TOLEDO FIRE & RESCUE DEPARTMENT

C-17 Concrete Construction

Emergency Manual

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Policy/Procedure

When fires or other emergencies are encountered at construction sites where concrete construction is being used, special precautions must be employed due to the nature of concrete and its construction processes.

There are two main divisions of concrete construction: Cast -in-place and Pre-cast. Cast- in-place is, as the name implies, cast (formed and poured) in the place it is intended to remain. Cast-in-place concrete can be plain concrete, reinforced concrete or post-tensioned concrete. Pre-cast concrete is concrete that has been cast in a location other than the place where it is to remain. Pre-cast concrete may be plain concrete, reinforced concrete or pre-tensioned concrete.

Pre-stressing is a process where engineered stresses are placed in cast in place concrete construction to offset the stresses that occur in the concrete when it is placed under load. There are two methods of pre-stressing concrete. They are pre-tensioning and post-tensioning. Pre-tensioning is when the concrete is poured before the stress is placed on the concrete. Steel strands or cables are stretched between abutments. Concrete is then poured into the forms which are built around the strands. As the concrete sets, it bonds to the tensioned (stretched) steel. When the concrete reaches a specific strength, the tension strands are released. This pre-stresses the concrete, putting it under compression thus creating built-in resistance to loads. In post-tensioned concrete, high tensile steel strands or bars are encased in tubing (plastic or paper are common) to prevent any adhesion to or connection with the concrete. They are then positioned in the forms with the ends of the bars exposed outside of the form. The concrete is then poured. After the concrete sets and reaches a specific strength, the steel is stretched and anchored at the ends of the unit.

Falsework is the temporary structure erected to support concrete work in the course of construction. It is composed of shores, formwork, and lateral bracing. Formwork is the mold that shapes the concrete. Shores are the members that support the formwork. Lateral bracing is usually diagonal members that

resist lateral (side) loads on the falsework. Falsework is a temporary structure usually built at the lowest possible cost and usually built by people with little or no engineering experience. It is only meant to hold concrete in place until it is set and can support its own weight. If you see falsework, always assume that the concrete has not set and will not support its own weight. When falsework bursts, it usually bursts at the bottom or lower portion of the falsework.

The following are precautions and guidelines when working at or near concrete construction sites.

1. Fires involving falsework can cause major collapse. If a fire involves or creates an exposure problem to falsework, protect the falsework from a distance. Incident commanders shall not let personnel work on or around falsework except to save a life. Newer advances have led to the use of aluminum or fiberglass falsework instead of wood. This does not diminish the hazards. Aluminum will fail and melt at low temperatures.

2. Strands or bars used in pre or post-tensioning will fail at about 800 degrees. Firefighters shall cool all exposed steel and continue to cool the exposed steel for the duration of the fire or until the threat of overheating is gone. Fire department personnel should suspect the potential of collapse in any well involved fire.

3. Concrete (especially that which is newly formed and therefore with high moisture content) can ‘spall’, or explode, sometimes violently, if exposed to high heat.

4. If spalling exposes reinforcing steel, this exposed area may become extremely susceptible to collapse. This is common with concrete floors and ceilings. Firefighters shall utilize high-velocity, narrow-fog hose streams to cool these areas as soon as possible, from a safe distance.

5. Firefighters shall avoid cutting reinforcing rods when venting with power tools. Not only will cutting reinforcing rods expose the enclosed steel to heat, but also it will naturally weaken the structure.

6. Concrete highway overpasses and underpasses are usually cast in place pre-tensioned concrete construction. A well-involved fire resulting from a vehicular accident can cause collapse of an underpass. Firefighters shall endeavor to protect all exposed steel.

7. If it is necessary to retard the setting of concrete to afford the rescue of a worker or firefighter who has become stuck in it, firefighters shall work as much sugar as can be obtained into the concrete. Concrete containing sugar sets slowly if at all.

See Also:

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