SECTION 504 - PRESTRESSED CONCRETE MEMBERS

504.01 Description. This work includes furnishing and placing prestressed concrete members according to the contract. This work shall conform to Sections 501 - Steel Structures, 503 - Concrete Structures, 505 - Piling and 602 - Reinforcing Steel.

This work includes the manufacture, transportation, storage and placement of prestressed concrete members.

The Contractor shall furnish the prestressed concrete members complete in place including concrete, prestressing steel, reinforcing steel and incidental materials.

For cast-in-place prestressed concrete, the term "member" shall mean the concrete that the Contractor is to prestress.

The Contractor shall design, fabricate and erect prestressed members according to the "Standard Specifications for Highway Bridges" adopted by the AASHTO, including the latest interims.

Subject to the acceptance of the Engineer, the Engineer may allow an alternate design of pretension, post-tension, or a combination of pretension and post-tension, for girders. The Contractor shall not make changes in the prestressing force and the location of the center of gravity of the prestressing force unless accepted by the Engineer. The Contractor shall not make changes in the cross section of the girder. If the Contractor submits a complete post-tension design, the Engineer will require an end block with a minimum length equal to the depth of the girder at each end of the girder. If the Contractor submits a design using a combination of pretension and post-tension, the Engineer may require end blocks subject to the stress requirements. For the alternate design, the Contractor shall submit to the Engineer for acceptance:

(1) preliminary plans and engineering calculations as soon as possible after the award of contract and

(2) final plans and engineering calculations at least twenty (20) working days before fabrication.

The Contractor shall prepare the plans and engineering calculations by or under the supervision of a Registered Structural Engineer. The Contractor shall prepare the alternate plans on tracing paper twenty-two (22) inches wide and thirty-six (36) inches long. The tracing paper shall have a two (2) inch margin on the left side and a half (1/2) inch margin on the other sides. The Contractor shall submit the tracings to the Engineer after final acceptance. The accepted tracings shall become the property of the Department. The Contractor shall not make changes in the size, spacing or shape of the reinforcing steel. The Contractor may increase or rearrange the bar reinforcing steel in the ends of members as required by the method of prestressing if accepted by the Engineer.

The Contractor shall compute the quantity of prestressing steel for post-tensioning. The maximum tensile stress in the prestressing steel at the jacking end shall not exceed seventy (70) percent of the specified minimum ultimate tensile strength of the prestressing steel. The actual stress in the prestressing steel induced by the jacking force shall not exceed seventy-five (75) percent of the specified minimum ultimate tensile strength of the prestressing steel.

504.02 Materials.

(A) Portland Cement Concrete. Concrete shall conform to Section 601 - Structural Concrete, and the following:

Concrete in prestressed concrete members shall have a cement content of not less than six hundred fifty-eight (658) pounds nor more than seven hundred ninety-nine (799) pounds of cement per cubic yard.

Concrete in prestressed piles shall have a minimum twenty-eight (28) day compressive strength of five thousand (5,000) pounds per square inch. Concrete for other prestressed members shall have a minimum twenty-eight (28) day compressive strength of six thousand (6,000) pounds.

The maximum nominal size of aggregate shall be three-quarters (3/4) inch.

The Contractor shall incorporate a water reducing admixture into the concrete mixture. The admixture shall conform to Subsection 711.03(B) - Water-Reducing Admixtures.

The size of the batches shall be such that the Contractor can maintain the initial workability of the concrete throughout the pouring operations. Slump for concrete shall be the minimum necessary for satisfactory placement of the concrete without honeycomb. The Engineer will not permit retempering.

(B) Other Materials. Other materials shall conform to the following:

Portland Cement	701.01
Reinforcing Steel	709.01
Prestressing Steel	709.03
Water	712.01

504.03 Construction Requirements.

(A) General. Before casting prestressed members, the Contractor shall submit to the Engineer for acceptance shop drawings. The shop drawings shall show complete details of the method, materials and equipment for

use in the prestressing operations. Such details shall outline the method and sequence of stressing. Such details shall include complete specifications and details of the prestressing steel and anchoring devices, anchoring stresses, type of enclosures and other data for the prestressing operation. The prestressing operation includes the proposed arrangement of the prestressing steel in the members, pressure-grouting materials and equipment. *|

The Contractor shall get the services of an authorized person from the manufacturer. This person shall give aid and instruction in the use of the prestressing equipment and installation of materials as may be necessary to attain the required results. The Contractor shall have a trained, skilled, and certified technician from the manufacturer in the prestressing method to supervise the prestressing operations. *|

When the Contractor does electric welding on or near members containing prestressing steel, the Contractor shall attach the welding ground directly to the steel. The Contractor shall protect the prestressing steel against temporary subjection to excessive temperatures such as produced by torches, welding equipment, sparks or arcing. *|

This contract defines working force and working stress as the force and stress remaining in the prestressing steel after losses. Losses include: *|

(1) creep and shrinkage of concrete, *|

(2) elastic compression of concrete, *|

(3) creep of steel, *|

(4) losses in post-tensioned prestressing steel due to sequence of stressing, friction and take up of anchorages, and *|

(5) other losses peculiar to the method or system of prestressing. *|

The Contractor shall fabricate the prestressed concrete members to plan dimensions within tolerances according to Division 6, Section 4 of the PCI manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products. Members having dimensions outside the tolerance limits may be subject to rejection. The Engineer will decide whether the Contractor shall impair the function and use of a particular member due to dimensional excesses above the specified tolerances. *|

(B) Prestressing Equipment. The Contractor shall tension the prestressing steel by hydraulic jacks or other means acceptable by the Engineer. The Contractor shall equip each jack used to stress tendons with either a pressure gage or a load cell for determining the jacking stress at the option of the Contractor. The Contractor shall accompany *|

each jack by an accepted calibration chart. The pressure gage, if used, shall have an indicating dial at least six (6) inches in diameter and have an accuracy in reading of one (1) percent or better. The Contractor shall calibrate the jack and gage as a unit with the cylinder extension in the approximate position so that the jack will be at final jacking force according to HWY-TQ 14 by a qualified laboratory. The Contractor shall calibrate the load cell, if used. The Contractor shall provide the load cell with an indicator so that the Contractor may decide the prestressing force in the tendon. The range of the load cell shall be such that the Contractor will not use the lower ten (10) percent of the manufacturer's rated capacity in determining the jacking stress.

The Contractor shall submit the information as specified in HWY-TQ at least two (2) weeks before usage of each jack. The permissible variation of the calibration curve shall not exceed ± five (5) percent within the loading range of the jacking unit. Calibration of the jacking equipment shall be at intervals not exceeding two (2) years for the load cell, one (1) year for the gage and jack, and after each repair. The Engineer may require recalibration if the accuracy of the jacking unit is in doubt.

The Engineer may verify the prestressing force with a State furnished load cell. The Contractor shall provide sufficient labor, equipment and material to install, support and protect the load cell at the prestressing tendons and to remove the load cell after the verification is complete as ordered by the Engineer.

Jacking units whose calibration chart show jacking forces greater than ninety-five (95) percent of the pressure times piston area may be reason for recalibration.

Gages shall have indicating dials at least six (6) inches in diameter and have an accuracy in reading of one (1) percent or better.

The Contractor shall use the identical tensioning equipment on each end of the prestressed member when the Contractor does simultaneous or two (2) end non-simultaneous post tensioning.

The Contractor shall seat the anchorage cones with hydraulically operated pistons.

The Contractor shall take safety measures to prevent accidents due to possible breaking of the prestressing steel or the slipping of the grips during the tensioning process.

(C) Prestressing Steel. The Contractor shall protect the prestressing steel against physical damage and rust, or other results of corrosion from manufacture to grouting or encasing in concrete. The Engineer will reject the prestressing steel that has sustained physical damage. The development of visible rust or other results of corrosion shall be cause for rejection when ordered by the Engineer.

When placed in the work, the Contractor shall clean the *| prestressing steel. The prestressing steel shall be free of oil, dirt, *| corrosion, scale, detrimental rust or other foreign matter.

The Contractor shall package the prestressing steel in containers *| or shipping forms for the protection of the steel against physical damage and corrosion during shipping and storage.

The Contractor may apply a corrosion inhibitor directly to the *| steel when permitted by the Engineer. The corrosion inhibitor shall have *| no deleterious effect on the steel or concrete or bond strength of steel to concrete. The Contractor shall replace or restore the packaging or *| forms damaged immediately to original conditions. *|

The Contractor shall mark the shipping package or form clearly *| that: *|

(1) the package contains high-strength prestressing steel, *|

(2) the package needs to be handled with care, *|

(3) the type, kind and amount of corrosion inhibitor used, *| including the date when placed, safety orders and instructions for *| use. *|

The Contractor shall protect the prestressing steel installed in *| ducts continuously against rust or other corrosion. The exception is *| when the Contractor grouts the ducts within twenty-eight (28) calendar *| days after the Contractor installed the prestressing steel in the ducts *| by a corrosion inhibitor placed in the ducts or applied to the *| prestressing steel in the ducts. The corrosion inhibitor shall conform to the contract. *|

The Contractor shall tension the prestressing steel by hydraulic *| jacks so that the force in the prestressing steel shall not be less than the value shown in the contract. The Contractor shall consider the force *| in the prestressing steel as the smaller of the two values determined by *| the measured elongation and the gage pressure. If the difference in stress exceeds five (5) percent of the required prestressing force, the | Contractor shall end the stressing process. The Contractor shall not *| resume until the Contractor submits the data showing the cause of the *| difference in stress and makes corrections acceptable by the Engineer. *|

The Contractor shall submit a record of gage pressures, jacking *| forces, seating losses and elongations to the Engineer daily for *| acceptance. *|

(D) Placing Steel. The Contractor shall straighten the wires, strands, *| wire groups, parallel-lay cables, and other prestressing elements to *| insure proper positioning in the enclosures for prestressed reinforcement.

The Contractor shall provide suitable horizontal and vertical spacers, if required, to hold the wires or strands in place in true position in the enclosures.

(E) **Pretensioning Method.** The Contractor shall hold the prestressing elements accurately in position and stressed by jacks. The Contractor shall keep a record of the jacking force and the elongations produced. The Contractor may cast several units in one (1) continuous line and stressed at one time. The Engineer will not permit the use of completed units in a line as part of the anchorage system. The Contractor shall leave sufficient space between ends of units to permit access for cutting after the concrete has attained the required strength.

When the Contractor prestresses by the multi-strand jacking method, the Contractor shall bring the strands to the accepted uniform initial tension before the Contractor gives their full pretensioning. The Contractor shall measure the initial tension of each strand by a dynamometer, gauge, load cell or other means accepted by the Engineer.

After the initial tensioning, the Contractor shall stress the strands until the Contractor attains the specified elongation and jacking pressure.

If the Contractor uses deflected pretensioned strands, the Contractor shall elongate the deflected strands first to a straight line and then deflect to the final position. The tension in the strands in the deflected position shall be the initial pretension required by the contract. The Contractor may use other tensioning methods of deflecting strands with the acceptance of the Engineer.

The Contractor shall use the low-friction devices at points of change in slope of strand trajectory at time of tensioning of draped pretensioned strands.

When the Contractor creates friction on or against the strands during post tensioning, the Contractor shall require a friction test at no cost to the State, according to the post-tension method.

Before stringing of strands, the Contractor shall inspect the bottom of forms for cleanliness and accuracy of alignment. The Contractor shall treat the form surfaces to be in contact with concrete with an effective bond breaker. The Contractor shall prevent contamination of the strands by bond breakers, mud, grease or other undesirable materials. The Contractor shall not string the strands outside the casting bed unless accepted by the Engineer in writing.

The Contractor may transfer the bond stress to the concrete, or end anchorages released when the concrete attains a compressive strength of at least four thousand (4,000) pounds per square inch. The Contractor may use three thousand five hundred (3,500) pounds per square inch for prestressed piles, or the value shown in the contract if larger.

Before the Contractor transfers stress to the members, the Engineer *| will accept the pattern and schedule for releasing the strands. The *| Contractor shall strip of loosen the forms that tend to restrict the *| horizontal or vertical movement of the member before the Contractor *| transfers the stress. *|

The Contractor shall release the hold-down anchors for the *| deflected strands in the sequence shown on the accepted shop drawings. *|

Transfer of prestress shall be either by the multiple strand | release method or by the single strand release method. |

When the Contractor uses the multiple strand release method, the *| Contractor shall release a symmetrical group of strands or all the | strands gradually and simultaneously. The Contractor shall remove the *| load on the strands and place the load on the jacking system. The *| Contractor shall release the jack(s) gradually until the Contractor *| relaxes the strands. *|

When the Contractor uses the single strand release method, the *| Contractor shall detension the strands by slow-heat cutting, using a low *| oxygen flame. The Contractor shall not cut the strands quickly. The *| Contractor shall heat and allow each strand to pull itself apart in the *| sequence of the pattern and schedule of release. |

The Contractor shall cut off the exposed ends of the prestressing *| steel not embedded in concrete flush with the end of the member. The *| Contractor shall coat the exposed ends of the prestressing steel heavily *| with roofing asphalt or coal tar. |

Prestressing steel embedded in concrete shall extend beyond the | ends of the member as ordered by the Engineer. |

(F) Placing Concrete. The Contractor shall inform the Engineer in | writing that the placement of the reinforcing steel, conduits, | anchorages, prestressing steel and others shown in the contract are | ready for inspection. The Contractor shall not pour the concrete in the *| forms until the Engineer inspects the placement of the reinforcement, | conduits, anchorages, prestressing steel and others shown in the | contract. The Engineer will permit the Contractor to pour concrete in *| writing. The Contractor shall place the encased concrete items *| accurately in position. The Contractor shall hold the encased concrete *| items firmly during the placing and setting of the concrete. *|

The Contractor shall vibrate the concrete internally or externally, *| or both. The Contractor shall apply the internal vibration to the *| concrete for time intervals of about (10) seconds and at points not more | than thirty (30) inches apart. The Contractor shall not use the *| vibrators to move the concrete horizontally in the form. The Contractor *| shall avoid displacement of the reinforcement, prestressing strand, *| sheaths, shoes and inserts. |

The Contractor shall place the concrete for each unit in a minimum of two (2) continuous lifts. Not more than thirty (30) minutes shall elapse between the placing of contiguous lifts of concrete. The thickness of the first layer for I-beam sections shall be such that the top of the concrete is slightly above the top of the bottom fillet. The Contractor shall modify the casting procedure if the concrete sets before the Contractor places another lift.

The Contractor shall make the concrete test cylinders and test according to Subsection 601.02 for each prestressed concrete casting bed and for each day's production. The number of cylinders and methods of test shall be as ordered by the Engineer. The Contractor shall decide the compressive strength of concrete at the location of manufacture of prestressed concrete members.

(G) Curing. The Contractor shall steam cure under a suitable enclosure to contain the live steam and to minimize moisture and heat losses. The initial application of the steam shall be from two (2) to four (4) hours after the final placement of concrete. If the Contractor uses retarders, the Contractor shall increase the waiting period before application of the steam from four (4) to six (6) hours. The steam shall be at one hundred (100) percent relative humidity to prevent loss of moisture and to provide excess moisture for proper hydration of the cement. Application of the steam shall not be directly on the concrete. During application of the steam, the ambient air temperature shall increase at a rate not to exceed forty (40) degrees Fahrenheit per hour until the Contractor reaches a maximum temperature of from one hundred forty (140) to one hundred sixty (160) degrees Fahrenheit. The Contractor shall hold the maximum temperature until the Contractor reaches the desired strength. In ending the steam, the ambient air temperature shall not decrease at a rate that exceeds forty (40) degrees Fahrenheit per hour until the Contractor reaches a temperature of about twenty (20) degrees Fahrenheit above the temperature of the air to which the Contractor shall expose the concrete. To prevent moisture loss on exposed surfaces during the presteaming period, the Contractor shall keep the exposed surfaces wet by fog spray, wet blankets, or methods accepted by the Engineer.

The Engineer will permit water curing, instead of steam curing, for prestressed members. The Contractor shall continue the water curing for at least seven (7) days after the Contractor places the concrete.

The Engineer will not permit impervious membrane curing on prestressed members.

If time lapses before the Contractor applies the prestress to the units under fabrication, the Contractor shall keep the units continuously wet until the Contractor prestresses them. The Contractor shall submit the method of continued curing for acceptance by the Engineer.

(H) Post-tension Method.

(1) Ducts. Post-tensioned prestressed members shall be of the bonded type. The Contractor shall install the tensioned steel in holes or accepted zinc-coated metal ducts cast in the concrete. The Contractor shall bond the tensioned steel to the surrounding concrete by filling the tubes or ducts with grout. The Contractor shall not leave void spaces, entrapped air, or entrapped water in the void spaces. The Contractor shall grout the ducts within three (3) days after the Contractor tensions the prestressing steel. The Contractor shall allow the grout to set for not less than three (3) days before the Contractor handles or induces loading or stressing of members.

Duct enclosures for prestressing steel shall be rigid ferrous metal, zinc-coated and mortar tight.

The Contractor shall fabricate the ducts with either welded or interlocked seams. The Contractor shall not require zinc-coating of the welded seam. Ducts shall have sufficient strength to maintain their correct alignment during placing of concrete. Joints between sections of duct shall be positive metallic connections that do not result in angle changes at the joints. The Contractor shall waterproof the joints with tape, sheet metal and other accepted materials. The Contractor shall bend the ducts without crimping or flattening. The Contractor need not zinc-coat the transition couplings connecting said ducts to anchoring devices.

Duct alignment shall be smooth, parabolic curve with no visible kinks or abrupt changes. The Contractor shall place the duct accurately at the locations shown in the contract or accepted by the Engineer.

The Contractor shall provide the ducts or anchorage assemblies with pipes or other suitable connections for the injection of grout after prestressing. When the Contractor uses bars, ducts for prestressing steel shall have a minimum inside diameter three-eighths (3/8) inch larger than the diameter of the bars used. The Contractor shall fasten the ducts for prestressing steel securely in place to prevent movement. After installation in the forms, the Contractor shall cover the ends of ducts as necessary to prevent the entry of water or debris. If the Contractor installs prestressing steel after placing concrete, the Contractor shall show that the ducts are free of water and debris.

Before placing forms for the top slabs of box girder cells, the Contractor shall show according to the contract that either:

(a) the prestressing steel is free or unbonded in the duct or

(b) if the Contractor has not yet placed the prestressing steel, that the ducts are unobstructed.

Before post-tensioning members, the Contractor shall show that *| the prestressing steel is free and unbonded in the duct according to *| the contract. *|

The efflux time of a grout sample immediately after mixing shall not be less than eleven (11) seconds when tested according to *| ASTM C939.

Immediately before grouting, the Contractor shall flush the *| ducts thoroughly with clean water and then all surplus water removed *| by compressed air.

Water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 0.1 pound per gallon. Compressed air used to blow out ducts shall be oil free.

For long and/or continuous members with draped strands, the Engineer will require open taps at the high and/or low points of the *| duct. *|

(2) Anchorages. The Contractor shall secure the post-tensioned *| prestressing steel at the ends by accepted permanent type positive *| anchoring devices. The Engineer will not permit loop tendon *| anchorages. *|

The Contractor shall ensure that the anchorage devices for *| post-tensioning can hold the prestressing steel at a load producing *| a stress of not less than ninety-five (95) percent of the guaranteed minimum tensile strength of the prestressing steel.

The Contractor shall distribute the load from the anchoring *| device to the concrete by accepted devices that will effectively *| distribute the load to the concrete.

Such accepted devices shall conform to the following *| requirements: *|

(a) The final unit compressive stress on the concrete directly beneath the plate or assembly shall not exceed three thousand (3,000) pounds per square inch.

(b) Bending stresses in the plates or assemblies induced by *| the pull of the prestressing shall not: *|

1. exceed the yield point of the material or *|

2. cause visible distortion in the anchorage plate *|

when the Contractor applies ninety-five (95) percent of the *| specified ultimate tensile strength of the tendons according to *| the contract. *|

If the Contractor chooses to furnish anchoring devices of a type that:

(a) are sufficiently large,

(b) uses with a steel grillage embedded in the concrete, and

(c) effectively distributes the compressive stresses to the concrete,

the Contractor may omit the steel distribution plates or assemblies.

The Contractor shall clean the surfaces of concrete by abrasive blasting and expose the cleaned aggregate after the Contractor completes the grouting of the ducts.

If the Contractor will not cover the end of a post-tensioned assembly by concrete, the Contractor shall recess the anchoring devices so that the ends of the prestressing steel and parts of the anchoring devices will be at least two (2) inches inside the end surface of the members. Following post-tensioning, the Contractor shall fill the recesses with grout, and finished flush.

(3) Friction Tests. Before final tensioning of the prestressing steel, the Contractor shall conduct friction tests to verify the friction losses used in calculating the working force. The Contractor shall conduct at least two (2) friction tests for each different tendon or duct length and profile. The cost shall be incidental to the prestressing operation. The Engineer will not pay for the tests separately. Friction test procedure shall be subject to acceptance of the Engineer.

(4) Tensioning Process. The Contractor shall tension the prestressing steel by simultaneous jacking at both ends. The Contractor shall conduct the tensioning process so that the Contractor may measure the tension and the elongation. The Contractor shall not apply the loads to the concrete until the Contractor attains the strength as specified for pretensioning method. The Contractor shall not apply the loads no sooner than ten (10) days after the Contractor places the last concrete. The Contractor shall show the stressing sequence on the shop drawings. The Contractor shall keep the temporary lateral eccentricity to a minimum.

(5) Grouting. Grout includes portland cement, water, and an expansive admixture accepted by the Engineer. The grout shall be fluid (consistency of thick paint) but proportioned so that free water shall not separate out of the mix.

Water shall comply with Section 712. The Contractor shall not *| use admixtures containing chlorides or nitrates. The Contractor *| shall first add the water to the mixer followed by the cement and *| admixtures.

The Contractor shall mix the grout in mechanical mixing *| equipment of a type that will produce uniform and thoroughly mixed grout. The water content shall be not more than five (5) gallons per sack of cement. The Engineer will not permit retempering of *| grout. The Contractor shall continuously agitate the grout until *| the Contractor pumps the grout. *|

The efflux time of a grout sample immediately after mixing shall not be less than eleven (11) seconds when tested according to *| ASTM C939. |

The Contractor shall ensure that the grouting equipment can *| grout at a pressure of at least one hundred (100) pounds per square inch. The Contractor shall furnish the grouting equipment with a *| pressure gage having a full-scale reading of not more than three hundred (300) pounds per square inch.

The Contractor shall ensure that the standby flushing equipment *| can develop a pumping pressure of two hundred fifty (250) pounds per *| square inch and of sufficient capacity to flush out partially *| grouted ducts. *|

Ducts shall be clean and free of deleterious materials that would impair bonding of the grout or interfere with grouting procedures.

Grout shall pass through a screen with 0.0787 inch maximum clear openings before the Contractor introduces the grout into the *| grout pump.

The Contractor shall fit the grout injection pipes with *| positive mechanical shutoff valves. The Contractor shall fit the *| vents and ejection pipes with valves, caps, or other devices that *| can withstand the pumping pressures. The Contractor shall not remove *| or open the valves and caps until the grout has set. *|

The Contractor shall prevent the leakage of grout through the *| anchorage assembly by positive mechanical means. *|

The Contractor shall pump the grout through the duct. The *| Contractor shall continuously waste the grout at the outlet until: *|

a. the Contractor does not eject visible slugs or other *| evidence of water or air and *|

b. the efflux time of ejected grout is not less than eleven *| (11) seconds. *|

The Contractor shall then close the outlet valve and hold the pumping pressure momentarily. The Contractor shall then close the valve at the inlet while maintaining this pressure.

When the hot weather conditions contribute to quick stiffening of the grout, the Contractor shall cool the grout by accepted methods as necessary to prevent blockages during pumping operations.

(I) Handling, Storage and Transportation. The Contractor may handle the precast prestressed members immediately after the Contractor transfers the prestressing forces to the concrete.

If the Contractor does not stress the prestressed members in a continuous operation, the Contractor shall not handle or disturb the prestressed members.

The Contractor shall maintain the beams and girders in an upright position. The Contractor shall pick up and support the beams and girders at points near their ends. The Contractor shall pick up the piles at the pick-up points shown in the contract. The Contractor shall support the piles at the pick-up points. The Contractor may support the piles at other locations if accepted in writing by the Engineer.

The Contractor shall stabilize the storage areas for precast prestressed members. The Contractor shall provide suitable foundations.

The Contractor shall separate and support the stacked members by battens placed across the full width of each bearing point. The Contractor shall arrange the battens in the same vertical planes and at support locations as described above. Stacking of members shall be such that lifting devices will be accessible and undamaged. The Contractor shall not use the upper members of a stacked tier as storage areas for shorter members or heavy equipment.

During transportation, the Contractor shall make provisions for supporting the members as described above, with adequate bracing to insure their maintaining the vertical position and damping of dangerous vibrations. The Contractor shall provide adequate padding material between tie chains or cables to preclude chipping of concrete.

The Contractor shall prevent the precast units from cracking or damage during storage, hoisting, and handling of the precast units. The Contractor shall replace the units damaged by improper storing or handling at no cost to the State.

(J) Placing. The Contractor shall place the precast, prestressed concrete members in the structure according to the contract.

504.04 Method of Measurement. The Engineer will not measure the prestressed concrete members when contracted on a lump sum basis. *|

The Engineer will measure the prestressed concrete members per linear foot when contracted on a unit price basis. *|

The Engineer will measure prestressed concrete piling as specified in Section 505 - Piling. *|

504.05 Basis of Payment. The Engineer will pay for the accepted quantities of prestressed concrete members at the contract lump sum price or linear foot shown in the proposal. *|

The price shall be full compensation for preparation; furnishing the shop drawings; getting an authorized person of the company making the members; welding; fabricating; tensioning; placing concrete; curing; grouting; taking safety measures; handling, storing, and transporting; placing; and furnishing materials, labors, equipment, tools and incidentals necessary to complete the work. *|

The Engineer will make payment under: *|

Pay Item	**Pay Unit**
Type ____ Prestressed Concrete Girders (___ Linear Foot)	Lump Sum
Prestressed Concrete Girders in _____	Linear Foot
Post-Tensioning Operation For _____ (____Linear Foot)	Lump Sum
Concrete for Prestressed _____ (____ Linear Foot)	Lump Sum

The Engineer will pay for the prestressed concrete piling as specified in Section 505 - Piling. *|