TO:

ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

SUBJECT: PRECAST CONCRETE WALL UNITS

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We are transmitting the following:

Standard Sheet 632-3, Precast Concrete Wall Units.

Standard Sheet 632-4, Structural Details for Precast Concrete Wall Units.

Revised Section 632 - Cribbing

Revised Subsection 704-06 - Precast Concrete Cribbing.

Special Note: Titled - Concrete Cribbing.

Design Criteria for Precast Wall Units

The precast concrete wall units are to be used as an equal alternate to the reinforced concrete cribbing now specified on Standard Sheet 632-1 and by Item 632.01 of the Standard Specifications. This alternate will be incorporated into the projects with concrete cribbing by incorporating the revised Specification for Section 632 and Subsection 704-06 into the contract as well as Standard Sheets 632-3 and 632-4.

The revision to the specifications will be added to the Standard Specifications by Addenda or a new Specification Book.

One of the following special notes will be inserted in each project using Concrete Cribbing, as the Precast Concrete Wall Units are a patented product and the Contractor may obtain these units from Marine Modules, Inc. If a Contractor elects to fabricate his own units he must use the structural details shown on Standard Sheet 632-4 and obtain a license from the Patentee.

1. The Contractor's attention is directed to the fact that this is a patented item and it will be necessary to pay a royalty for its use. A list of licensed manufacturers may be obtained from Marine Modules Inc., PO Box 333, Yonkers, New York 10710 (Telephone 914-779-5924).

2. The Contractor's attention is directed to the fact that the details shown on Standard Sheet 632-3 and 632-4 indicate unit shapes and procedures which are the patented item "Sta-Wal". A list of licensed manufacturers may be obtained from Marine Modules Inc., P.O. Box 333, Yonkers, N.Y. 10710 (Telephone 914-779-5924). If he elects to use details other than those shown on Standard Sheets 632-1, and 632-3 and 632-4, he must obtain approval for the design and erection procedures

from the Deputy Chief Engineer (Structures Design and Construction).

Note 1 should be used when no option will be allowed and he must use precast concrete wall units. Note 2 should be used when the Contractor has the option of using our standard cribbing details, precast concrete wall units or another design for cribbing.

The "Design Criteria for Precast Wall Units" was developed by the Soil Mechanics Bureau and shows safety factor vs. wall height graphically, and applies to the "Sta-Wal" type of precast wall only. The Soil Mechanics Bureau should be contacted for assistance if necessary and also if a condition not covered in this graph arises. We intend to insert the "Design Criteria for Precast Wall Units" into the Design Manual in the near future.

Walls constructed with "Precast Concrete Wall Units" possess several advantages which the Design Engineer should be aware of.

1. The erection time for the units can be shorter than for conventional concrete crib and metal bin walls because the precast units are larger and require less hand labor to install.

2. The shorter erection time makes it feasible to construct the wall in short segments. This feature is highly desirable when soil stability considerations mandate a close order construction sequence.

3. A combination of the above benefits should serve to effect an economic savings with the precast wall units over the conventional crib and bin walls.

4. In certain configurations higher wall heights may be achieved utilizing the precast units than are possible in the crib and bin wall standard sheets.

When the Design Engineer elects to allow the Contractor the option of Concrete Cribbing (Stretcher and Header Type) or Concrete Cribbing (Precast Concrete Wall Unit Type) he must set his estimate up so that all the necessary items of work are included for each type of cribbing. This is necessary because the excavation and backfill for the precast concrete wall unit is substantially less than the excavation and backfill for the stretcher and header type of concrete cribbing.

For examples of how to set up the Engineer's estimate and proposal see EI 76-68 titled "Optional Items on the Engineering Estimate."

MDG:WEH:MAK

PRECAST CONCRETE CRIBBING

Delete Section 632, page 455 through 457, and Subsection 704-06, page 617, of the Standard Specifications of January 2, 1973 in their entirety and Substitute the following:

SECTION 632--CRIBBING

632-1 DESCRIPTION

632-1.01 General. This work shall consist of all the work required for furnishing and placing precast concrete cribbing or metal bin-type retaining walls including all excavation and filling in the manner specified by the Contract Documents or the Engineer. Other types of cribbing not shown on the Standard Sheets may be furnished and placed, if approved by the D.C.E.S.

632-1.02 Definitions. The following general definitions shall be used in conjunction with this section:

A. Unit. Any single piece used to construct precast concrete cribbing or metal bin-type retaining walls. For precast concrete cribbing the word unit shall include but not be limited to, stretchers, headers (both closed and open face), coping, bearing blocks, full sections, half sections, end sections, and leveling beams. For metal bin-type retaining walls the word unit shall include, but not be limited to, stringers, spacers, columns, column caps, stringer stiffeners and base plates.

B. Bin. Any volumetric space which is designated to be filled with backfilling material, as defined in this section, and is enclosed on all four sides by precast concrete cribbing units, or metal bin-type retaining wall units.

C. Wall. A series of units to form bins connected in unbroken sequence so that, when filled with backfill material, they will act as a single entity (i.e., a retaining wall).

632-2 MATERIALS

632-2.01 Unit Materials. Materials shall meet the requirements specified in the following subsections of § 700---Materials:

Precast Concrete Cribbing	704-06
Metal Bin-Type Retaining Wall	715-11

632-2.02 Backfill. Backfill Material shall conform to the material requirements for either Stone Filling (Fine), as specified in Subsections 620-2.01 and 620-2.02, or Select Granular Fill and Select Structure Fill as specified in Subsections 203-2.01 and 203-2.02C.

632-3 CONSTRUCTION DETAILS

632-3.01 Precast Concrete Cribbing

A. Excavation. Excavation shall be conducted in accordance with the applicable requirements of § 206, "Trench, Culvert and Structure Excavation," and the details specified in the Contract Documents.

Prior to erection of the cribbing, the foundation shall be inspected and approved by the Engineer.

B. Erection. All units shall be assembled and handled in accordance with the Manufacturer's instructions and the Contract Documents. In the event of a conflict between the Contract Documents and the Manufacturer's instructions, the Engineer shall decide which course to follow. During erection, any units damaged beyond repair, shall be removed and replaced by the Contractor with approved units.

The Contractor shall have the option of using either precast or cast-in-place leveling beams when units requiring leveling beams are used. When he elects cast-in-place leveling beams they shall have dimensions equal to or greater than the dimensions shown on the Standard Sheet for this work. The concrete, for cast-in-place leveling beams, shall meet the requirements for Class A of Section 501-Portland Cement Concrete General.

C. Backfill. Immediately prior to backfilling, the Engineer shall inspect units for damage. Units, which are determined by the Engineer to be damaged, shall be rejected. Rejected units shall be replaced by the Contractor.

Filling for the interior of the bins and behind the walls shall progress simultaneously with the erection of the units and the material shall be placed as specified in § 203-3.15 "Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cables."

D. Contractor Responsibility. Movement of construction equipment and all other vehicles and loads over and adjacent to walls shall be done at the Contractor's risk. Any damage to bins and units from any cause whatsoever shall be repaired or replaced by the Contractor in a manner satisfactory to the Engineer.

632-3.02 Metal Bin--Type Retaining Walls. The provisions specified in § 632-3.01 "Precast Concrete Cribbing" shall apply with the following additions and modifications:

The ends of all stringers and spacer units shall be bolted to corner columns by means of connecting channels.

In the construction of a wall on a curve, the proper curvature for the face shall be obtained by the use of shorter stringers in the front or rear units of walls as designated on the plans or by the Engineer.

The wall height and depth may be varied, but not to exceed the maximum dimension shown for the design selected. Two or more wall designs may be incorporated in the same wall by the use of standard split columns to make the connections on the step-back.

632-4 METHOD OF MEASUREMENT

632-4.01 Cribbing or Retaining Wall. Cribbing or retaining wall shall be measured by the number of square feet of the front wall face computed between the payment lines shown on the plans or between payment lines established, in writing, by the Engineer.

632-4.02 Excavation and Disposal of Excavated Material for the Installation of Cribbing or Retaining Wall. Excavation and disposal of excavated material shall be measured by the number of cubic yards of material measured in its original position between the payment lines shown on the plans or between payment lines established, in writing, by the Engineer.

632-4.03 Backfill for the Installation of Cribbing or Retaining Wall. Backfill shall be measured by the number of cubic yards of material, computed in its final compacted position between the payment lines shown on the plans or between payment lines established in writing by the Engineer.

632-5 BASIS OF PAYMENT.

632-5.01 Cribbing or Retaining Wall. The unit price bid shall cover the cost of furnishing all materials, labor, and equipment necessary to complete the work including leveling beams required for precast concrete wall units, and the replacement or repair of any materials damaged by the Contractor's operations.

632-5.02 Excavation and Disposal of Excavated Material for the Installation of Cribbing or Retaining Wall. The unit price bid shall include the cost of all labor, material and equipment necessary to complete the work.

632-5.03 Backfill for the Installation of Cribbing or Retaining Wall. The unit price bid shall include the cost of all materials, labor, and equipment necessary to complete the work. No direct payment will be made for any losses of material which may result from compaction, foundation settlement, erosion, or any other cause; the cost of such losses shall be included in the price bid for this work. The cost of adding water for compaction of backfill shall be included in the price bid unless items for "Furnishing Water Equipment" and "Applying Water" are included in the proposal.

Payment will be made under:

Pay Item No.	Item	Unit
632.0101	Concrete Cribbing (Stretcher and Header Type)	Square Foot
632.0102	Concrete Cribbing (Precast Concrete Wall Unit Type)	Square Foot
632.02	Metal Bin-Type Retaining Wall	Square Foot

Pay Item No.	Item	Unit
632.0501	Excavation for Concrete Cribbing (Stretcher and Header Type)	Cubic Yard
632.0502	Excavation for Concrete Cribbing (Precast Concrete Wall Unit Type)	Cubic Yard
632.0503	Excavation for Metal Bin-Type Retaining Wall	Cubic Yard
632.0601	Backfill for Concrete Cribbing (Stretcher and Header Type)	Cubic Yard
632.0602	Backfill for Concrete Cribbing (Precast Concrete Wall Unit Type)	Cubic Yard
632.0603	Backfill for Metal Bin-Type Retaining Wall	Cubic Yard

704-06 PRECAST CONCRETE CRIBBING

SCOPE. This specification covers the material and fabrication requirements for precast concrete cribbing. Cribbing may consist of one of the following two types:

1. Stretcher and header type.
2. Precast concrete wall unit type.

MATERIAL REQUIREMENTS. Materials shall meet the requirements of the following Sections:

Portland Cement	701-01
Coarse Aggregates	703-02
Concrete Sand	703-07
Bar Reinforcement Grade 60	709-01
Wire Fabric for Concrete Reinforcement	709-02
Admixtures	711-08
Water	712-01

Cement shall be Type 1 or Type 2. Coarse aggregate gradation shall conform to the No. 1 Size Designation S 703-02 Coarse Aggregate, Table 703-4.

Concrete Manufacturing. The manufacturer shall formulate a concrete mix design, with a minimum cement content of 694 pounds per cubic yard, such that the properties of the concrete meet the following requirements:

Property	Requirements
Air Content, %	5.5 - 9.5
Compressive Strength, psi, Min., 28 days	3000

The Manufacturer shall maintain at the manufacturing site a record of material used and their sources, and a copy of the concrete mix design.

Fabrication. Precast concrete cribbing shall be fabricated to confrom to the shape and size shown on the Standard Sheet unless otherwise shown on the plans. The reinforcement shall be the size and configuration shown on the Standard Sheet. The Manufacturer shall produce precast cribbing units that are uniform in appearance. The units shall be straight and the concrete shall be cast in steel forms. The concrete shall be thoroughly consolidated by external or internal vibrators or a combination of both.

Curing. All cribbing shall be subjected to curing by any one of the methods described in the following paragraphs. After removal of forms and before curing begins, cribbing shall be sheltered from direct sunlight and drafts in a manner satisfactory to the Regional Director or his representative. The curing process shall commence no later than eight hours after the removal of the forms. Curing shall be accomplished to the satisfaction of the Regional Director or his representative. If at any time curing temperatures fall below the specified minimum for the chosen curing procedure, the curing period shall be increased accordingly.

(1) Steam Curing. Cribbing may be placed in a curing chamber, free from outside drafts, and cured in a moist atmosphere maintained at a temperature between 100° and 160°F, by the injection of steam for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the cribbing to meet the strength requirements. Steam curing shall not commence until at least two hours have elapsed since completion of placement of concrete in the forms.

When a curing chamber is not available, cribbing may be placed in an enclosure of canvas and subjected to steam at the temperature and for the time specified above. The enclosure shall be so erected as to allow full circulation of steam around the entire cribbing section. The interior surfaces of the curing room or canvas jackets and the surfaces of the cribbing shall be entirely moist at all times.

(2) Water Spray Curing. Under the conditions of enclosure described in the above paragraph on "Steam Curing", cribbing may be cured by subjecting it to a continuous fine spray of water in an enclosure maintained at a temperature of not less than 70°F for a period of not less than 72 hours or such additional time as may be necessary to meet the strength requirements.

(3) Saturated Cover Curing. The sides and top of each cribbing section shall be covered with heavy burlap or other suitable material saturated with water before applying and kept saturated at a temperature of not less than 70°F for a period of not less than 72 hours or such additional time as may be necessary to meet the strength requirements.

Repair. Cribbing sections that contain minor defects caused by manufacture or mishandling may be repaired. Minor defects are defined as those that are small holes or spalls that do not penetrate deeper than the steel reinforcement. Repairs shall be made using a concrete repair material conforming to the requirements of 701-04 and having a color similar to that of the cribbing section. The repair shall be finished to the proper shape and cured. It shall withstand a moderate blow with a 16 ounce hammer.

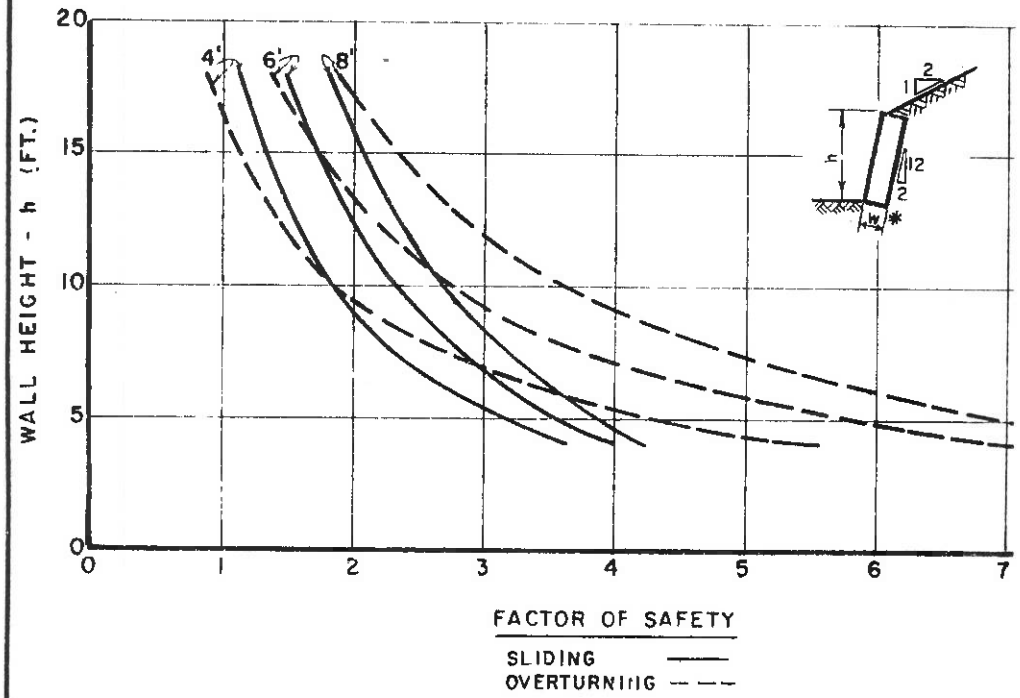
Cribbing sections having honeycombing, cracks, or large spalls are not acceptable and shall not be repaired.

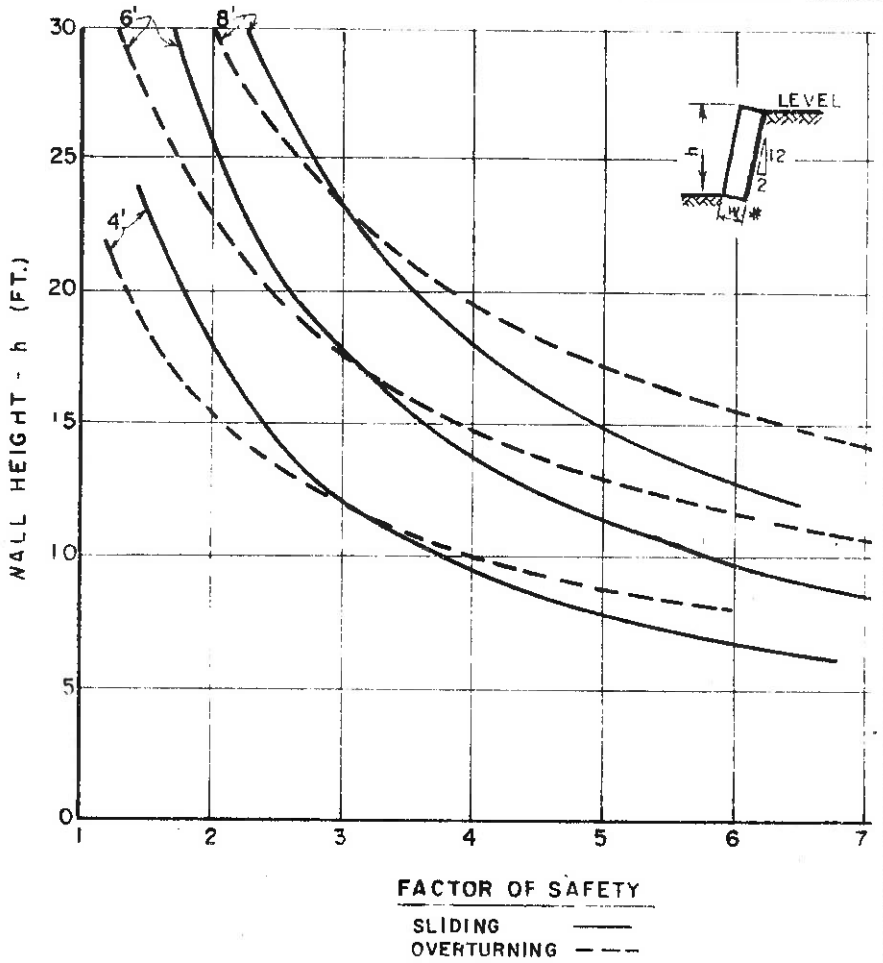
Sampling and Testing. Precast concrete cribbing sections manufactured under the requirements of this specification shall be separated into specific and identifiable stock lots. A lot shall consist of only one type of cribbing. However, a variety of sizes may be included in a lot.

The maximum number of sections in a lot shall be in accordance with Department directives.

The properties of the concrete will be determined by the Department using cores four inches in diameter drilled by the manufacturer. The sampling procedure and test methods may be obtained from the Materials Bureau.

BASIS OF ACCEPTANCE. Precast concrete cribbing will be accepted in stock lot quantities at the manufacturing location according to the procedural directives of the Materials Bureau.





NOTES ON DESIGN PROCEDURE

1. Minimum safety factors of 1.5 for sliding and 2.0 for overturning are recommended for design.

2. For earth slopes different from those indicated contact the Soil Mechanics Bureau for safe wall heights.

*W = Widths of units, i.e., 4', 6' or 8'

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
DESIGN AND CONSTRUCTION DIVISION

DESIGN CRITERIA FOR PRECAST CONCRETE UNIT RETAINING WALLS

DRAWING NO 1 OF 1

FIG.