERIC EQUIVALENT</u>
I	1
II	2
III	3
IP	4
V	5
III MODIFIED	6

\* CODES RESERVED FOR FUTURE USE

FOR STUDY GUIDE PURPOSES ONLY. TO OBTAIN AN UP TO DATE LIST,  
PLEASE CONTACT YOUR DISTRICT MATERIALS OFFICE.

## CEMENT SOURCE

<u>TABLE</u>	<u>CODE</u>	<u>NAME</u>	<u>CITY</u>	<u>STATE</u>
CEMB	1	COPLAY	LIME KILN	MD
CEMB	2	BLUE CIRCLE ATLANTIC INC.	RAVENA	NY
CEMB	3	BLUE CIRCLE ATLANTIC INC.	VALENCIA	SP
CEMB	4	ATLANTIC	CHESAPEAKE	VA
CEMB	5	ATLANTIC	BALTIMORE	MD
CEMB	6	ROANOKE CEMENT CO.	CLOVERDALE	VA
CEMB	7	TARMAC-LONESTAR INC.	CHESAPEAKE	VA
CEMB	8	COPLAY	NAZARATH	PA
CEMB	9	IDEAL	CASTLE NAYNES	NC
CEMB	10	LEHIGH PORTLAND CEMENT CO.	UNIONBRIDGE	MD
CEMB	11	LEHIGH PORTLAND CEMENT CO.	ALLENTOWN	PA
CEMB	12	CAPITAL	MARTINSBURG	WV
CEMB	13	MARQUETTE	HAGERSTOWN	MD
CEMB	14	MEDUSA	YORK	PA
CEMB	15	DIXIE	KNOXVILLE	TN
CEMB	16	SANTEE	HOLLY HILL	SC
CEMB	17	UNIVERSAL ATLAS	BAHAMAS	GB
CEMB	18	LEHIGH PORTLAND CEMENT CO.	LEEDS	AL
CEMB	19	INDEPENDENT	HARLEYVILLE	SC
CEMB	20	GIFFORD HILL	EVANSVILLE	PA
CEMB	21	ALLENTOWN CEMENT CO.	KNOXVILLE	TN
CEMB	22	IDEAL	HAGERSTOWN	MD
CEMB	23	TARMAC	PERTIGALETE	VZ
CEMB	24	LEHIGH VENEZULAN	HAGERSTOWN	MD
CEMB	25	INDEPENDENT CEMENT CORP.	ASLAND	SP
CEMB	26	TARMAC	SAGUNTO	SP
CEMB	27	BLUE CIRCLE ATLANTIC INC.	PERTIGALETE	VZ
CEMB	28	TARMAC	MILAKI	GR
CEMB	29	TARMAC	ELEFSU	GR
CEMB	30	TARMAC	S.A.	GR
CEMB	31	TITAN	ALMERIA	SP
CEMB	32	HORNOS IBERICOS ALBA	VERACUZ	MX
CEMB	33	CEMENTOS APCOSCOSA	AMPAROPAULA	MX
CEME	34	LEHIGH-TAMPICO CEMENT CO.	EVANSVILLE	PA
CEMB	36	ALLENTOWN CEMENT CO.	BEAUPORT	CA
CEMB	37	INDEPENDENT CEMENT	EVANSVILLE	PA
CEMB	38	COPLAY CEMENT CO.	BEAUPORT	CA
CEMB	39	LEHIGH PORTLAND CEMENT CO.	FREDERICK	MD
CEMB	40	HERCULES CEMENT CO.	NORFOLK	VA
CEMB	41	KOSMOS CEMENT CO.	STOCKERTOWN	MD
CEMB	42	INDEPENDENT CEMENT CORP.	LOUISVILLE	KY
CEMB	43	BLUE CIRCLE ATLANTIC INC.	BALTIMORE	MD
CEMB	44	BLUE CIRCLE ATLANTIC INC.	KAMARI	GR
CEMB	45	BLUE CIRCLE ATLANTIC BARRANQUILLA	ORIZABA	MX
CEMB	46	BLUE CIRCLE ATLANTIC BARQUISIMETO	COLUMBIA	SA
CEMB	47	BLUE CIRCLE ATLANTIC INC.	VENEZUELA	SA
CEMB	48	BLUE CIRCLE ATLANTIC CARTAGENA	ALCANCA	SP
CEMB	49	BLUE CIRCLE ATLANTIC PERTIGALETE	COLUMBIA	SA
CEMB	50	LEHIGH PORTLAND CEMENT CO.	VENEZUELA	SA
CEMB	51	COPLAY	MITCHELL	IN
CEMB	52	GIANT CEMENT CO.	SPEED	IN

THIS IS A CODE LIST FOR INPUT DATA ONLY. CHECK WITH YOUR DISTRICT MATERIALS ENGINEER FOR AN APPROVED LIST OF SOURCES.

## Concrete Plant Example Problem

It is the producer technician's responsibility to complete Lines A and B of the TL-28A coding form at the plant and send the form out to the state construction project site with the driver of the first load of concrete going to the project.

Using the information below and using Mix Design No. 4-7501-07 (see next page), fill in Lines A and B (upper portion) of the TL-28A coding form.

The contractor on project 0295-127-101,C501 orders 2 cubic yards of A-3 general concrete from B. M. Jones Ready Mix Plant in Richmond (Plant Code No. 4006) on January 12, 2007.

The cement is coming from Roanoke Cement Company in Cloverdale, VA. The producer code for Bedrock S&G is 4009 and for Smith Quarries is 4015. The code for MBAE Air Entraining Agent is 02.

The free moisture on the sand is 5% and on the Coarse Aggregate (No. 57) is 0.6%.

There were 70 mixing revolutions put on the mixer at the plant and 1 gallon of water per cubic yard was withheld.

Form TL-27MC (Revised 1/07)

**VIRGINIA DEPARTMENT OF TRANSPORTATION  
MATERIALS DIVISION**

**STATEMENT OF HYDRAULIC CEMENT CONCRETE MIX DESIGN**

Submit one copy to the District Administrator, Virginia Department of Transportation. Approval must be received by the contractor from the Materials Division before work is begun. This mix design is approved for all projects of the Department for the class of concrete shown: Calendar Year 2007 Mix Design No. 4-7501-07

Producer B. M. JONES READY MIX Plant Location RICHMOND, VA Phone 804-555-1234  
Type of Mix: Ready Mix X Job Mix \_\_\_\_\_ Date 01/05/2007

Mix Design - One Cubic Yard (Meter) Based on SSD Condition

Class of Concrete A3 GENERAL (E) Slump/ 3.5 In. \_\_\_\_\_ mm Air Content 6 %  
(M) Flow

Material	Type	Quantities	Source		Plant/Quarry Location
			Code	Name	
Cement	<u>IP</u>	<u>588</u> lbs.	<u>6</u>	<u>ROANOKE CEMENT CO</u>	<u>CLOVERDALE, VA</u>
Min.Admix.1		_____ lbs.	_____	_____	_____
Min.Admix.2		_____ lbs.	_____	_____	_____
Sand <sup>(1)</sup>		<u>1228</u> lbs.	<u>4009</u>	<u>BEDROCK S &amp; G</u>	<u>RICHMOND, VA</u>
No. <u>57</u> Stone <sup>(1)</sup>		<u>1725</u> lbs.	<u>4015</u>	<u>SMITH QUARRIES</u>	<u>RICHMOND, VA</u>
Gr./No. _____ Aggr. <sup>(1)</sup>		_____ lbs.	_____	_____	_____
Water <sup>(2)</sup> <u>275</u> lbs.		<u>33</u> gal.	_____	<u>CITY WATER</u>	_____
Admixture (AE) <sup>(3)</sup>		<u>4.6</u> oz.	<u>2</u>	<u>MBAE 20 - MASTER BLDRS.</u>	<u>CLEVELAND, OHIO</u>
Admixture (Retarder) <sup>(3)</sup>		_____ oz.	_____	_____	_____
Admixture (Other) <sup>(3)</sup>		_____ oz.	_____	_____	_____

NOTES:

(1) The quantities of fine and coarse aggregates necessary to conform to specifications in regard to consistency and workability shall be determined by the method described in "Recommended Practice for Selecting Proportions for Normal Weight Concrete" (ACI-211.1) and the actual quantities used shall not deviate more than plus or minus 5 percent from such quantities.

(2) To provide minimum slump permissible in Table II-17 while satisfying placement and finishing requirements. A separate design shall be submitted for each slump desired.

(3) The quantity of admixture will not be approved or disapproved since it varies considerably and must be initially established by trial and error by the producer or contractor with subsequent adjustment during batching to maintain the desired results within the range specified.

Mineral Admixture #1 - sp.gr. \_\_\_\_\_  
Mineral Admixture #2 - sp.gr. \_\_\_\_\_  
Sand - Abs. 0.5  
Sand - F.M. 2.8  
Sand - sp.gr. 2.64

C.A. #1 - Abs. 0.3  
C.A. #1 - sp.gr. 2.59  
C.A. #1 Unit mass 94.7 / \_\_\_\_\_  
Lbs./C.F. kg/C.M.

Aggr. #2 - Abs. \_\_\_\_\_  
Aggr. #2 - sp.gr. \_\_\_\_\_  
2nd F.A./C.A.-F.M./u.wt. \_\_\_\_\_ / \_\_\_\_\_  
E M

Design W/C Ratio 0.47

Contractor B. M. JONES READY MIX, INC.  
(Name of Company)

By B. M. JONES  
(Certified Technician Preparing Form)

Producer Technician's Expiration Date 12/31/2012  
(Do Not Use Social Security Number)

**FOR DEPARTMENT USE ONLY**

Remarks: \_\_\_\_\_

Copies: District Materials Engineer  
Project Inspector  
Plant Inspector  
Sub- Contractor and / or R.M. Producer

Checked by W. R. TAYLOR 1/5/07

Approved by H. R. JONES 1/5/07  
District Materials Engineer

Approved tentatively subject to the production of material meeting the requirements of the Specifications and Special Provisions.



## Calculations for Plant Example Problem

Cement Weight Calculation - Line A 38-41

588 lbs. (From TL-27) x 2 cubic yards = 1176 lbs. of cement for 2 cubic yards

Sand, SSD Weight Calculation - Line A 46-50

1228 lbs. (From TL-27) x 2 cubic yards = 2456 lbs. of sand for 2 cubic yards

Sand, Free Water Calculation - Line A 51-53

2456 lbs. of sand (Line A 46-50) x .05 (% Free Moisture in Sand expressed as a decimal) =  
122.8 (Rounded to nearest whole pound) = 123 lbs.

Coarse Aggregate (No.57), SSD Weight Calculation - Line A 60-64

1725 lbs. (From TL-27) x 2 cubic yards = 3450 lbs. of Coarse Aggregate for 2 cubic yards

Coarse Aggregate (No. 57), Free Water Calculation - Line A 65-67

3450 lbs. of C.A. (Line A 60-64) x .006 (% Free Moisture in C.A. expressed as a decimal) = 20.7  
(Rounded to nearest whole pound) = 21 lbs.

Total Allowable Water - Line B 13-16

33 gals. (From TL-27) x 2 cubic yards = 66.0 gallons

Water Added at Plant - Line B 20-23

123 lbs. of free water in sand + 21 lbs. of free water in C.A. = 144 lbs.

144 lbs. of free water in sand and C.A. ÷ 8.33 weight of one gallon of water in lbs. = 17.3 gals.

1 gallon of water per cubic yard withheld at plant x 2 cubic yards = 2 gals. of water withheld

66.0 gallons (Line B 13-16) – 19.3 gallons of free and withheld water = 46.7 gallons of  
water added at plant

A. E. Admixture - Line B 31-34

4.6 oz. (TL-27) x 2 cubic yards = 9.2 oz. of Air Entrained Admixture for 2 cubic yards

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## Concrete Field Example Problem

Using the information below, fill in Line C (lower portion) of the TL-28A Coding Form and the Notice of Shipment of Concrete Cylinders Form TL-13.

December 2, 2015 the contractor on Project 0295-127-101,C501 has ordered 8 cubic yards of A-3 General concrete from B. M. Jones Ready Mix (Plant Code No. 4006) to be placed in a paved ditch. This is Load No. 1 batched at 2:00 p.m. on Truck No. 306.

When this load of concrete arrived on the project, the project inspector took the TL-28A from the mixer driver in order to fill out Line C on the form.

The mix was dry so the contractor told the mixer driver to add 4 gallons of water to the load and put 25 additional mixing revolutions on the drum.

The inspector took the temperature of the concrete and determined it to be 72°F. The inspector checked the slump by the slump cone method and found the slump to be 3.50 inches. The entrained air content was checked using a Type A Air Meter (Protex Air Meter) and was found to be 6.5%. This load met VDOT specifications and was accepted. The contractor began discharge at 2:45 p.m.

The average air temperature during pouring was 75°F.

Design Quality Control Cylinders were cast by the inspector at 2:55 p.m. and were numbered 1, 1A and 1B. The cylinders were placed in a curing box for 24 hours. The low field storage temperature was 65°F and the high field storage temperature was 75°F.

The paved ditch was cured using polyethylene sheeting.



## Concrete Field Study Problem Solution Form TL-13

FORM TL-13

REV. 2/96

### VIRGINIA DEPARTMENT OF TRANSPORTATION MATERIALS DIVISION

#### NOTICE OF SHIPMENT OF CONCRETE CYLINDER

PROJECT NUMBER																PLANT	LOAD NO.	DATE TAKEN						FIRST CYLINDER SAMPLE				SECOND CYLINDER SAMPLE				THIRD CYLINDER SAMPLE						
ROUTE				CO.			SECT.			TYPE								YY	MM		DD																	
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	48	49	50	51	56	57	58	59	64	65	66	67
0	2	9	5	1	2	7	1	0	1	C	5	0	1		4	0	0	6	0	1	1	6	1	2	0	2	1				1 A				1 B			

CLASS OF CONCRETE     A 3 GENERAL    

SUBMITTED     PROJECT INSPECTORS NAME



## Concrete Field Study Problem Solution Form TL-13 - BLANK

FORM TL-13  
REV. 2/96

### VIRGINIA DEPARTMENT OF TRANSPORTATION MATERIALS DIVISION NOTICE OF SHIPMENT OF CONCRETE CYLINDER

PROJECT NUMBER																PLANT	LOAD NO.	DATE TAKEN						FIRST CYLINDER SAMPLE				SECOND CYLINDER SAMPLE				THIRD CYLINDER SAMPLE						
ROUTE				CO.			SECT.			TYPE			YY	MM	DD																							
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	48	49	50	51	56	57	58	59	64	65	66	67

CLASS OF CONCRETE \_\_\_\_\_

SUBMITTED \_\_\_\_\_