



To: <p style="text-align: center;">SUPERSEDED BY EB 99-025 EFFECTIVE 3/17/99</p>		ENGINEERING INSTRUCTION <i>New York State Department of Transportation</i>	95-027 <hr/> Supersedes
Title: REVISED PILE SPECIFICATIONS (ENGLISH VERSION) OF THE STANDARD SPECIFICATIONS			
Distribution: xMain Office(30) <input checked="" type="checkbox"/> Local Gov.(31) xRegions(32) <input type="checkbox"/> Contractors/AGC(39) xConsultants(34) <input type="checkbox"/> _____ ()	Approved:  A. M. Shirolé, Deputy Chief Engineer (Structures) 6/19/95 Date		

This Engineering Instruction transmits the new English version of the specifications for Piles and Pile Driving Equipment. These specification changes were needed as a consequence of changes made to Section 551 of the New York State Standard Specifications, dated January 2, 1990. This new specification eliminates test piles and has virtually no affect on cost. Dynamic Pile Testing has been added as a specification.

The attached specification can be used immediately, but must be used on projects utilizing the English Version of the Standard Specification whose Letting Date is November 16, 1995 or later. The specifications will be modified via the attached Shelf-Note and are as follows:

- Item 551.10XX Steel Bearing Piles
- Item 551.11 Cast-In-Place Concrete Piles
- Item 551.12XX Splices
- Item 551.13 Furnishing Equipment For Driving Piles
- Item 551.14 Dynamic Pile Testing

The following Item Numbers will be deleted from the Standard Specifications:

- Item 551.01 Untreated Timber Test Piles
- Item 551.02 Steel Bearing Test Piles
- Item 551.03 Untreated Timber Piles
- Item 551.04 Creosoted Timber Piles
- Item 551.05 Steel Bearing Piles
- Item 551.06 Steel Bearing Piles As Driven
- Item 551.07 Cast-In-Place Concrete Piles
- Item 551.08 Splices For Steel Bearing Piles
- Item 551.09 Furnishing Equipment For Driving Piles

Also, attached is a Serialized List of the Steel Bearing Piles and associated splice item for the Designer's use.

Questions should be directed to Jack Hartkern of this office at (518)457-7677.

SERIALIZED ITEMS

551.1001	STEEL BEARING PILES (HP 10 X 42)	LF
551.1002	STEEL BEARING PILES (HP 10 X 57)	LF
551.1003	STEEL BEARING PILES (HP 12 X 53)	LF
551.1004	STEEL BEARING PILES (HP 12 X 74)	LF
551.1005	STEEL BEARING PILES (HP 14 X 73)	LF
551.1006	STEEL BEARING PILES (HP 14 X 89)	LF
551.1007	STEEL BEARING PILES (HP 14 X 102)	LF
551.1008	STEEL BEARING PILES (HP 14 X 117)	LF
551.1201	SPLICES FOR STEEL BEARING PILES (HP 10 X 42)	EA
551.1202	SPLICES FOR STEEL BEARING PILES (HP 10 X 57)	EA
551.1203	SPLICES FOR STEEL BEARING PILES (HP 12 X 53)	EA
551.1204	SPLICES FOR STEEL BEARING PILES (HP 12 X 74)	EA
551.1205	SPLICES FOR STEEL BEARING PILES (HP 14 X 73)	EA
551.1206	SPLICES FOR STEEL BEARING PILES (HP 14 X 89)	EA
551.1207	SPLICES FOR STEEL BEARING PILES (HP 14 X 102)	EA
551.1208	SPLICES FOR STEEL BEARING PILES (HP 14 X 117)	EA

PILES AND PILE DRIVING EQUIPMENT

Make the following changes to the Standard Specifications of January 2, 1990.

P. 5-27 through P. 5-33.

Delete Section 551 - "PILES AND PILE DRIVING EQUIPMENT" and replace it with the attached Section 551 - "PILES AND PILE DRIVING EQUIPMENT".

SECTION 551 - PILES AND PILE DRIVING EQUIPMENT

551-1 DESCRIPTION

551-1.01 Piles. Under this work, the Contractor shall furnish and place piles of the type and size and at the locations indicated on the Plans, or where ordered by the Engineer. The Contractor shall furnish equipment and personnel for dynamic pile tests as required. Timber piles are not covered under this specification.

551-1.02 Splices for Steel Bearing Piles. This is a contingent item and shall apply only when the Engineer directs the Contractor to drive a pile more than five feet beyond the estimated length provided in the Contract Plans. Pile splices shall be constructed as shown on the Plans, or as approved by the D.C.E.S..

551-1.03 Furnishing Equipment for Driving Piles. Under this work, the Contractor shall furnish equipment at the site for driving piles. The Contractor shall submit to the D.C.E.S., Form BD 138, "Pile Driving Equipment Data", for approval. The D.C.E.S. shall be allowed 15 working days upon receipt for review. Each separate combination of pile and pile driving equipment proposed by the Contractor shall require the submission of a corresponding Form BD 138.

551-2 MATERIALS. Materials for piling shall conform to the requirements of the following Subsections:

Bar Reinforcement, Grade 60	709-01
Casings for Cast-In-Place Concrete Piles	720-03
Steel Bearing Piles	720-04
Pile Shoes	720-05

In addition to the requirements specified in the preceding Subsections, the following shall apply:

551-2.01 Cast-In-Place Concrete Piles.

A. Concrete for Cast-In-Place Piles. Concrete placed in the Cast-In-Place Piles shall comply with requirements specified for Class A Concrete in S501, Portland Cement Concrete.

B. Paint for Exposed Piles and Pile Casings. The paint shall be in accordance with the Contract Documents. The color shall be as specified on the Plans and Proposal, or as required by the Engineer.

C. Cast-In-Place Concrete Pile Dimensions. Pile dimensions, including the rate of taper for tapered piles, shall be as shown on the Plans, or as approved by the D.C.E.S.. In no

case, however, shall the outside diameter at the toe be less than 8 inches nor shall the outside diameter at the section to be cut off be less than 12 inches.

The Contractor shall furnish the particular type of pile casing shown on the Contract Plans. No used pipe or shell will be permitted.

Pile casings which do not hold their original form during driving, which fracture, or fail during driving, due to manufacturer defect, fabrication, or Contractor's operations, unless otherwise directed, shall be withdrawn and removed from the site at the Contractor's expense. If, at any time during the driving or placing of the pile casings, the D.C.E.S. determines from the results of the driving that the pile casings of the type or thickness being used cannot be satisfactorily placed, the Contractor shall remove same from the site and furnish casings of a different type or greater thickness at the expense of the State.

551-3 CONSTRUCTION DETAILS

551-3.01 General

A. Storage, Handling and Inspection. The method of storing and handling of piles shall be such as to avoid damage to the piles.

B. Site Preparation. Piles shall not be driven until after the excavation is completed to the elevation required for the bottom of the footing or bottom of tremie. Unless otherwise shown on the Plans, any material forced up or depressions made by the driving shall be removed or filled and the correct elevation of foundation established before any concrete is placed.

C. Preparation Of Piles.

1. Points.

a. Steel Bearing Piles. Steel Bearing Piles shall be furnished with a shoe. These shall be fabricated as detailed on the Plans, or as approved by the D.C.E.S.. Substitution of commercial shoes for those detailed on the Plans may be permitted subject to the approval of the D.C.E.S.. Unless shown on the Plans, the prefabricated shoes shall

be attached by a NYSDOT Certified Welder with a 5/16" thick minimum fillet weld along the entire outside edge of the flanges.

b. Cast-In-Place Concrete Piles. The ends of all pile casings shall be perpendicular to the longitudinal axis of the casings. All pile casings for "Cast-In-Place Concrete Piles" shall be equipped with a round plate with a diameter of not more than 5/8 inch larger than the diameter of the pile, and a minimum thickness of 3/4 inch, unless otherwise indicated on the Plans.

2. Splices.

a. General. Full length piles shall always be used where practicable. Where splices are unavoidable, their number, locations, and details shall be subject to the approval of the D.C.E.S..

Splices to steel piles, and steel pile casings shall be welded in conformance with the provisions of the S.C.M.. These requirements include but are not limited to a NYS certified welder and a D.C.E.S. approved welding procedure

b. Cast-In-Place Concrete Piles. Where design considerations and soil characteristics permit, the D.C.E.S. may approve the use of mechanical splices in lieu of the welded splice herein specified under §551-3.01.C.2.a. The mechanical couplings used for such splices shall be subject to the provisions of §715-01, Structural Steel. A seal weld shall be provided completely around the pile casing.

D. Equipment for Driving Piles.

1. General - Piles shall be driven only with equipment which has the prior approval of the D.C.E.S. in accordance with §551-1.03. All malfunctioning equipment, as determined by the Engineer, shall be removed from the site and be replaced with equipment which is satisfactory to the D.C.E.S.. The minimum rated striking energy of the hammer to be used in driving Steel Bearing Piles and Cast-In-Place Concrete Piles shall be 13,000 Foot Pounds Per Blow.

Hammers having greater striking energy may be used upon approval by the D.C.E.S.. These hammers shall produce a minimum of 20 Blows/12 inches and a

maximum of 120 Blows/12 inches at the Ultimate Pile Resistance shown on the Contract Plans. However, if, in the opinion of the D.C.E.S., satisfactory results are not obtained with the hammer furnished by the Contractor, a hammer meeting the approval of the D.C.E.S. shall be furnished and used.

2. Air/Steam Hammers - Sufficient boiler or compressor capacity shall be provided at all times to maintain the rated speed of air/steam hammers during the full time of pile driving. The valve mechanism and other parts of a single or double-acting hammer shall be maintained such that the number of blows per minute for which the hammer is designated, is satisfied.

3. Diesel Hammers -The valves, pumps, ports, rings, and other hammer parts shall be maintained such that the following condition for which the hammer is designated is satisfied:

Hammer Type	Designated Condition
Single Acting	Length Of Stroke Or Blows Per Minute
Double Acting	Bounce Chamber Pressure

All Diesel Hammers shall be provided with an acceptable means of measuring hammer energy. When pressure gages are included as normal equipment, they shall be furnished and maintained in operable condition. Manufacturer's Charts and Graphs, required to calibrate hammer energy, shall be furnished to the Engineer by the Contractor. The Contractor shall also arrange easy access to the pressure gages so that readings may be conveniently taken by the Engineer.

A double acting hammer not operating at the required bounce chamber pressure shall be removed promptly from the work site. It shall be replaced by a hammer acceptable to the Engineer at no cost to the State.

4. An approved hammer cushion block shall be used to transfer pile hammer energy to the pile. Each hammer shall be equipped with a helmet/drive head to fit the type of pile to be driven.
5. Pile driver leads shall be constructed in such a manner as to afford freedom of movement of the hammer. The use of either swinging or hanging leads will be permitted provided the pile or leads are properly supported during driving and the required final position and batter of pile is achieved. In the event the Engineer determines that the use of swinging or hanging leads is producing unsatisfactory results, he may require the Contractor to hold the leads in position with guys or braces to give the required support. The Contractor may, as an alternative, replace the unsatisfactory equipment with equipment having fixed leads.

Pile driving leads shall be of sufficient length so that the use of a follower will not be necessary. The driving of piles with followers will generally not be permitted and shall be done only with written permission and direction of the D.C.E.S..

When directed by the Engineer, either approved steel or wooden spuds shall be used to penetrate consolidated material or obstructions in the upper 10 feet in order to assist in driving the piles to the required depth and resistance. Augers may be used for this purpose when written permission is obtained from the D.C.E.S..

6. Water jets and vibratory hammers shall not be used in driving any pile, unless written approval is given by the D.C.E.S.. Piles installed with a water jet or vibratory hammer shall be impact driven to secure the final penetration.

E. Methods of Driving. The driving of piles shall be done with an air/steam, diesel, or hydraulic hammer. Piles shall be driven starting from the center of the foundation and proceeding outward from this point, or starting at the outside row and driving progressively across the foundation.

F. Length of Piles. The length of piles will be determined in

the field by driving to the driving criteria determined by the D.C.E.S.. Piles may be completely driven in one operation or, if directed by the D.C.E.S., be partially driven and allowed to set from 2 to 24 hours (or as indicated on the Plans) before driving is resumed.

G. Allowable Variation in Pile Alignment. Piles shall be truly vertical or accurately battered as indicated on the Contract Plans. The top of any pile driven its full length into the ground shall not vary from the plan location by more than four inches, unless otherwise shown on the Plans. The top of any pile partially exposed or included in an integral abutment shall not vary from the plan location by more than 1 inch, unless otherwise shown on the Plans. In addition, piles may have a variation at their tip of not more than 1/4 inch per foot from the vertical or from the batter shown on the Plans or permitted by the D.C.E.S..

H. Defective Piles. All piles forced up by any cause shall be driven again, as directed by the Engineer.

The following shall be causes for rejection of a pile:

1. Pile location or batter is incorrect.
2. Pile damaged from any cause whatsoever.
3. Pile fails to attain the driving resistance determined by the D.C.E.S., or the driving resistance set forth in the Contract Documents.
4. Pile tip elevation is not within the limits called for on the Plans, or specified by the Engineer.
5. Pile is determined by the Engineer to be unserviceable for other reasons related to the furnishing and installing of the pile.
6. Cast-In-Place Concrete Pile Casing not free from water.

No footing concrete shall be placed until all piles within the footing are inspected by the Engineer. The Contractor shall remove such rejected piles, or, at the option of the Engineer, a second pile may be driven adjacent thereto, if this can be done without impairing the structure.

I. Cutting Off Piles and Pile Casings. The tops of all piles and pile casings shall be cut off at the elevation indicated on the Plans, or as established by the Engineer. The cut shall be clean and to a true plane, in accordance with the detail shown on the Plans.

All cut off lengths shall become the property of the Contractor.

J. Included Work.

1. Voids. All cavities, left by the pile driving operation, shall be backfilled, as specified by the Engineer.

2. Concrete. Cast-In-Place Concrete Pile casings shall be inspected immediately prior to placing concrete in the casing. The Engineer may require that all casings in the footing be satisfactorily placed and dry before concrete is placed. Each casing shall be filled with a continuous pour of concrete, mixed and placed in accordance with the Specifications for Concrete for Structures Class A, Section 555, except that the slump of the concrete shall not exceed 5 inches.

Special care shall be exercised in filling the piles to prevent honeycomb and air pockets from forming in the concrete. Internal vibrators and other means shall be used to the maximum depth practicable, as determined by the Engineer, to consolidate the concrete.

3. Reinforcement. Cast-In-Place Concrete Piles shall be reinforced as shown on the Plans and the reinforcement secured in such a manner as to insure its proper location in the finished piles.

K. Painting of Exposed Piles and Pile Casings. All exposed pile or pile casing surfaces not embedded in concrete shall be painted as described in the Contract Documents.

L. Furnishing Equipment And Personnel - Dynamic Testing Of Piles. The Contractor shall furnish pile driving equipment, a source of electrical power, and a suitable test enclosure to perform field testing of piles and evaluate pile hammer efficiency. All incidental labor and material necessary to make the work area accessible shall also be supplied by the Contractor.

The actual tests shall be conducted by the Engineer under the direction of the D.C.E.S.. The Contractor's responsibility is limited to the supplying of support services for the individual tests. Tests shall be performed at the locations indicated on the Contract Plans and where ordered by the Engineer.

A Dynamic Testing Procedure, known as the "Impact Driving Method", will be used. This Procedure entails the following steps:

1. Prior to being struck with the pile driving hammer, each pile to be tested will be instrumented with strain and acceleration transducers by State personnel, aided by the Contractor's forces.
2. Dynamic measurements resulting from the pile hammer blows will be automatically recorded on a pile driving analyzer supplied by the State. State personnel will operate the pile driving analyzer.
3. Upon determination by the Engineer that valid data has been recorded, State personnel, assisted by the Contractor's forces, will remove the instrumentation.

The Contractor will schedule equipment movements to ensure that testing is done as part of the normal driving schedule, insofar as it is possible.

551-4 METHOD OF MEASUREMENT.

551-4.01 Piles. The quantity of piles to be paid for under the work specified for Steel Bearing Piles or Cast-in-Place Concrete Piles, will be the number of feet of driven, acceptable piles, measured below cut off elevation, remaining in the finished structure in accordance with the Plans, Specifications, and orders of the Engineer.

The length of piles will be determined in the field by driving to the resistance required by the Plans, Specifications, or D.C.E.S. at the time of driving. The pile lengths indicated on the Plans are for estimating purposes only.

551-4.02. Splices for Steel Bearing Piles. The quantity of splices paid for will be the number of piles that exceed the estimated length by more than five feet. A second splice may be utilized at 25 feet beyond the estimated length subject to D.C.E.S. approval.

551-4.03. Dynamic Pile Tests. The quantity of Dynamic Pile Tests will be made for the number of piles tested. If the pile requires re-driving within 28 hours after the initial test, this shall be considered as one Dynamic Pile Test. If re-driving is more than 28 hours, this shall be considered as an additional test.

551-5 BASIS OF PAYMENT.

551-5.01 Furnishing Equipment for Driving Piles. The Lump Sum Price Bid shall include the cost of furnishing all labor, materials, and equipment necessary for transporting, erecting, maintaining, making any ordered equipment replacement, dismantling and removing the entire pile driving equipment.

The furnishing of equipment for driving sheet piling is not included in this work.

Payment will be made at the Lump Sum Price Bid for this Item, as follows: Seventy-five percent (75%) of the amount bid will be paid when the equipment for driving piles is furnished and driving of satisfactory piles has commenced. The remainder will be paid when the work of driving piles is completed.

551-5.02 Piles. The Unit Price Bid Per Foot for each of the respective Pile Items shall include the cost of furnishing all labor, (including the manipulation of pile driving equipment and materials), materials and equipment (excluding pile driving equipment) necessary to complete the work as prescribed in the Specifications, including the following additions:

A. Structure Excavation. Payment for removal of any material forced up above the foundation by the driving of piles shall be included in the cost of the pile.

B. Defective Piles. No payment will be made for piles rejected in accordance with requirements under \$551-3.01H, Defective Piles.

C. Backfilling. Payment for backfilling of all cavities left by the extraction of damaged piles or from auger holes or soil deformations necessary to place piles shall be included in the work for the respective Pile Item.

D. Redriving Piles. The cost of driving piles that are forced up by any cause shall be included in the Unit Price Bid for the respective Pile Item.

E. Pile Shoes, Etc. The cost of furnishing and using pile shoes, followers, augers, or spuds shall be included in the Unit Price Bid. Partial payment for pile shoes on the pile shall be in accordance with the requirements of \$109-04.

F. Reinforcement and Splices for Cast-in-Place Concrete Piles. Bar reinforcement and splices for Cast-In-Place Concrete Piles shall be included in the Unit Price Bid for Cast-in-Place Concrete Piles.

G. Progress Payments for Steel Piles. Progress payments will be made when the piles are properly installed in accordance with the Plans, Specifications and orders of the Engineer. Payment will be made, at the Unit Price Bid, for 80% of the quantity properly installed, exclusive of cutting off piles, placing concrete in Cast-In-Place Piles and pile casings, and painting of exposed piles and pile casings. The balance of the quantity will be paid for upon completion of the work, including the cutting off, placing concrete in the pile, and painting of the pile and pile casings.

551-5.03 Splices. The Unit Price Bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete each splice to the satisfaction of the Engineer.

555-5.04 Dynamic Pile Test. The cost of furnishing equipment and personnel to perform Dynamic Tests shall be included in the Unit Price Bid.

Payment will be made under:

Item No.	Item	Pay Unit
551.10XX	Steel Bearing Piles	Linear Foot
551.11	Cast-In-Place Concrete Piles	Linear Foot
551.12XX	Splices for Steel Bearing Piles	Each
551.13	Furnishing Equipment for Driving Piles	Lump Sum
551.14	Dynamic Pile Testing	Each