

CHAPTER 5

INSPECTION OF PLANT AND EQUIPMENT

The District Materials Engineer or representative will be responsible for the initial inspection and approval of the plant and trucks.

MIX DESIGN

Before any concrete is batched, it is the responsibility of the producer's technician to prepare and submit a mix design for approval. The approved design must be at the plant prior to the beginning of the batching operations. The approved mix design controls the amount of water and other materials used in the batching. A sample design (form TL-27) is shown on Page 5 - 3.

AGGREGATES

Aggregates should be handled and stored to minimize segregation and to prevent contamination with deleterious substances. Stockpiles should be built in layers of uniform thickness. Stockpiles should not be built in high cone-shaped piles; this results in segregation. To minimize segregation, aggregates should be removed from stockpiles in horizontal layers.

Stockpiles are checked to determine that they are free from foreign matter, separated by space or bulkheads so that aggregates will not intermingle while loading, and kept in at least a saturated surface-dry (SSD) condition. In order to keep stockpiles in an SSD condition, they should be sprinkled, using an approved method, the night before batching. If aggregates are in less than SSD condition, there will be no surface moisture and only partial or no absorbed moisture, resulting in the loss of part of the mixing water to the aggregates. If stockpiles are built on the ground, the loader should remain at least twelve inches from the ground while removing the material. A check is made to see that the aggregates have been tested. When material comes from a local source, the delivery ticket is to have a certification stating that this material has come from a previously tested and approved stockpile, and the certification is to be signed by the producer or representative. In the case of rail shipments, each shipment should be accompanied by a seal or other evidence of inspection. If no evidence is found, or the material does not arrive at the plant in satisfactory condition, whether previously tested or not, the District Materials Engineer should be notified promptly. He will then decide whether or not the material must be resampled and tested before it is accepted for use.

CEMENT

Cement storage structures should be checked to determine if they are weatherproof. Any moistening of the cement prior to its use, creating lumpy and partially hydrated material, shall be cause for rejection. Since there are many different types and brands of cement used, the producer's technician should make sure the type and brand used is the same as that shown on the mix design. Some silos have more than one compartment, and are capable of storing more than one type of cement. If more than one type is stored in one silo, the producer's technician should make sure that the correct type is being used.

Before any concrete is batched, the producer's technician should determine that there is a certification stating the cement meets the requirements of the VDOT Specifications.

SCALES

Scales used for weighing aggregates and cement shall be approved and sealed in accordance with the requirements of Section 109 of the Specifications. Before weighing aggregates and cement, the technician should be sure the scales have been serviced within the past 6 months by a private scale service company certifying that all concrete hopper scales meet Handbook 44 Regulations. Scales should be checked and certified whenever the scales are moved, whenever there is reason to believe they are inaccurate, or at the request of the Engineer. Before the weigh hopper is loaded, the scales are to be on the zero mark. If scales are not on zero, weighing operations cannot begin. It is the duty of the Certified Concrete Plant Technician to see that the correct batch weights are used. The batch weights are to be shown on the TL-28A form which is the producers batch weight certification. Cement and aggregates are to be weighed within the following tolerances:

Cement	$\pm 1\%$
Coarse & Fine Aggregate	$\pm 2\%$

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. 4-9907-07

Producer GENERAL READY MIX Plant Location RICHMOND, VA Phone 804-555-2000
 Type of Mix: Ready Mix X Job Mix _____ Date 02/15/2007

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

Class of Concrete A-4 GENERAL (E) Slump/ 2 TO 4 In. _____ mm Air Content 6.50% %
25% FLYASH Flow

Material	Type	Quantities	Code	Source		Plant/Quarry Location
				Name		
Cement	<u>II</u>	<u>476</u> lbs. _____ kg.	<u>10</u>	<u>LEHIGH CEMENT CO.</u>	<u>UNION BRIDGE, MD</u>	
Min. Admix. 1		<u>159</u> lbs. _____ kg.	<u>114</u>	<u>PROASH</u>	<u>ROXBORO, NC</u>	
Min. Admix. 2		_____ lbs. _____ kg.	_____	_____	_____	
Sand ⁽¹⁾		<u>1166</u> lbs. _____ kg.	<u>4017</u>	<u>TARMAC</u>	<u>KINGSLAND, VA</u>	
No. <u>57</u> Stone ⁽¹⁾		<u>1748</u> lbs. _____ kg.	<u>4027</u>	<u>VULCAN MATERIALS</u>	<u>HYLAS, VA</u>	
Gr./No. _____ Aggr. ⁽¹⁾		_____ lbs. _____ kg.	_____	_____	_____	
Water ⁽²⁾	<u>267</u> lbs.	<u>32</u> gal. _____ L.	_____	<u>DEEPWELL</u>	<u>RICHMOND, VA</u>	
Admixture (AE) ⁽³⁾		<u>2.5</u> oz. _____ ml.	<u>49</u>	<u>SIKA AEA 15</u>	<u>LYNDHURST, NJ</u>	
Admixture (Retarder) ⁽³⁾		<u>12.7</u> oz. _____ ml.	<u>6</u>	<u>SIKA PLASTIMENT</u>	<u>LYNDHURST, NJ</u>	
Admixture (Other) ⁽³⁾		_____ oz. _____ ml.	_____	_____	_____	

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.	<u>2.63</u>
Mineral Admixture # 2 - sp.gr.	_____
Sand - Abs.	<u>0.6</u>
Sand - F.M.	<u>2.9</u>
Sand - sp.gr.	<u>2.62</u>

C.A. #1 - Abs.	<u>0.5</u>
C.A. #1 - sp.gr.	<u>2.69</u>
C.A. #1 Unit mass	<u>98.1</u> / _____
	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 0.42

Contractor GENERAL READY MIX
(Name of Company)

By B. L. SMITH
(Certified Technician Preparing Form)

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

FOR DEPARTMENT USE ONLY

Remarks: _____

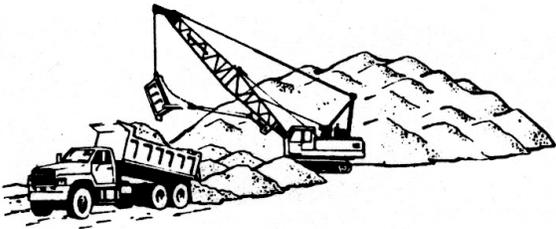
Copies: District Materials Engineer
 Project Inspector
 Plant Inspector
 Sub- Contractor and / or R.M. Producer
 2011 v1.0

Checked by JOHN DOE
 Approved by I. M. JONES
District Materials Engineer

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

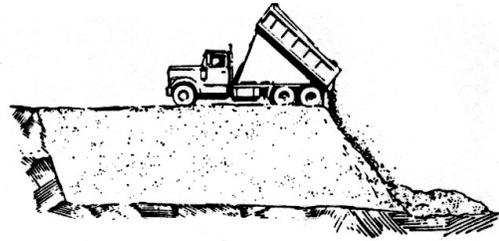
CORRECT AND INCORRECT METHODS OF HANDLING AND STORING AGGREGATES

Incorrect methods of stockpiling aggregates cause segregation and breakage.



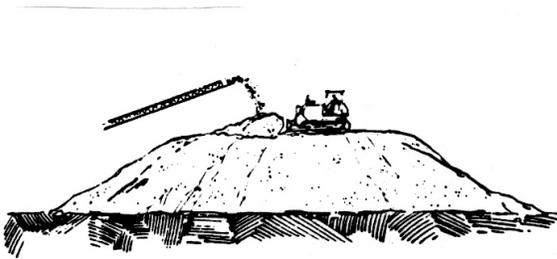
PREFERABLE

Crane or other means of placing material in pile in units not larger than a truckload which remain where placed and do not run down slope.



OBJECTIONABLE

Methods which permit the aggregate to roll down the slope as it is added to the pile or permit hauling equipment to operate over the same level repeatedly.



LIMITED ACCEPTABILITY

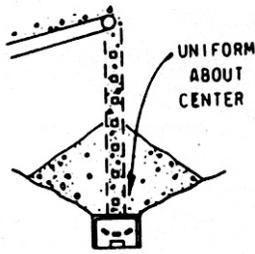
Pile built radially in horizontal layers by dozer or front end loader working from materials as dropped from conveyor belt. A rock ladder may be needed in setup.



GENERALLY OBJECTIONABLE

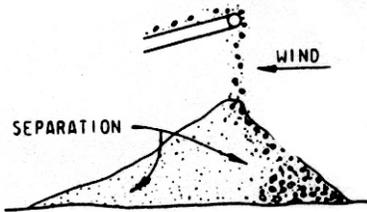
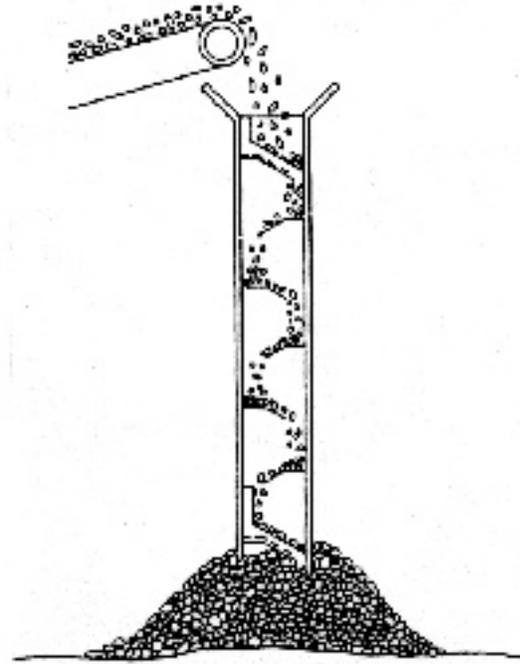
Dozer or front end loader stacking progressive layers on slope not flatter than 3:1 is objectionable unless materials strongly resist breakage.

FIGURE 13



CORRECT

Chimney surrounding material falling from end of conveyor belt to prevent wind from separating fine and coarse materials. Openings provided as required to discharge materials at various elevations on the pile.



INCORRECT

Free fall of material from high end of stacker permitting wind to separate fine from coarse material.

When stockpiling large sized aggregates from elevated conveyors, breakage is minimized by use of a rock ladder.

UNFINISHED OR FINE AGGREGATE STORAGE (DRY MATERIALS) FINISHED AGGREGATE STORAGE

Stockpiling of Coarse Aggregate When Permitted: Stockpiled aggregate should be finish-screened at batch plant. When this is done no restrictions on stockpiling are required.

FIGURE 13

WATER

Water must be previously approved and may be measured by either volume or weight. Means of dispensing water into the batch are by: meter, holding tank, or scales. Water is to be dispensed within an accuracy of $\pm 1\%$.

ADMIXTURES

There are several types of admixtures used in highway concrete. Examples are: air entraining agents, set retarders, water reducers, and accelerators. The Department of Transportation publishes an approved list of admixtures periodically. Admixtures must be used and dispensed according to manufacturer recommendations by means of an approved, graduated, transparent, measuring device before they are introduced into the mixer. (Page 5 - 8). If more than one admixture is to be used, they shall be released in sequence rather than at the same instant as there may be a chemical reaction between the admixtures. Liquid admixtures should be agitated prior to their use. Admixtures must be dispensed within an accuracy of $\pm 3\%$. Admixtures must be stored and handled to prevent freezing, contamination, and deterioration.

TRUCKS

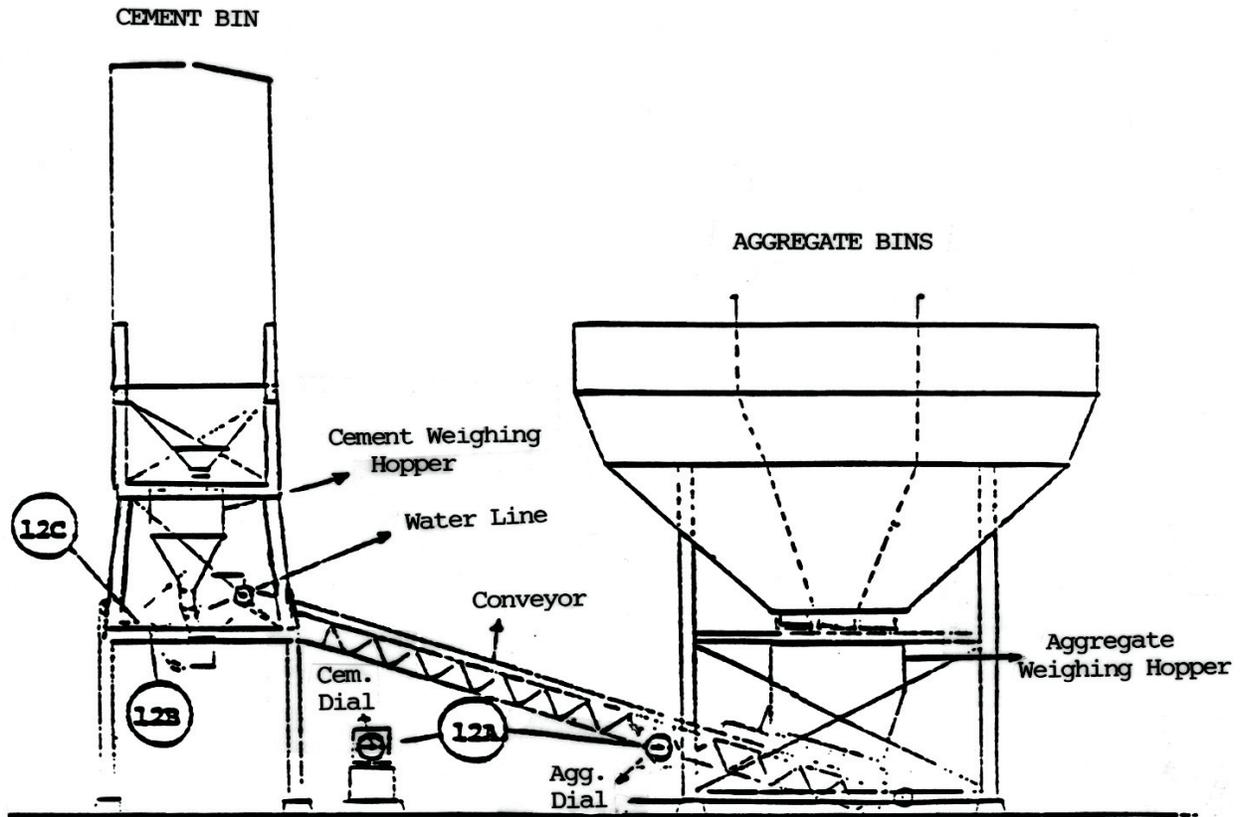
Before a transit mix truck leaves the plant, the producers technician should see that the required mixing revolutions are obtained. The correct speed can be obtained from the manufacturer's rating plate on the truck. Truck mixers are to be equipped with the following devices: revolution counter, manufacturer's rating plate which shows the mixing capacity (specifications require a maximum and minimum that can be mixed), and agitating speed of the mixer, and a properly calibrated water measuring device. (See Page 5 - 9). Periodically, the technician should make a visual inspection of the trucks to see that the blades are in good condition and there is no excessive buildup of hardened concrete in the drum. Before any truck is used for VDOT concrete, the technician should make sure the truck has a current VDOT strap tag.

The volume of concrete mixed per batch shall not be less than 15 percent nor more than 110 percent of the mixer's rated capacity.

CONCRETE BATCH REPORT - FORM TL-28A

Before the truck leaves the plant, the upper half of Form TL-28A, should be filled out by the producer. He should send the original to the project with the truck driver and retain the carbon copy for his records. An example of Form TL-28A is shown on Page 10 - 9.

FIGURE 14 BATCH PLANT DIAGRAM



- 12A - SCALES
- 12B - WATER MEASURING DEVICE
- 12C - ADMIXTURE DISPENSER

FIGURE 15 ADMIXTURE DISPENSER

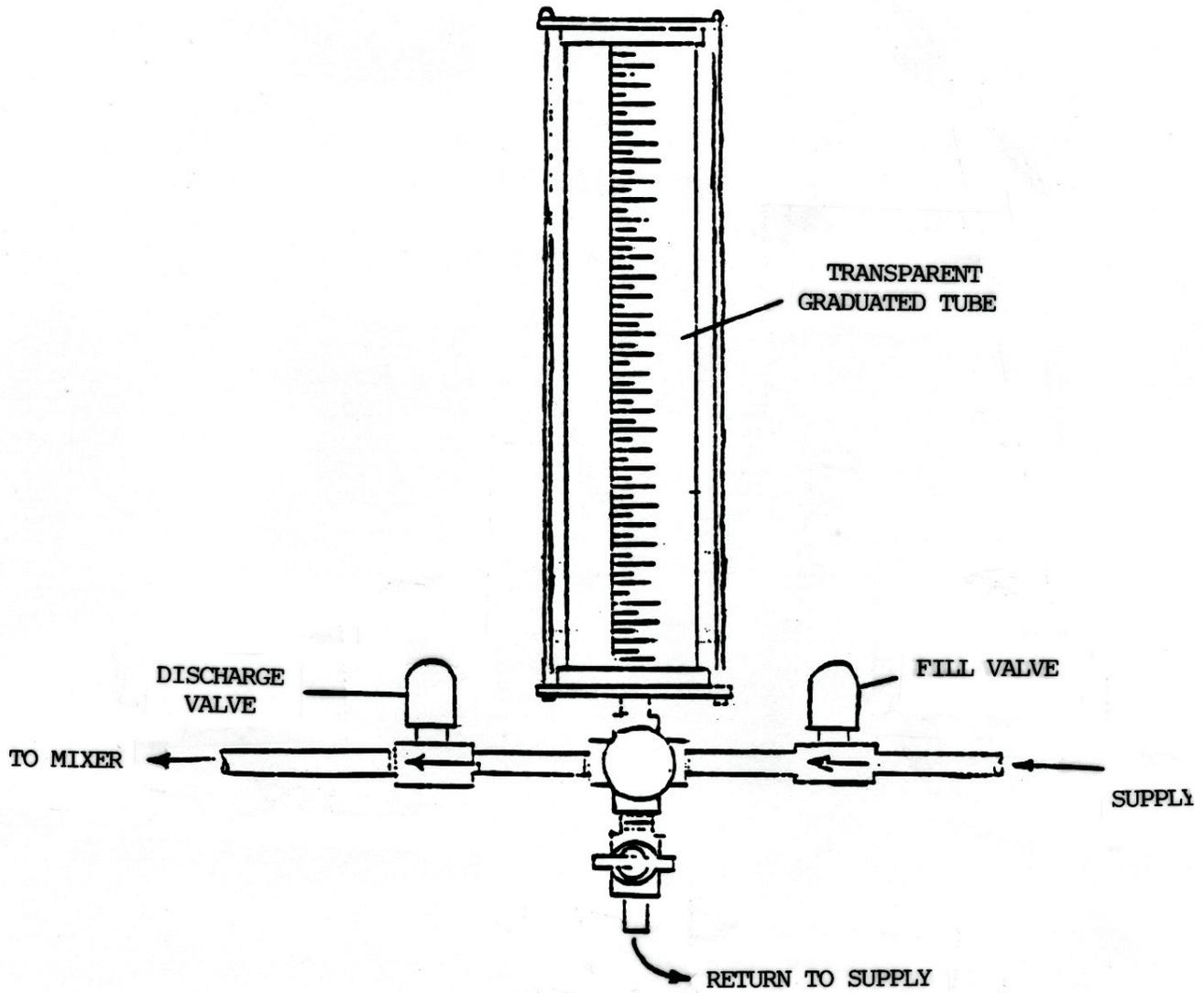
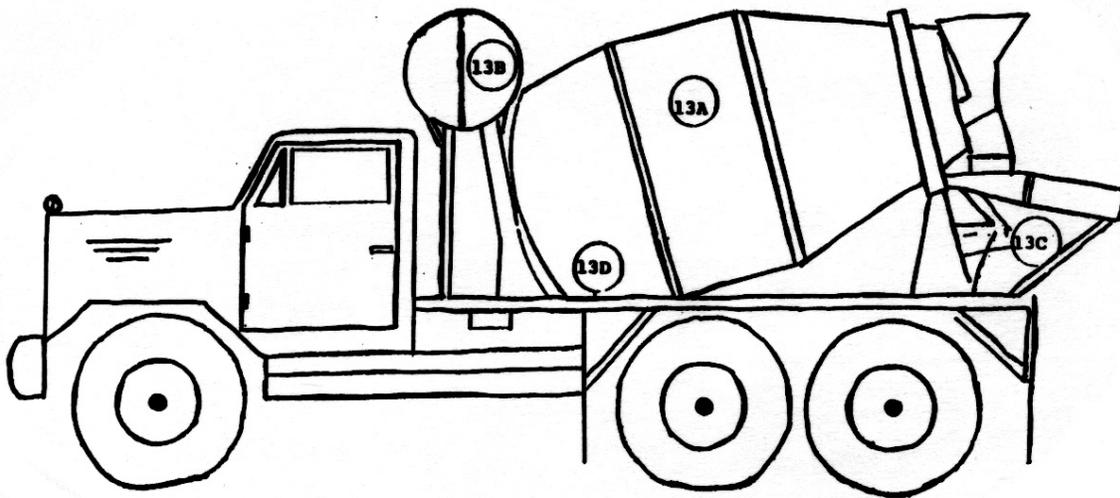
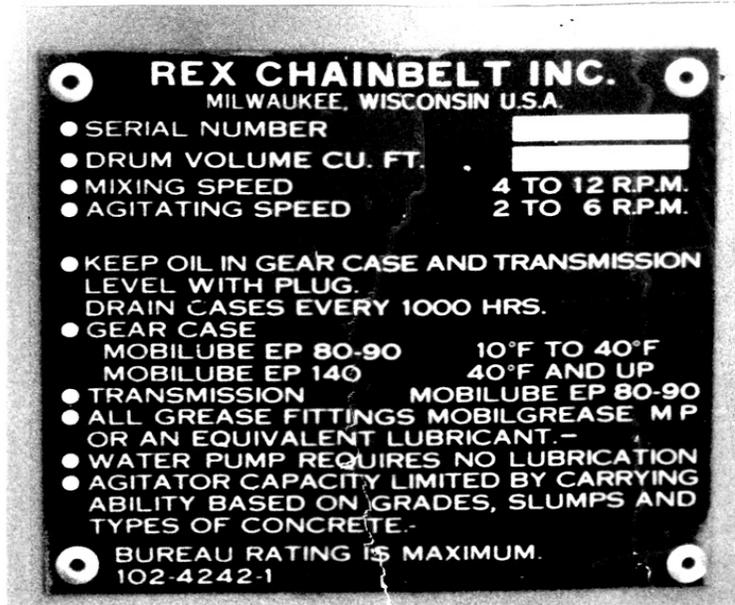


FIGURE 16 TRUCK MIXER



- 13A Drum and Blades
- 13B Water Tank
- 13C Manufacturer Plates
- 13D Revolution counter

FIGURE 17 MANUFACTURER PLATES



Chapter 5 Study Questions

1. Before any concrete is batched, the producer's technician should determine that there is an approved _____ at the plant.
2. The required weighing accuracy for cement is _____.
3. Aggregates arriving at a plant by truck are acceptable for use if they are accompanied by a _____.
4. Hopper and cement scales for batching concrete materials must be _____.
5. Aggregates should be handled and stockpiled in such a manner as to minimize _____.
6. The required weighing accuracy for aggregate is _____.
7. The minimum and maximum limits of volume of concrete which can be mixed in a mixer are _____.
8. The loader should remain _____ from the ground while removing material if stockpiles are built on the ground.

