



**South Carolina
Department of Transportation**

955 Park Street
Post Office Box 191
Columbia, South Carolina 29202-0191

Office of the Director
(803) 737-1302 ♦ Fax (803) 737-2038

Deputy Director of Engineering
(803) 737-1314 ♦ Fax (803) 737-2038

Deputy Director of Finance and Administration
(803) 737-1240 ♦ Fax (803) 737-1719

Deputy Director of Mass Transit
(803) 737-9720 ♦ Fax (803) 737-9739

DM0497

March 6, 1997

MEMORANDUM TO GROUP LEADERS AND CONSULTANTS

SUBJECT: Payment of Reinforcing Steel used for Pile Anchorage

Beginning with the June 1997 Letting, the Bridge Design Office will detail reinforcing bars used for anchorage of prestressed concrete piles on the bent sheets. The summary of quantities for the bents shall include the weight (mass) for these reinforcing bars.

New standard drawings for both the English and Metric prestressed concrete piles are attached and have been revised to reflect necessary changes.

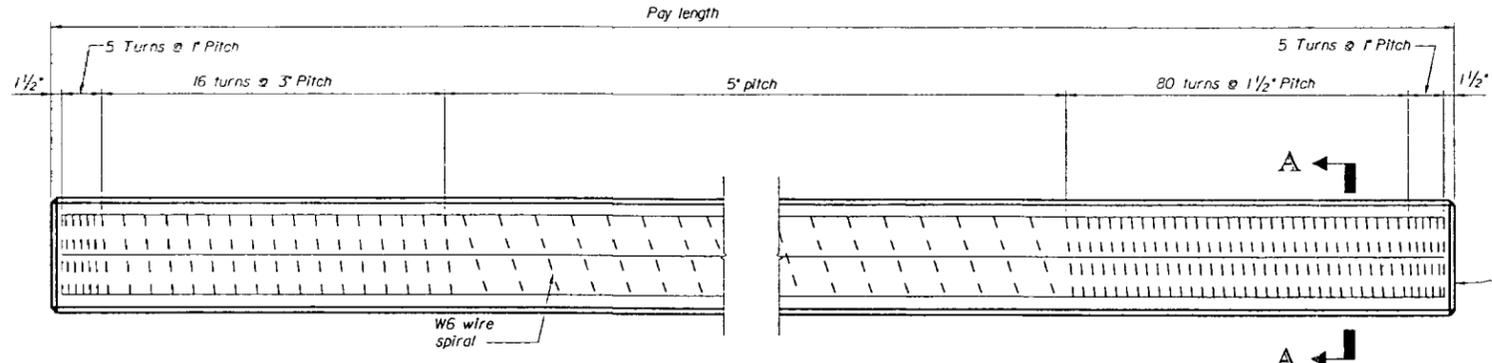
This revision is the result of an AGC request that allows the Contractor to purchase all reinforcing steel from a single source.


Randy R. Cannon
Interim Bridge Design Engineer

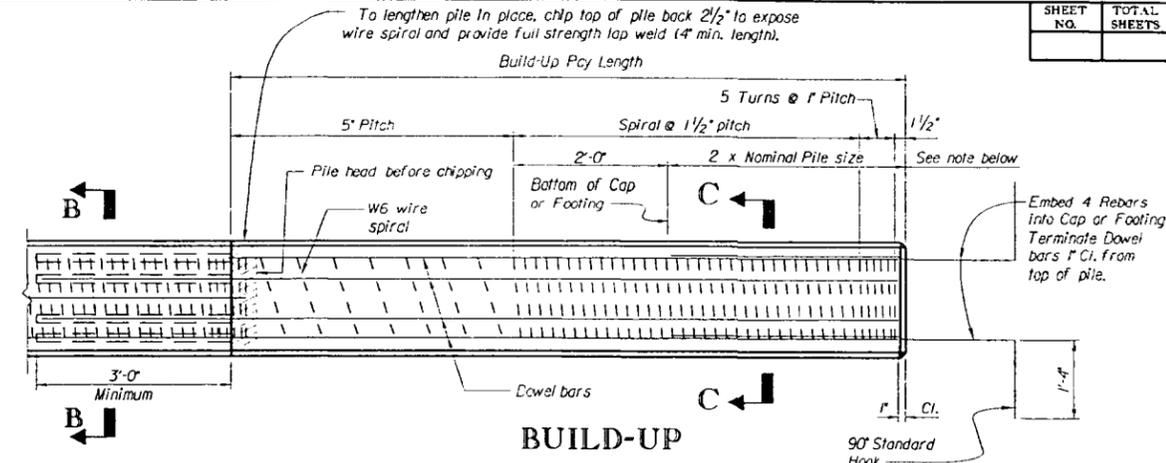
Attachments:

cc: Assistant Bridge Design Engineers

REL/slb

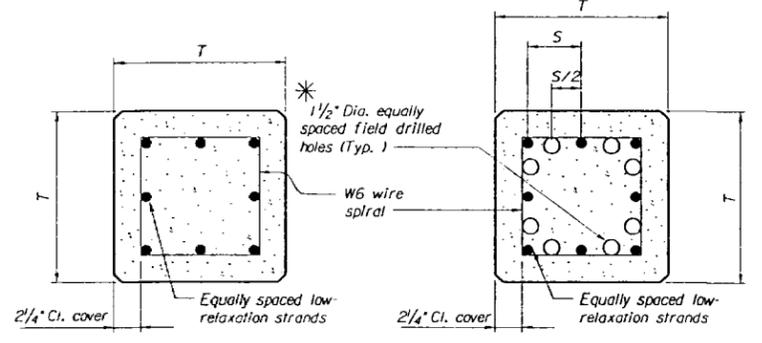


TYPICAL PILE ELEVATION

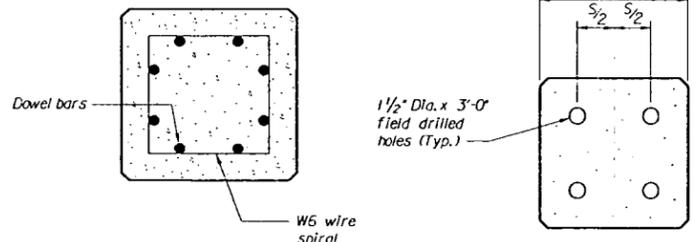


BUILD-UP

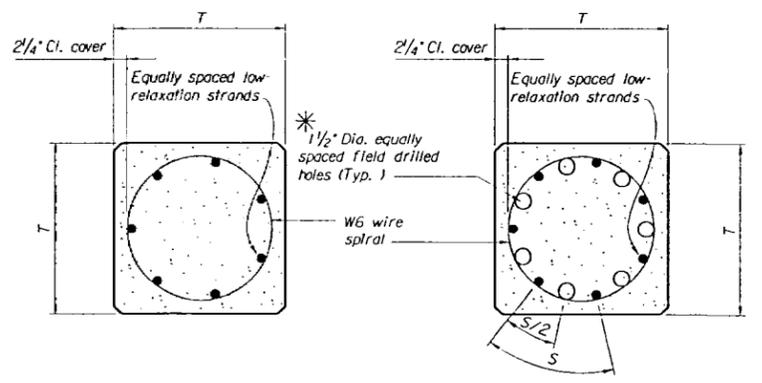
NOTES FOR BUILD-UP
 Chip back top of piles as shown in build-up detail and field drill holes in top of pile as shown in Section B-B. Dowel bar shall be grouted (f'c = 5000 psi, non-shrink) in the holes.
 When length of required build-up permits, the 1/2" pitch of the spiral shall be extended 2'-0" below bottom of cap or footing. Piles shall not be cut off an additional length in order to provide spiral at 1/2" pitch for 2'-0" below the cap or footing.
 If Pile Build-up is required with further driving, Dowel bars may be terminated at the top of Build-up and Pile Anchorage accomplished as shown in the Pile Anchorage Detail.
 Piles having an embedment length less than 12" shall be built up as shown above and measurement shall be made for Pile Build-up Preparation. Build-up may be cast with bent cap provided rebar, pile spiral and *4 spiral cage are in place and the cap is cast with Class "X" Concrete. Concrete in the cap will be paid for as normal bent concrete regardless of the class used. Measurement of prestressed pile build-ups for payment shall include an embedment length of 20" when the build-up is cast with the bent cap.



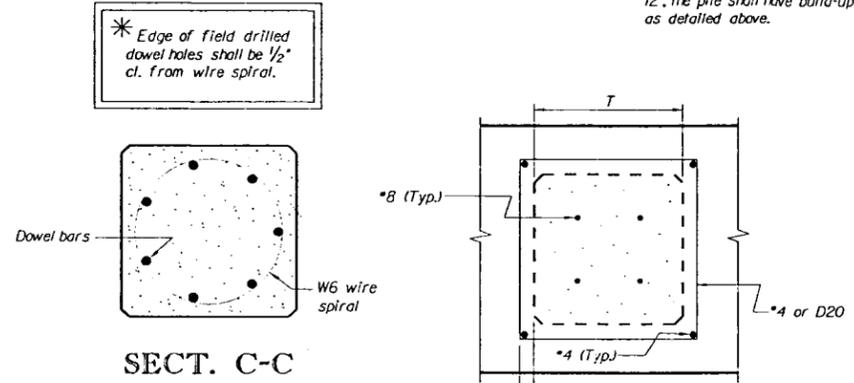
SQURE STRAND PATTERN



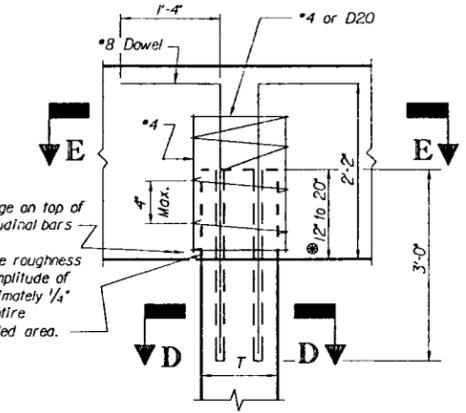
SECT. C-C SECT. D-D



CIRCULAR STRAND PATTERN



SECT. C-C SECT. E-E



PILE ANCHORAGE DETAILS

*8 and *4 or D20 bars are for pile anchorage and are detailed on bent sheets and included in bent quantities. Any additional reinf. for pile build-up shall be included in the unit price bid for prestressed concrete piling. *8 bars shall be spliced a min. of 3'-0" with a dowel bar in the pile build-up when build-ups are required.

Note: All piles shall be anchored into the Bent Caps or Footings using the details shown on this sheet. All costs for this work shall be included in the unit price bid for prestressed concrete piling.

Costs for dowel bars, wire spirals, concrete and surface roughness for build-ups shall be included in the unit price bid for prestressed concrete piling.

GENERAL NOTES
 The splice of wire spiral shall be made by full strength lap welds.
 The Contractor shall submit dowel bar lengths to the Resident Engineer for approval.
 Chamfer all exposed edges 1/4" unless noted otherwise.
 All dimensions relative to reinforcing steel are to centers of bars (except as noted).
 Release alternate strands simultaneously at opposite ends without shock.
 Wire spiral shall be tied to cables and reinforcing bars as required to maintain pitch of the spiral.

MATERIALS

Prestressing Strand - Grade 270, Low Relaxation	AASHTO M203
Wire Spiral	AASHTO M32, M225
Reinforcing Steel - Grade 60	AASHTO M31
Concrete - Class "X"	SCDHPT Sect. 701

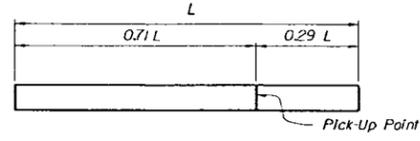
TOLERANCES

Length	± .3"
Pile width	± 1/8" (including form draft)
Sweep (Variation from straight line parallel to centerline of member) (considered to be a form tolerance)	± 1/8" per 10'
Position of strands	± 1/4"
Position of pick-up points	± 6"
Variation from specified end squareness or skew	± 1/4" per 12'
Longitudinal spacing of spiral	± 1/4"

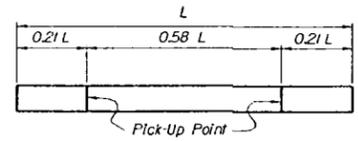
P I L E D A T A

Pile size T	Strands	Stress (psi)	Dowel Bars	Maximum L		
				1 pick-up point	2 pick-up points	3 pick-up points
Square strand pattern	16" 8 - 1/2"	835	8 * 8	62'	88'	126'
	18" 8 - 1/2" S	729	8 * 8	63'	89'	128'
	20" 12 - 1/2"	804	12 * 8	69'	97'	140'
Circular strand pattern	16" 6 - 3/16"	790	6 * 9	61'	87'	124'
	7 - 1/2"	739	7 * 8	60'	85'	121'
	18" 7 - 3/16"	733	7 * 9	63'	89'	128'
	8 - 1/2" S	729	8 * 9	63'	89'	128'
	9 - 1/2"	750	9 * 8	64'	90'	129'
	20" 10 - 3/16"	761	9 * 9	67'	96'	137'
10 - 1/2" S	737	10 * 8	67'	95'	135'	
11 - 1/2"	743	11 * 8	67'	95'	136'	

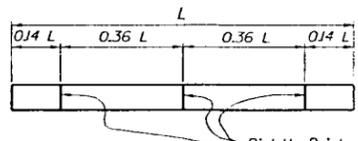
Note: Piles shall be marked at pick-up points to indicate proper points for attaching handling lines.



SINGLE POINT PICK-UP



DOUBLE POINT PICK-UP



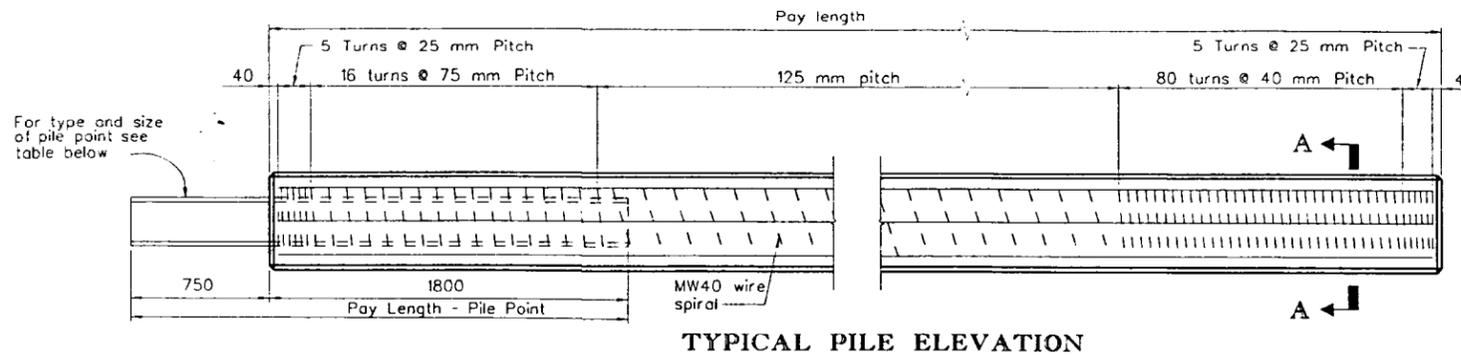
TRIPLE POINT PICK-UP

DESIGN DATA
 Low Relaxation Strands
 F's - 270,000 psi
 Fsi - 202,500 psi
 Class "X" Concrete
 F'c - 5000 psi
 Fci - 3500 psi
 Fc - 2000 psi

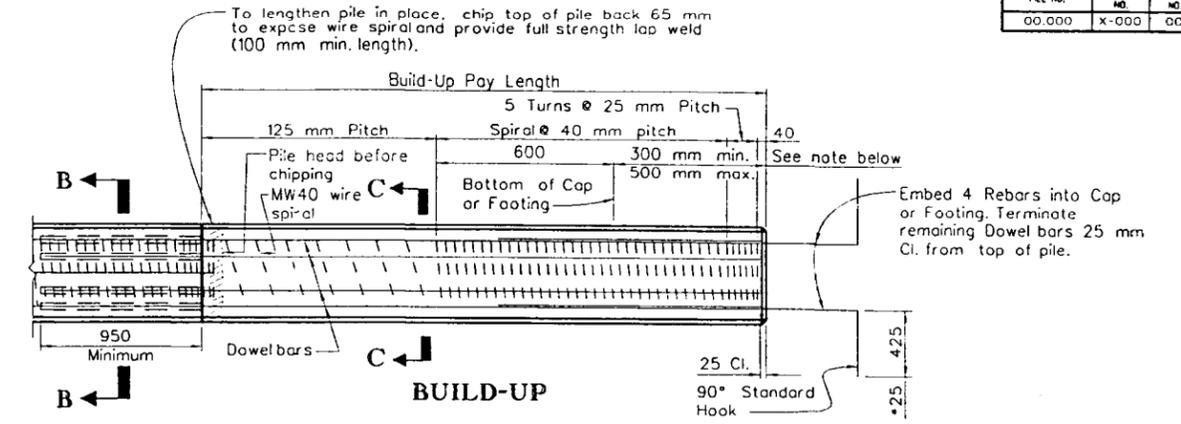
STRAND DATA

Diameter	Area (in ²)	Ult. Strength	75% Ultimate
1/2"	0.153	41,310 lbs.	30,982 lbs.
1/2" Special	0.167	45,090 lbs.	33,817 lbs.
3/16"	0.192	51,840 lbs.	38,880 lbs.

REV.	DWM	BDP	11-94	SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION BRIDGE DESIGN COLUMBIA, SC.
REV.	DWM	BDP	7-94	
REV.	IBK	JLC	5-93	
REV.	REMOVE 14" PILE			PREST. CONC. PILES
QUAN.				
DR.	MSA	BWB	9-89	FILE NO. ROUTE COUNTY DRAWING NO.
DES.	MSA	BWB	7-89	
BY	CHK.	DATE		



TYPICAL PILE ELEVATION



BUILD-UP

NOTES FOR BUILD-UP

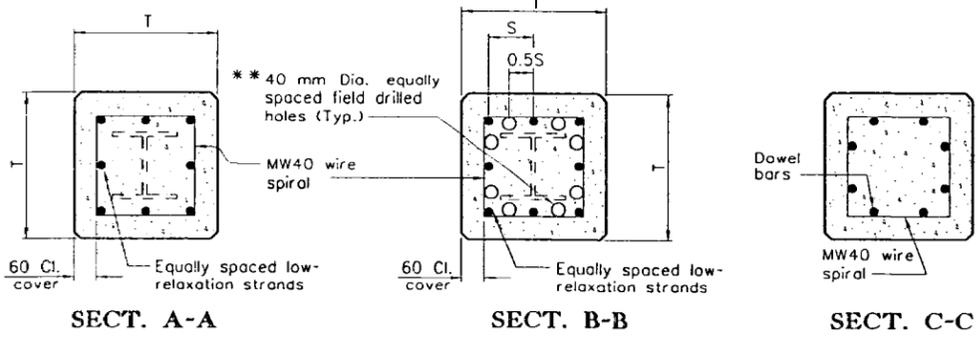
Chip back top of piles as shown in build-up detail and field drillholes in top of pile as shown in Section B-B. Dowel bar shall be grouted ($f'c = 35$ MPa, non-shrink) in the holes.

When length of required build-up permits, the 40 mm pitch of the spiral shall be extended 600 mm below bottom of cap or footing. Piles shall not be cut off on additional length in order to provide spiral at 40 mm pitch for 600 mm below the cap or footing.

If Pile Build-up is required with further driving, Dowel bars may be terminated at the top of Build-up and Pile Anchorage accomplished as shown in the Pile Anchorage Detail.

Piles having an embedment length less than 300 mm shall be built up as shown above and measurement shall be made for Pile Build-up Preparation. Build-up may be cast with bent cap provided rebar, pile spiral and #13 spiral cage are in place and the cap is cast with Class 35 Concrete. Concrete in the cap will be paid for as normal bent concrete regardless of the class used. Measurement of prestressed pile build-ups for payment shall include an embedment length of 500 mm when the build-up is cast with the bent cap.

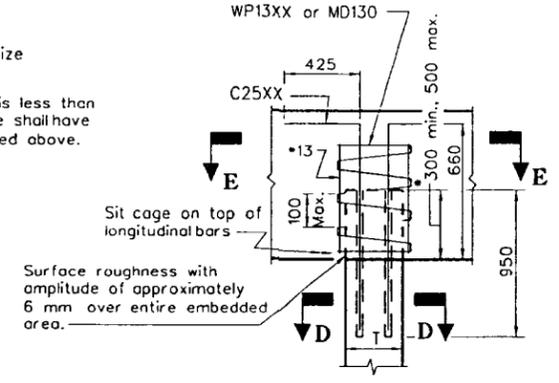
Costs for dowel bars, wire spirals, concrete and surface roughness for build-ups shall be included in the unit price bid for prestressed concrete piling.



SQUARE STRAND PATTERN

T = Nominal pile size

* If this dimension is less than 300 mm, the pile shall have build-up as detailed above.



PILE ANCHORAGE DETAILS

C25XX and WP13XX or MD130 bars are for pile anchorage and are detailed on bent sheets and included in bent quantities. Any additional reinf. for pile build-up shall be included in the unit price bid for prestressed concrete piling. C25XX bars shall be spliced a min. of 900 mm with a dowel bar in the pile build-up when build-ups are required.

Note:
All piles shall be anchored into the Bent Caps or Footings using the details shown on this sheet. All costs for this work shall be included in the unit price bid for prestressed concrete piling.

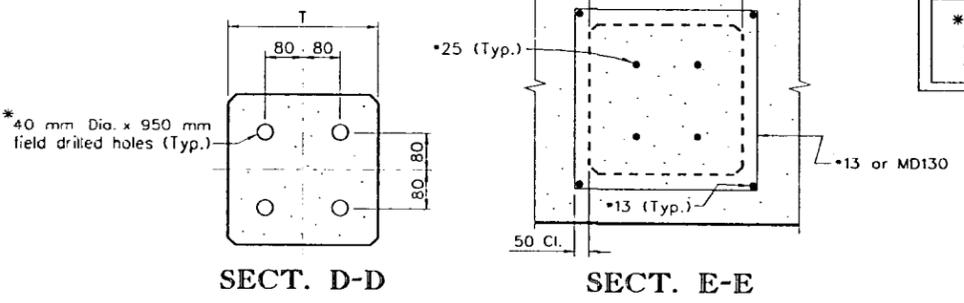
TOLERANCES

Length	-25 mm, +76 mm
Pile width	-10 mm, +13 mm (Including form draft)
Sweep (Variation from straight line parallel to centerline of member) (considered to be a form tolerance)	±3 mm per 3.048 m
Position of strands	6 mm
Position of pick-up points	±152 mm
Variation from specified end squareness or skew	±6 mm per 305 mm
Longitudinal spacing of spiral	±19 mm
Position of steel pile point	±13 mm
Alignment of steel pile point	±13 mm
Length of steel pile point	-76 mm, +152 mm
Projection of steel pile point from end of pile	±25 mm

MATERIALS

Prestressing Strand - Grade 270, Low Relaxation	AASHTO M203
Wire Spiral	AASHTO M32, M225
Reinforcing Steel - Grade 420	ASTM A 615M-96a
Concrete - Class 35	SPEC. PROV.
HP Pile Point - Grade 250	AASHTO M270M

NOTE TO DETAILER:
Maximum pile lengths shall be adjusted if length of pile point is increased.



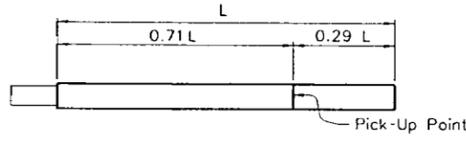
SECT. D-D

SECT. E-E

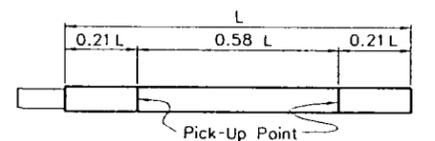
PILE DATA								
Square strand pt. l.	Pile size T	Strands	Stress (MPa)	Dowel Bars	Maximum L			Pile point size
					1 pick-up pt.	2 pick-up pts.	3 pick-up pts.	
	457 mm	8 - 13 mm Sp	5.03	8 *25	16 400	24 900	38 100	HP250x85

Note:
Piles shall be marked at pick-up points to indicate proper points for attaching handling lines.

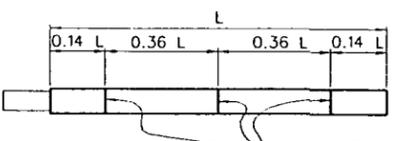
STRAND DATA			
Diameter	Area (mm ²)	Ult. Strength	75% Ultimate
13 mm Spec.	107.74	200.6 kN	150.4 kN



SINGLE POINT PICK-UP



DOUBLE POINT PICK-UP



TRIPLE POINT PICK-UP

DESIGN DATA

Low Relaxation Strands	
f's	1862 MPa
f'si	1396 MPa
Class 35 Concrete	
f'c	35.0 MPa
f'ci	24.5 MPa
f'c	14.0 MPa

South Carolina Department of Transportation



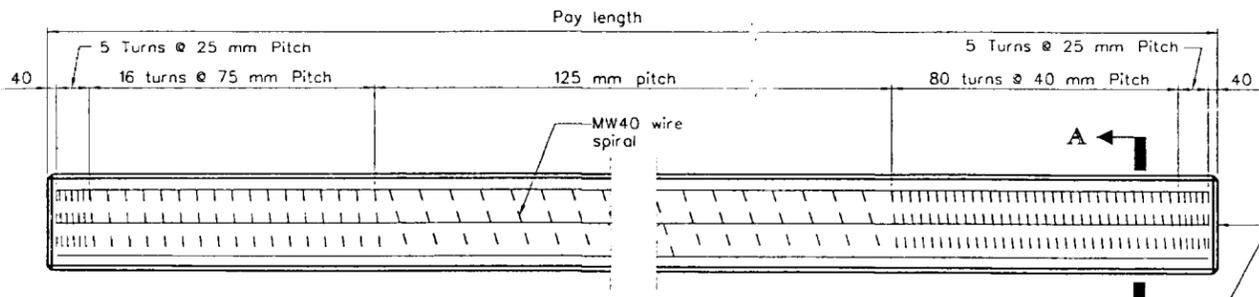
BRIDGE DESIGN

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REV.	MADE	AUTH	DATE	DESCRIPTION	

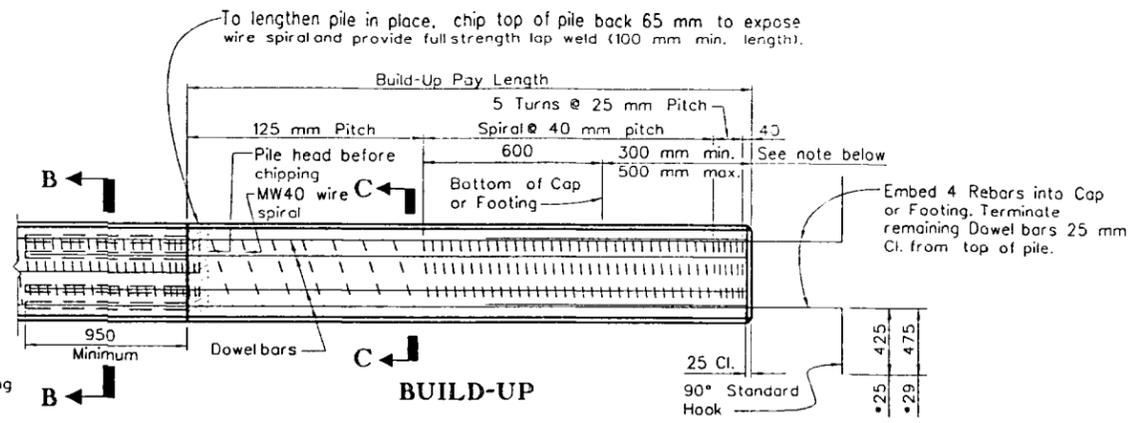
PRESTR. CONC. PILES WITH POINTS

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TYPICAL PILE ELEVATION



BUILD-UP

NOTES FOR BUILD-UP

Chip back top of piles as shown in build-up detail and field drill holes in top of pile as shown in Section B-B. Dowel bar shall be grouted (f'c = 35 MPa, non-shrink) in the holes.

When length of required build-up permits, the 40 mm pitch of the spiral shall be extended 600 mm below bottom of cap or footing. Piles shall not be cut off an additional length in order to provide spiral at 40 mm pitch for 600 mm below the cap or footing.

If Pile Build-up is required with further driving, Dowel bars may be terminated at the top of Build-up and Pile Anchorage accomplished as shown in the Pile Anchorage Detail.

Piles having an embedment length less than 300 mm shall be built up as shown above and measurement shall be made for Pile Build-up Preparation. Build-up may be cast with bent cap provided rebar, pile spiral and #13 spiral cage are in place and the cap is cast with Class 35 Concrete. Concrete in the cap will be paid for as normal bent concrete regardless of the class used. Measurement of prestressed pile build-ups for payment shall include an embedment length of 500 mm when the build-up is cast with the bent cap.

Costs for dowel bars, wire spirals, concrete and surface roughness for build-ups shall be included in the unit price bid for prestressed concrete piling.

GENERAL NOTES

The splice of wire spiral shall be made by full strength lap welds.

The Contractor shall submit dowel bar lengths to the Resident Engineer for approval.

Chamfer all exposed edges 20 mm unless noted otherwise.

All dimensions relative to reinforcing steel are to centers of bars (except as noted).

Release alternate strands simultaneously at opposite ends without shock.

Wire spiral shall be tied to cables and reinforcing bars as required to maintain pitch of the spiral.

MATERIALS

- Prestressing Strand - Grade 270, Low Relaxation AASHTO M203
- Wire Spiral - AASHTO M32, M225
- Reinforcing Steel - Grade 420 ASTM A 615M-96a
- Concrete - Class 35 SPEC. PROV.

TOLERANCES

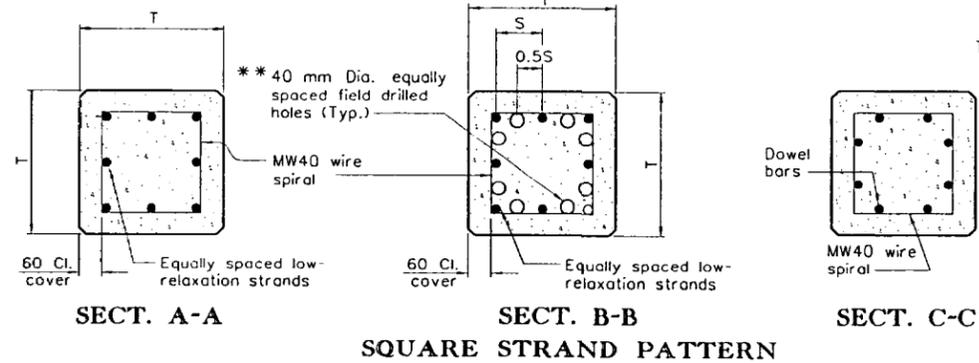
- Length - - - - - ±25 mm, ±76 mm
- Pile width - - - - - ±10 mm, ±13 mm (Including form draft)
- Sweep (Variation from straight line parallel to centerline of member) - - - - - ±3 mm per 3.048 m (considered to be a form tolerance)
- Position of strands - - - - - ±6 mm
- Position of pick-up points - - - - - ±152 mm
- Variation from specified end squareness or skew - - - - - ±6 mm per 305 mm
- Longitudinal spacing of spiral - - - - - ±19 mm

DESIGN DATA

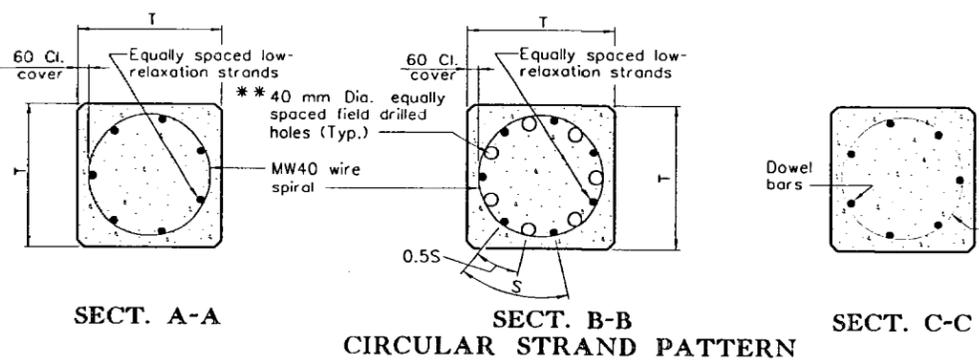
- Low Relaxation Strands
- f's - 1862 MPa
- f'si - 1396 MPa
- Class 35 Concrete
- f'c = 35.0 MPa
- f'ci = 24.5 MPa
- fc = 14.0 MPa

STRAND DATA			
Diameter	Area (mm ²)	Ult. Strength	75% Ultimate
13 mm	98.71	183.8 kN	137.8 kN
13 mm Spec.	107.74	200.6 kN	150.4 kN
14 mm	123.87	230.6 kN	172.9 kN

Note: Piles shall be marked at pick-up points to indicate proper points for attaching handling lines.

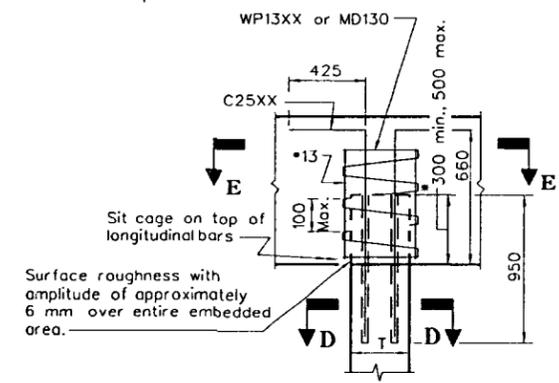


SQURE STRAND PATTERN



CIRCULAR STRAND PATTERN

If this dimension is less than 300 mm, the pile shall have build-up as detailed above.

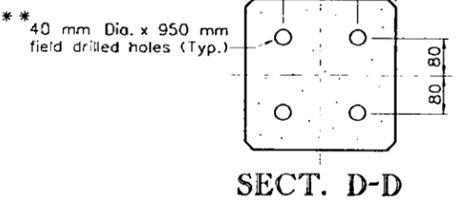


PILE ANCHORAGE DETAILS

C25XX and WP13XX or MD130 bars are for pile anchorage and are detailed on bent sheets and included in bent quantities. Any additional reinf. for pile build-up shall be included in the unit price bid for prestressed concrete piling. C25XX bars shall be spliced a min. of 900 mm with a dowel bar in the pile build-up when build-ups are required.

Note: All piles shall be anchored into the Bent Caps or Footings using the details shown on this sheet. All costs for this work shall be included in the unit price bid for prestressed concrete piling.

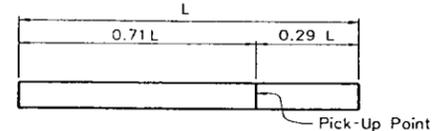
** Edge of field drilled dowel holes shall be 13 mm cl. from wire spiral.



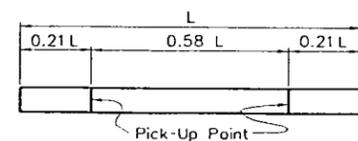
SECT. D-D

SECT. E-E

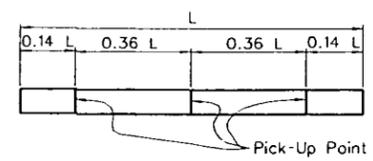
PILE DATA						
Pile size T	Strands	Stress (MPa)	Dowel Bars	Maximum L		
				1 pick-up pt.	2 pick-up pts.	3 pick-up pts.
457 mm	8 - 13 mm Sp	5.03	8-•25	19 200	27 100	39 000
				19 200	27 100	39 000
457 mm	8 - 13 mm Sp	5.03	8-•29	19 200	27 100	39 000
				19 200	27 100	39 000
457 mm	9 - 13 mm	5.17	9-•25	19 500	27 400	39 300
				19 500	27 400	39 300



SINGLE POINT PICK-UP



DOUBLE POINT PICK-UP



TRIPLE POINT PICK-UP

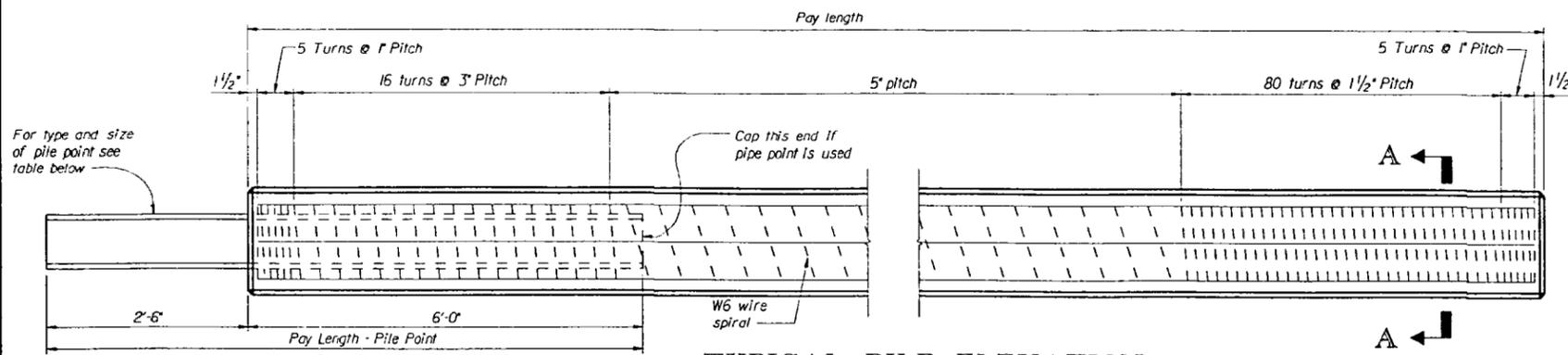
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South Carolina Department of Transportation

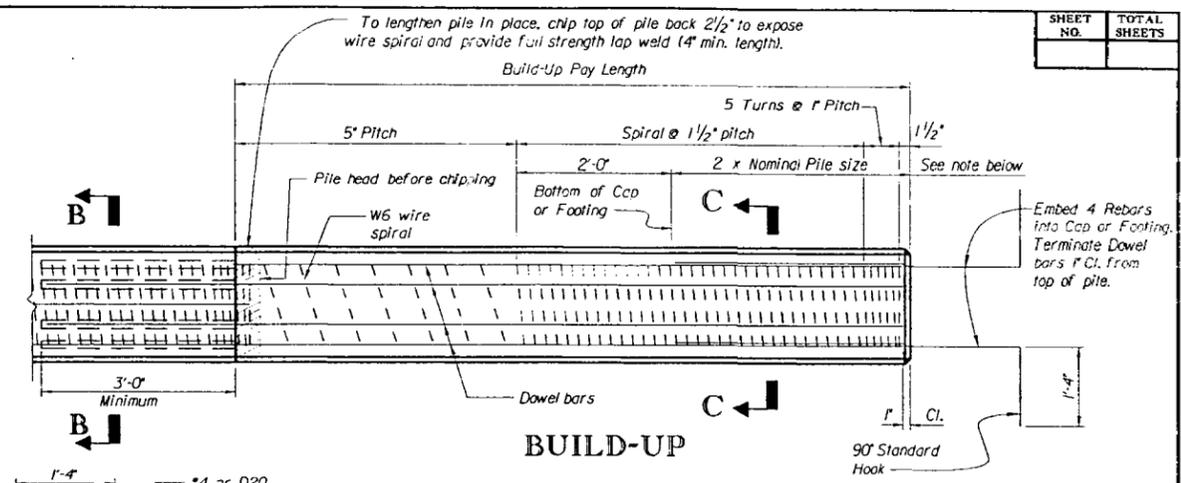
BRIDGE DESIGN

3				
2	WAR	REL	2-97	PILE ANCH./B. U. NOTE
1	XXX	XXX	XX-9X	FROM STANDARD
REV	MADE	AUTH.	DATE	DESCRIPTION

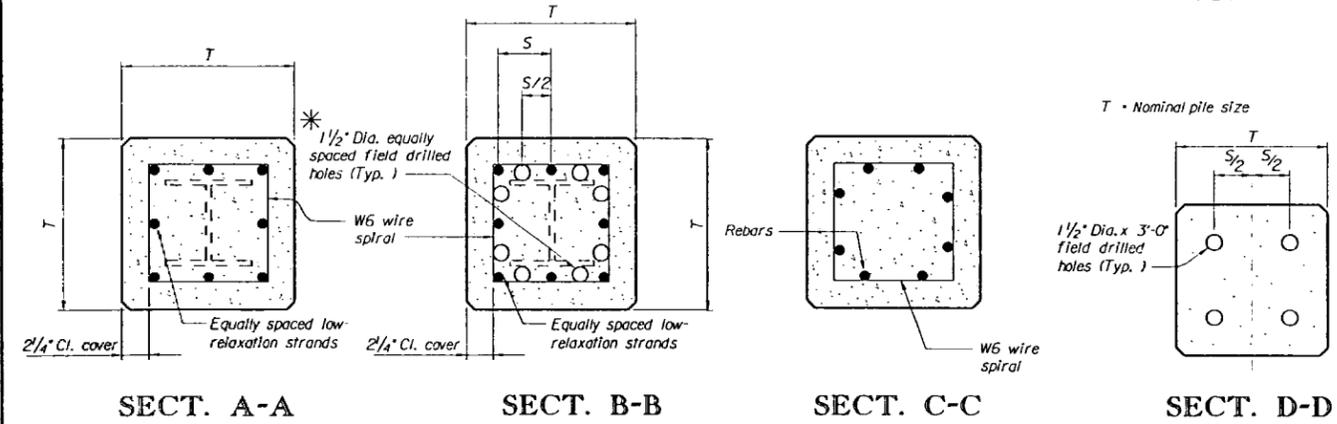
PRESTR. CONC. PILES



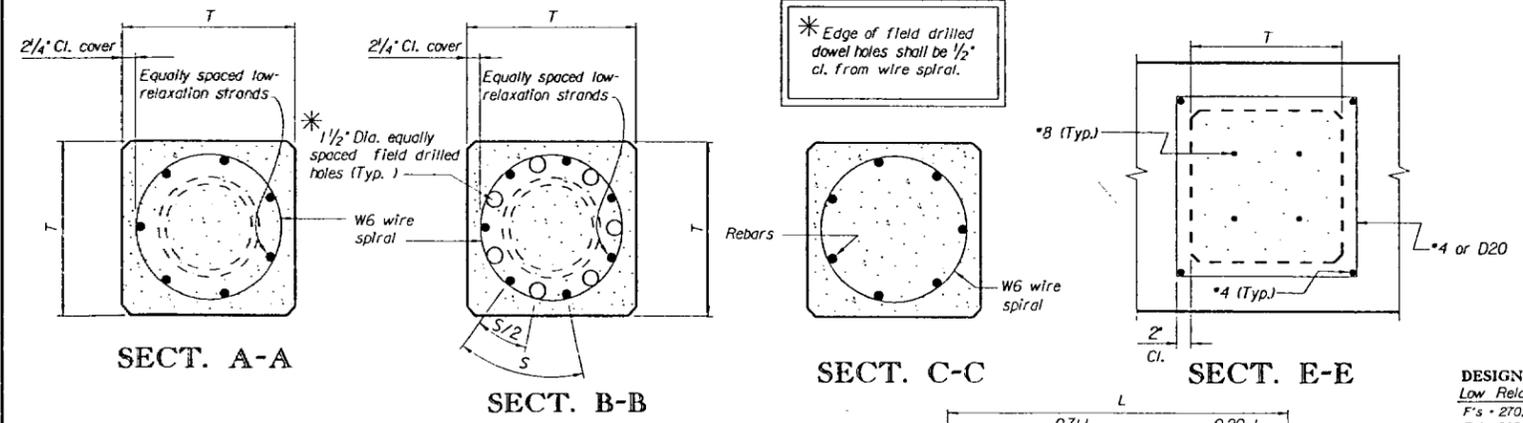
TYPICAL PILE ELEVATION



BUILD-UP

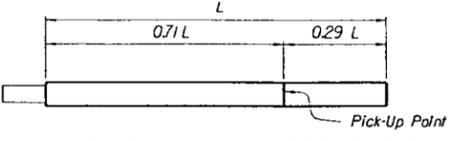


SQUARE STRAND PATTERN



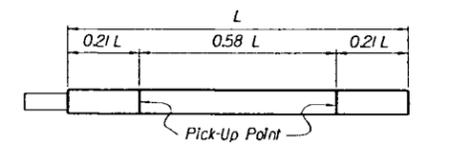
CIRCULAR STRAND PATTERN

P I L E D A T A								
Pile size T	Strands	Stress (psi)	Rebar	Maximum L			Pile Point Size	
				1 pick-up point	2 pick-up points	3 pick-up points		
Square strand pattern	16"	8 - 1/2"	835	8 * 8	60'	88'	126'	HP8x36
	18"	8 - 1/2" S	729	8 * 8	61'	89'	128'	HP10x57
	20"	12 - 1/2"	804	12 * 8	66'	97'	140'	
Circular strand pattern	16"	6 - 3/16"	790	6 * 9	59'	87'	124'	Double Extra Strong 6" dia. Pipe
		7 - 1/2"	739	7 * 8	58'	85'	121'	
	7 - 9/16"	733	7 * 9	61'	89'	128'		
	18"	8 - 1/2" S	729	8 * 9	61'	89'	128'	Double Extra Strong 8" dia. Pipe
		9 - 1/2"	750	9 * 8	61'	90'	129'	
	20"	9 - 9/16"	761	9 * 9	64'	96'	137'	Double Extra Strong 8" dia. Pipe
		10 - 1/2" S	737	10 * 8	64'	95'	135'	
11 - 1/2"		743	11 * 8	64'	95'	136'		



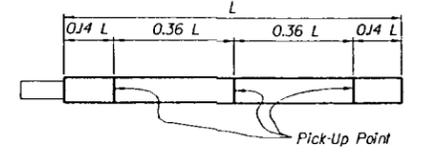
SINGLE POINT PICK-UP

Note: Double Extra Strong Pipe may be substituted for the HP pile point at the Contractor's option and at no additional cost to the department.



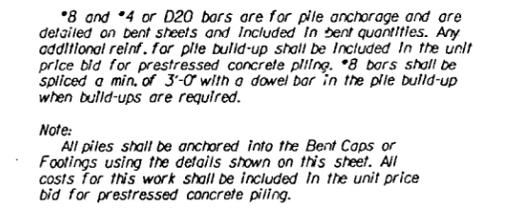
DOUBLE POINT PICK-UP

Note: Piles shall be marked at pick-up points to indicate proper points for attaching handling lines.



TRIPLE POINT PICK-UP

PILE ANCHORAGE DETAILS



*8 and *4 or D20 bars are for pile anchorage and are detailed on bent sheets and included in bent quantities. Any additional reinf. for pile build-up shall be included in the unit price bid for prestressed concrete piling. *8 bars shall be spliced a min. of 3'-0" with a dowel bar in the pile build-up when build-ups are required.

STRAND DATA			
Diameter	Area (in ²)	Ult. Strength	75% Ultimate
1/2"	0.153	41,310 lbs.	30,982 lbs.
1/2" Special	0.157	45,090 lbs.	33,817 lbs.
3/16"	0.192	51,840 lbs.	38,880 lbs.

DESIGN DATA	
Low Relaxation Strands	
F _s	270,000 psi
F _{st}	202,500 psi
Class	"X" Concrete
F _c	5000 psi
F _{ct}	3500 psi
F _c	2000 psi

MATERIALS		
Prestressing Strand - Grade 270, Low Relaxation	AASHTO M203	
Wire Spiral	AASHTO M32, M225	
Reinforcing Steel - Grade 60	AASHTO M31	
Concrete - Class "X"	SCDHPT Sect. 701	
HP Pile Point - Grade 36	AASHTO M270	
Pipe Pile Point - Grade B	ASTM A53	

TOLERANCES

Length	± 1/8" - 3"
Pile width	± 3/16" - 1/2" (including form draft)
Sweep (Variation from straight line parallel to centerline of member)	± 1/8" per 10'
Position of strands	± 1/4"
Position of pick-up points	± 6"
Variation from specified end squareness or skew	± 1/4" per 12'
Longitudinal spacing of spiral	± 3/4"
Position of steel pile point	± 1/2"
Alignment of steel pile point	± 1/2"
Length of steel pile point	± 3'-6"
Projection of steel pile point from end of pile	± 1"

NOTES FOR BUILD-UP
 Chip back top of piles as shown in build-up detail and field drill holes in top of pile as shown in Section B-B. Dowel bar shall be grouted (f'c = 5000 psi, non-shrink) in the holes.
 When length of required build-up permits, the 1/2" pitch of the spiral shall be extended 2'-0" below bottom of cap or footing. Piles shall not be cut off an additional length in order to provide spiral at 1/2" pitch for 2'-0" below the cap or footing.

If Pile Build-up is required with further driving, Dowel bars may be terminated at the top of Build-up and Pile Anchorage accomplished as shown in the Pile Anchorage Detail.

Piles having an embedment length less than 12' shall be built up as shown above and measurement shall be made for Pile Build-up Preparation. Build-up may be cast with bent cap provided rebar, pile spiral and *4 spiral cage are in place and the cap is cast with Class "X" Concrete. Concrete in the cap will be paid for as normal bent concrete regardless of the class used. Measurement of prestressed pile build-ups for payment shall include an embedment length of 20' when the build-up is cast with the bent cap.

Costs for dowel bars, wire spirals, concrete and surface roughness for build-ups shall be included in the unit price bid for prestressed concrete piling.

PRESTRESSED PILE POINTS
 The Department reserves the right to extend prestressed pile points by field welding additional lengths of prestressed pile points, and to shorten the lengths of prestressed pile point by cutting off some of the prestressed pile points. Therefore, any reinforced pile tips used shall not be welded onto the prestressed pile points until directed by the Engineer, normally just prior to driving. If splices are necessary, they shall be made as indicated in section 713.05 of the Standard Specifications for Highway Construction. All costs for additional lengths of prestressed pile points will be paid for at the unit cost bid for prestressed pile points, with an allowance of two feet of prestressed pile point for each splice eligible for payment.

REINFORCED PILE TIPS
 When specified in the contract, prestressed pile points shall be reinforced with manufactured cast steel pile tips conforming to AASHTO M103 (ASTM A-27). The pile tips shall be installed in accordance with the manufacturer's recommendations except that as a minimum, the welds shall extend across the full width of each flange. The reinforced steel pile tips shall be approved by the Engineer prior to installation and the welds shall be visually inspected by the Resident Engineer in the field. All costs for installing reinforced pile tips to prestressed pile points shall be included in the unit price bid for reinforced pile tips.

FIELD WELDING
 Field welding shall comply with the special provisions for field welding.

GENERAL NOTES
 The splice of wire spiral shall be made by full strength lap welds. The Contractor shall submit dowel bar lengths to the Resident Engineer for approval. Chamfer all exposed edges 1/4" unless noted otherwise. All dimensions relative to reinforcing steel are to centers of bars (except as noted). Release alternate strands simultaneously at opposite ends without shock. Wire spiral shall be tied to cables and reinforcing bars as required to maintain pitch of the spiral.

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION BRIDGE DESIGN COLUMBIA, S.C.			
STANDARD FOR PREST. CONC. PILES WITH POINTS			
REV.	DWM	BDP	11-94
	BAR CLEARANCE		
REV.	DWM	BDP	7-94
	M225		
REV.	WGP	JP	5-94
	PILE POINTS		
QUAN.			
DR.	MSA	BWB	9-89
DES.	MSA	BWB	7-89
BY	CHK.	DATE	
FILE NO.	ROUTE	COUNTY	DRAWING NO. 712P

NOTE TO DETAILER: Maximum pile length for single point pick-up shall be adjusted if length of pile point is increased.