Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Ref: 4

DEVELOPMENT DOCUMENT
FOR
EFFLUENT LIMITATIONS GUIDELINES
AND
STANDARDS OF PERFORMANCE

THE CONCRETE PRODUCTS INDUSTRIES

R/M Conc.
SIC No 3273

Contract No: 68-01-2633

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placed. Once the concrete is set, cured and the forms are removed, the external tension is released from the steel cables. The cable remains stressed due to the compression of the concrete around the cable. This method of prestressing predominates in the industry.

Prestressed post-tensioned products are made by placing cables in the form, casting the concrete, allowing it to set and cure to a certain strength, then placing the steel tendons under tension. Cables must be protected with a steel or plastic tube or mastic coating to prevent bonding with the concrete prior to tensioning. Cables may or may not be grouted while under tension and are locked under tension by appropriate end anchorage or clamps. An alternate method of post-tensioning involves casting the concrete member with a tube or slot for future insertion of the steel tendon.

3.3 Ready-Mixed Concrete (SIC 3273)

The Ready-Mixed Concrete Industry includes establishments engaged in manufacturing portland cement concrete produced and delivered to the purchaser in a plastic and unhardened state. Ready-mixed concrete represents the largest category of portland cement concrete used in the United States. According to U.S. Bureau of Census figures, 159.4 million cu m (208.5 million cu yd) were produced in 1972. This total quantity of ready-mixed concrete was produced by 4,915 total establishments, of which 1,328 establishments operated with 20 employees or more.

In contrast to this figure, the National Ready-Mixed Concrete Association (NRMCA) has indicated that there are in excess of 8,000 ready-mixed concrete plants in the U.S. A state-by-state listing of the number of companies in this industry in 1971 provided by NRMCA is presented in Table III-2.

The two processes used for ready-mixed concrete are batching and central mixing. At a batch plant, the concrete is mixed in the truck mixer, while at a central mix plant, the concrete is prepared in a plant mixer then transferred to a truck mixer or agitator for delivery.

The raw materials for the concrete, coarse and fine aggregate and cement are usually shipped to the plant via rail or truck. However, at some 300 ready-mixed establishments according to Census figures, the coarse or fine aggregate is mined or quarried at the plant site. The coarse and fine aggregates are generally stockpiled in the open, where they are kept saturated with moisture. The aggregates are transferred to the plant by conveyor, front end loader or crane, to distribution bins. The portland cement is usually received in bulk form either by rail or by truck, transferred to a cement hopper, and then conveyed to a storage silo or to the central batch bin. The aggregates and cement are weighed and blended into a mixer with a premeasured quantity of water and the concrete is mixed for specified length of time. At a batch plant, the mixing is accomplished in the truck mixer, while in a central mix plant, a central mixer is used which then transfers the concrete to an agitator truck.

(1) Permanent - This type of plant uses ready-mixed trucks which deliver various types of concrete to numerous customers. The concrete may be mixed in central mixers and hauled in agitator trucks or may be dry batched into mixer trucks and mixed in the truck on the way to the job.

(2) Portable - This is the type of plant used on large highway and airport paving jobs. The concrete may be produced in a central mixer and hauled in agitator trucks or it may be dry batched into trucks and hauled to a portable mixer at the construction site. The latter is the older method.

(3) Mobile - The mobile concrete plant utilizes trucks capable of measuring and mixing the aggregate, cement, and water at the job site. The raw materials are transported separately on the mobile truck, proportioned and mixed in the truck-mounted mixer at the job site. Mobile ready-mixed concrete is primarily used for small jobs that can be economically serviced without returning to the base plant after each job.

The permanent ready-mixed concrete plant may operate either as a dry batch plant or a central mixer plant. In a dry batch plant, the mix of aggregate and cement are weighed and

transferred in a dry state to the ready-mixed trucks along with a proportioned amount of water, then mixed in the truck. This type of operation is found in approximately three-fourths of the plants in the permanent segment of the ready-mixed industry. The other one-fourth of these plants uses a central mixer with an average capacity of 4 cu m (5 cu yd).

A general practice in the construction industry is to order slightly more concrete than necessary to complete the job to prevent running short. This practice results in an excess of concrete in the truck which must be either dumped or reused. In some cases, the unused concrete is dumped on the job site, however, in most cases, it returns to the plant in the ready-mixed truck to be either incorporated in the following order, used for paving the plant yard, or flushed out as waste material. The disposal of the unused concrete depends on the amount left in the truck, the length of time since batching, the formulation of the following order, and other factors. The amount of returned waste concrete varies but averages between 1 to 3 percent of average daily production. Ready-mixed concrete plants use water primarily in the batching of concrete, and for washing out the ready-mixed trucks and central mixer. The washout is an essential part of the daily operations of all concrete plants to prevent hardening of the concrete in the equipment and consequent lost time and maintenance costs.

The concrete produced by ready-mixed plants can be considered to be made of two major components, aggregates and paste. The aggregates generally occupy 60 to 80 percent of the volume of concrete. The most commonly used aggregates such as sand, gravel, crushed stone, and air cooled blast furnace slag produce a normal weight concrete having a density in the range of 2,166 to 2,568 kg/cu m (135 to 160 lbs/cu ft). Structural lightweight concretes use aggregates such as expanded shale, clay, slate and slag. The lightweight concretes have densities ranging from 1,364 to 1,846 kg/cu m (85 to 115 lbs/cu ft). Other lightweight materials such as pumice, scoria, perlite, vermiculite, and diatomite are used to produce insulating concretes weighing 241 to 1,445 kg/cu m (15 to 90 lbs/cu ft). Heavyweight concrete is produced primarily for nuclear applications and uses heavy aggregates such as barite, limonite, magnetite, ilmenite, and iron or steel particles.