



## **2600SEG139**

# **SAFETY STANDARD FOR CONCRETE AND MASONRY CONSTRUCTIONS**

## **1.0 PURPOSE**

To establish safety requirements for Concrete and Masonry Construction.

## **2.0 BACKGROUND**

A review of existing standards was conducted and no previous record was found for this standard.

## **3.0 SCOPE**

This regulation applies to all Panama Canal Authority (ACP) employees, contractors, and third parties that carry out work or activities in ACP installations or areas under its responsibility.

## **4.0 LEGAL FOUNDATION**

This standard is based on Agreement No. 12 of the ACP Board of Directors, Hazard Control and Occupational Health Regulations, Chapter 1, Article 8.

## **5.0 DEFINITIONS**

**5.1 Bull Float:** A tool used to spread out and smooth concrete.

**5.2 Formwork:** The total system of support for freshly placed or partially cured concrete, including the mold or sheeting (form) that is in contact with the concrete, as well as all supporting members including shores, hardware, braces, and related hardware.

**5.3 Guy Line:** Cable that stabilizes a piece from a high structure by pulling against an off-centered load.

**5.4 Shore:** Supporting member that resists a compressive force imposed by a load.

**5.5 Vertical Slip Forms:** Forms which are jacked vertically during the placement of the concrete.

## **6.0 GENERAL REQUIREMENTS**

### **6.1 General Requirements**

**6.1.1** Building reinforced concrete structures and other structures in high places shall be based on blueprints that:

-Indicate the characteristics with regard to steel structures, concrete, and any other material to be used, as well as the technical procedures that will be adapted to handle and put them in place under safe conditions.

-Indicate the type, resistance, and disposition of the elements that will carry the load.

-Provide, if needed, the calculations of resistances for structures or heavy frameworks.

**6.1.2** The placement of construction loads on fully completed or partially completed structures is prohibited, unless approved by a person who is qualified in structural design, that the structure or portions of the structure is capable of supporting the loads.

**6.1.3** Employees are banned from working on any reinforced steel that protrudes vertically, unless guarded, to eliminate the hazard of impalement.



## **2600SEG139**

### **SAFETY STANDARD FOR CONCRETE AND MASONRY CONSTRUCTIONS**

**6.1.4** During steel rod post-tensioning operations, employees not essential to the operation shall not be permitted behind the jacks. The area must be isolated with barriers and adequately marked.

**6.1.5** No employee shall be permitted to work under concrete buckets while buckets are being elevated or lowered into position.

**6.1.6** No employee shall be permitted to ride concrete buckets.

**6.1.7** High pressure nozzle and injection pump operators, as well as other personnel directly involved in the operation of applying cement, sand, and water mixture through a pneumatic hose shall wear protective head and face equipment in accordance with ACP's Safety and Health Manual 2600SEG101, Section 12.

**6.1.8** Employees working more than 2 meters (6 Ft.) above any work surface, , must wear fall protection equipment.

#### **6.2 Equipment and Tool Requirements**

**6.2.1** Concrete mixers equipped with one or two yard loading skips shall be equipped with a mechanical device to clear the skip of materials.

**6.2.2** One or more yard mixers shall be installed with guardrails on each side of the skip.

**6.2.3** Powered and rotating type concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the operator removes his hands from the equipment handles.

**6.2.4** Concrete pumping systems using discharge pipes shall be provided with pipe supports designed for 100% overload. Compressed air hoses used on such systems shall be provided with positive fail-safe joint connectors to prevent separation of sections when pressurized

**6.2.5** Concrete buckets equipped with hydraulic or pneumatic gates shall have positive safety latches or similar safety devices installed to prevent the accumulation of added or loose material on top and on the sides of the bucket.

**6.2.6** The end of joints in concrete vibrators shall have a protective shield or guard.

**6.2.7** When bull float handles are used in places where they might contact energized electrical conductors, they shall be constructed of non-conductive or insulated material. The electrical and mechanical characteristics of this equipment shall provide protection equivalent to that of a handle made of insulating material.

**6.2.8** The practice of lockout and tagout for equipment used on maintenance or repair activities shall be followed. In addition, these requirements shall be in accordance with ACP's Lockout and Tagout Standard 2600SEG118.

#### **6.3 Formworks and Shoring**

**6.3.1** Formworks and shoring shall be designed, fabricated, erected, supported, braced, and maintained so that it will be capable of supporting without failure all vertical and lateral loads that might be applied to the formwork.

**6.3.2** Drawings and plans including all revisions for the jack layout, formwork, shoring, working decks, and scaffolds shall be available at the jobsite.

**6.3.3** All shoring equipment shall be inspected prior to erection to determine that the equipment meets the requirements specified in the formwork drawings. Damaged shoring equipment shall not be used for shoring.

## **2600SEG139**

### **SAFETY STANDARD FOR CONCRETE AND MASONRY CONSTRUCTIONS**

**6.3.4** Erected shoring equipment shall be inspected immediately prior to, during, and immediately after concrete placement. Shoring equipment that is found to be damaged or weakened after erection shall be immediately reinforced or re-shored.

**6.3.5** Re-shoring shall be erected, when necessary, to securely support the slabs and beams after they have been removed or when such pieces are subjected to superimposed loads due to the construction work that has been carried out.

**6.3.6** All base plates, shore heads, extension devices, and adjustment screws shall be in firm contact and secured with the foundation and the form.

**6.3.7** The sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.

**6.3.8** Welded tubular frames used for shoring must not exceed the safe work load recommended by the manufacturer.

**6.3.9** Guying: Reinforced steel for walls, piers, columns, and similar vertical structures shall be held and supported with guys to prevent collapse.

**6.3.10** Wire Mesh Rolls: Wire mesh rolls shall be secured at each end to prevent it from recoiling.

**6.3.11** Structures must be adequately supported until the concrete has been tested to guarantee that it is strong enough.

**6.3.12** Forms and shores shall not be removed until authorized by a competent person after proving that the concrete has gained sufficient strength to support its weight and any superimposed load applied to it.

#### **6.4 Vertical Slip Forms**

**6.4.1** All steel rods or pipes of hydraulic jacks or of other means used to erect formwork shall be designed for that purpose.

**6.4.2** Hydraulic jacks or vertical supports shall be positioned in such a manner that vertical loads will be uniformly distributed and shall not exceed the rated capacity of the jacks.

**6.4.3** Hydraulic jacks or other lifting devices shall have other automatic holding devices to support the slip forms whenever failure of the power supply or lifting mechanism occurs.

**6.4.4** Forms shall be kept united and in a single direction during the jacking operation.

**6.4.5** All vertical slip forms shall be provided with scaffolds or work platforms completely surrounding the work area.

#### **6.5 Masonry Construction**

**6.5.1** A limited access zone shall be established whenever a masonry wall is constructed.

**6.5.2** The limited access zone shall be established prior to the construction of the wall.

**6.5.3** The limited access zone shall be equal to the height of the wall to be constructed plus 1.2 meters ( 4 ft.), and shall run the entire length of the wall.

**6.5.4** The limited access zone shall be established on the side of the wall which will be unscaffolded.

**6.5.5** The limited access zone shall be restricted to entry by employees actively engaged in constructing the wall. No other employees shall be permitted to enter the zone.

## **2600SEG139**

### **SAFETY STANDARD FOR CONCRETE AND MASONRY CONSTRUCTIONS**

**6.5.6** The limited access zone shall remain in place until the wall is adequately supported to prevent overturning and to prevent collapse.

**6.5.7** All masonry walls over 2.4 meters ( 8 ft.) in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place.**6.6 Order, Cleanliness, and Personal Protective Equipment**

**6.6.1** During the course of construction, alteration, or repairs, form and scrap lumber with protruding nails, and all other debris, shall be kept cleared from work areas, passageways, and stairs, in and around buildings or other structures. These materials shall be placed in especially assigned areas and the disposal of the scrap lumber and debris shall be coordinated with pertinent authorities (Sanitation, Control of Vectors and Vegetation Unit (OPEM-S), Sales and Disposal of Excess Goods Unit (FAAD), or Metropolitan Cleaning Bureau, Panama or Colon municipalities).

**6.6.2** Scrap material and debris shall be removed at regular intervals during the course of the construction. Safe means shall be provided to facilitate such removal. Debris such as galvanized material, solvents, paints, brushes, rags, scrap lumber, metallic materials and other refuse will be picked up and temporarily stored in a single place. They will be recycled, if possible and if not, they will be treated in such a way as to mitigate their impact on the environment.

**6.6.3** Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers used for garbage and other oily, flammable, or hazardous wastes, such as caustics, acids, harmful dusts, etc. shall be equipped with covers. Garbage and other waste shall be disposed of at frequent and regular intervals.

**6.6.4** The personal protective equipment must be kept ready for its immediate use at all times. Workers must use and care for the personal protective equipment that is delivered to them, as well as wear adequate clothing for each type of work. The basic safety equipment is:

- Gloves, helmet, boots, goggles and, if necessary, respiratory protection equipment and/or devices.
- Take every precaution to avoid skin contact with the concrete.
- Wash frequently and, if necessary, apply cream to exposed areas of the skin.

## **7.0 RESPONSIBILITIES**

The responsibilities to guarantee compliance with this standard are described in the ACP Safety and Occupational Health Management Standard 2600SEG101.

**7.1** Training shall be provided to all personnel required to use adequate personal protection equipment during operations involving exposure to hazardous conditions. Contractor shall provide training for their own employees.

## **8.0 INQUIRIES**

Any information or clarification of the content or application of this Standard must be requested in writing to the Safety and Industrial Hygiene Unit (RHSH)

## **9.0 EXCEPTIONS**

Any requests for changes or temporary exceptions to this Standard must be made in writing to the Safety and Industrial Hygiene Unit (RHSH)



**2600SEG139**

**SAFETY STANDARD FOR CONCRETE AND MASONRY CONSTRUCTIONS**

**10.0 TERM**

This Standard shall remain in force until amended or revised.

**11.0 REFERENCES**

**11.1** Accident Prevention Manual for Business and Industry, 11th Edition, 1997, Itasca, Illinois. National Safety Council.