Make the following Section a part of the Standard Specifications:

SECTION 694 – STATE-FURNISHED PORTABLE CONCRETE BARRIER, CONTRACTOR-FURNISHED INERTIAL BARRIER SYSTEM AND LANE-SHIFT PAVEMENT MARKINGS

694.01 Description. This section is for furnishing, hauling, installing, maintaining, relocating, and subsequently removing State-furnished portable concrete barriers, Contractor-furnished inertial barrier systems, and lane-shift pavement markings according to the contract documents.

694.02 Materials.

(A) State-Furnished Portable Concrete Barriers. Materials shall meet the requirements specified in the following subsections of Division 700 - Materials.

Reinforcing Steel	709.01
Structural Steel	713.01
Standard Fasteners	718.01
Reflector Marker	750.07
Preformed Pavement Marking Tape	755.04

(B) Contractor-Furnished Inertial Barrier System (Sand Barrels).

(1) Container. The inertial barrier system shall consist of modules in 200, 400, 700, 1400, and 2100 lbs. sizes. 200, 400, 700 and 1400 lbs. modules shall consist of a container molded in one piece with a minimum capacity of 21 cubic feet. The material shall be durable, weatherproof, and shall be formulated to resist deterioration from ultraviolet rays. The color shall be yellow.

This model must be of continuous molded construction and be nestable. The modules shall be designed and manufactured from a frangible polyethylene material which shall shatter upon impact to permit dispersion of the sand mass container within.

(2) Lid. Each module shall have a black lid which locks securely over the top lip of the outer container. Material shall be durable, weatherproof, and shall be formulated to resist deterioration from ultraviolet rays.

(3) Insert. All 200, 400 and 700 lbs. modules will require a cone-shaped supporting insert used to support various sand masses. Cone inserts shall be of one-piece molded construction and be nestable.

(4) Sand. Sand placed into these modules should be washed concrete sand conforming to ASTM-C-33 or equal.

The center of gravity of each properly filled module shall be at a height which will aid in controlling the pitch of standard passenger vehicles.

The components of the modules shall interface to prevent leakage of sand contained therein. The interface shall, however, permit drainage of excess water contained within the sand mass.

(5) Test Level. The inertial barrier system shall be a non-redirective, energy-absorbing terminal. For design speeds up to 43 mph it shall meet MASH, Test Level 2 (TL-2) criteria for Non-Redirective Crash Cushions, as accepted by the Federal Highways Administration (FHWA).

Inertial barrier system for design speeds above 43 mph (up to 62 mph) shall meet MASH, Test Level 3 (TL-3) criteria for Non-Redirective Crash Cushions, as accepted by FHWA.

Each inertial barrier system array shall be configured per manufacturer's recommendations, and complies with appropriate MASH Test Level criteria as indicated in the contract documents or as directed by the Engineer.

694.03 Construction.

(A) State-Furnished Portable Concrete Barriers.

(1) Portable Concrete Barriers. Select the barrier units from the State stockpile at storage location shown in the contract documents or as specified by the Engineer. Do not mix barrier units of different design standards within the same barrier installation. Haul the barrier units from the storage areas to the job site.

(2) Accessories. Furnish, install, and maintain steel pins for connecting the barrier units.

Furnish, and install one (1) RM-2 reflector marker, and a steady burn amber lamp on top of each 20-foot concrete barrier unit.

Furnish, and install longitudinal 4-inch wide permanent preformed pavement marking tape, Type I (color to match adjacent roadway pavement stripe) facing traffic on the sloped side of each 20-foot concrete barrier unit.

(3) Type II Barricades. Furnish, and install Type II Barricades with a steady burn amber lamp. Spacing and position shall comply with part 6 of the MUTCD Typical Application 5.

(4) Installation. Erect all barrier units in accordance with the contract documents or as directed by the Engineer. The units shall have a maximum of 1/4–inch offset in any direction between adjacent panels at the connections. Horizontal alignment of the panels shall be such that any panel is not out of alignment by more than 1/2–inch from a straight line.

If required during construction, relocate the barrier units at locations shown in the contract documents or as directed by the Engineer at no increase in contract price and contract time.

Any damaged barrier unit that, in the judgment of the Engineer, is considered irreparable shall be replaced with a State-furnished barrier unit at no increase in contract price or contract time.

(a) End Treatments. Contractor shall shield barrier ends exposed to traffic with end treatments that comply with appropriate MASH Test Level criteria as indicated in the contract documents or as directed by the Engineer. Do not mix existing State portable concrete barrier of older NCHRP-230 design, if available, with newer NCHRP-350 compliant units within the same barrier installation.

(b) Cleaning and Repair. Upon completion of the work, remove, clean, and repair all barrier units. The cleaning and repair of the units shall be performed regardless of cause, such as ‘wear and tear’ or improper handling by the Contractor during use. Repair all damaged unit back to its original configuration.

All portable concrete barrier units will be inspected by the Engineer before the Contractor delivering them to the storage area.

(c) Hauling and Storage. Upon completion of the work, clean, repair, remove, haul, and store all barrier units at the storage location shown in the contract documents or as directed by the Engineer. If the final destination is not available when the units are ready to be removed, haul the units to an interim location at no increase in contract price or contract time.

(B) Contractor-Furnished Inertial Barrier System (Sand Barrels).

(1) Installation. Furnish, install, and maintain the inertial barrier system in accordance with the manufacturer's recommendations. Grade and compact the ground prior to placing modules. Filling each installed inertial barrier module with sand.

(a) Cleaning and Repair. Upon completion of the work, remove, clean all inertial barrier modules. Remove and dispose of sand from installed inertial barrier modules.

All inertial barrier modules will be inspected by the Engineer before the Contractor delivering them to the storage area.

(b) Hauling and Storage. Remove, haul, and store all empty modules at the storage location shown in the contract documents or as directed by the Engineer. If the final destination is not available when the units are ready to be removed, haul the units to an interim location at no increase in contract price or contract time.

(2) Ownership. The inertial barrier system (sand barrels) shall become the property of the State after project completion.

(C) Pavement Striping and Markers for Lane Shifting.

Furnish, and install pavement striping and markers according lane shift striping plan in contract and to **Subsection 629.03 (C) Permanent Pavement Markers**. Do not use temporary pavement striping and markers.

Pavement Striping shall be done in accordance with the contract documents or as directed by the Engineer. If no lane shift striping plan is provided, submit striping plan for approval 14 days prior to the setting of the units.

If pavement markings need to be modified due to change in traffic pattern, all conflicting pavement striping shall be eradicated per **Subsection 629.03(D) Removal of Existing Pavement Markings**. Eradication of existing markings by painting over them will not be allowed.

Furnish and install lane shift traffic control signs shown in the lane shift striping plan in contract, in accordance with **Subsection 631.03 Construction** or as directed by the Engineer.

Upon completion of the contract work, remove the lane shift striping and markers, lane shift traffic control signs, and restore original striping and markers in accordance with the contract documents or as directed by the Engineer.

694.04 Measurement. The Engineer will measure State-furnished portable concrete barrier per each according to the contract.

The Engineer will measure the inertial barrier system per each according to the contract.

The Engineer will not measure installing, maintaining, and subsequently removing lane shift pavement striping and markers for payment.

694.05 Payment. The Engineer will pay for the accepted State-furnished portable concrete barriers at the contract unit price per each. The price includes full compensation for work prescribed in this section and the contract documents.

The Engineer will not pay separately for transporting, installing, maintaining, relocating, and subsequently removing the State-furnished portable concrete barriers. The price includes full compensation for preparing beds; hauling and setting State-furnished barriers; installing connector pins; maintaining reflector markers, lamps, and permanent preformed pavement marking tape; relocating barrier units during construction; cleaning, repairing and hauling the State-furnished portable concrete barriers after completion of the project as directed by the Engineer; and furnishing labor, materials, tools, equipment and incidentals necessary to complete the work.

The Engineer will pay for the accepted Contractor-furnished inertial barrier system at the contract unit price per each. The price includes full compensation for work prescribed in this section and the contract documents.

The Engineer will not pay separately for installing, maintaining, relocating, and subsequently removing the inertial barrier system. The price includes full compensation for submitting a list of materials and equipment to be incorporated in the work; grading and compacting the ground; furnishing, assembling, and installing an inertial barrier system; relocating inertial barrier system to locations specified in the contract; filling each installed inertial barrier module with sand; removal and disposal of sand; cleaning and hauling the empty modules to locations on island of Oahu as directed by the engineer upon completion of the project, and furnishing labor, materials, tools, equipment and incidentals necessary to complete the work.

The Engineer will consider the cost for the lane shift pavement striping markers, and traffic control signs as incidental to various contract pay items.

The Engineer will not pay separately for installing, maintaining, modifying, and removing the pavement striping and markers for lane shifting. The price includes full compensation for submitting the lane shift striping plans; removing the existing pavement striping and markers; installing the lane shift pavement striping, markers, and traffic control signs; removing the lane shift striping, markers and traffic control signs; and restoring original striping and markers according to the contract or as directed by the Engineer; and furnishing labor, materials, tools, equipment and incidentals necessary to complete the work.

The Engineer will pay for each of the following pay items when included in the proposal schedule:

Pay Item	**Pay Unit**
State-Furnished Portable Concrete Barrier	Each
Contractor-Furnished Inertial Barrier System	Each

The Engineer will make partial payments as follows:

(1) Pay 40% of the amount bid when the barriers are furnished and delivered to the jobsite and prepared the ground for installation.

(2) Pay 40% of the amount bid when the barriers are assembled and installed, relocated and maintained during construction, and replaced damaged barriers.

(3) Pay the remainder of the contract amount upon removal and delivery of the barriers and modules after completion of the project or as directed by the Engineer."

END OF SECTION 694