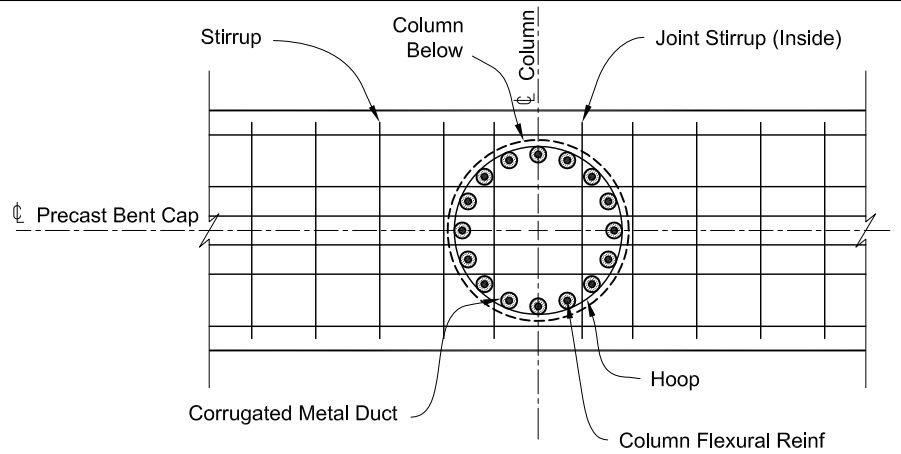


ECD Attachments

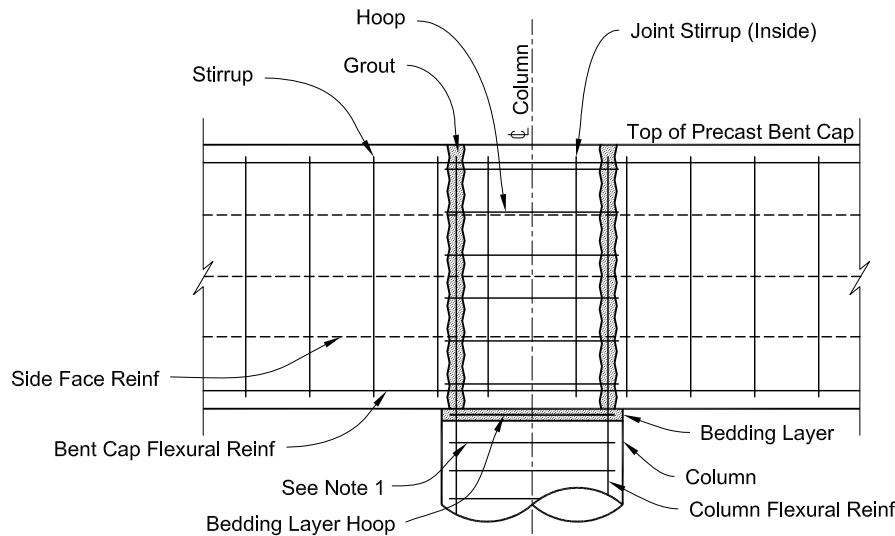
Example Connection Details

- Attachment ECD1: SDC A—Grouted Duct Connection.
 - Example bent cap details for grouted duct connection in SDC A
- Attachment ECD2: SDC A—Cap Pocket Connection.
 - Example bent cap details for cap pocket connection in SDC A
- Attachment ECD3: SDC B—Grouted Duct Connection
 - Example bent cap details for grouted duct connection in SDC B (minimum joint reinforcement used)
- Attachment ECD4: SDC B—Cap Pocket Connection.
 - Example bent cap details for cap pocket connection in SDC B (minimum joint reinforcement used)
- Attachment ECD5: SDCs B, C and D—Grouted Duct Connection.
 - Example bent cap details for grouted duct connection in SDCs B, C, and D (additional joint reinforcement required)
- Attachment ECD6: SDCs B, C and D—Cap Pocket Connection.
 - Example bent cap details for cap pocket connection in SDCs B, C, and D (additional joint reinforcement required)
- Attachment ECD7: SDCs B, C and D—Hybrid Connection.
 - Example bent cap details for hybrid connection in SDCs B, C, and D
- Attachment ECD8: SDCs B, C and D—Integral Connection.
 - Example bent cap details for integral connection in SDCs B, C, and D



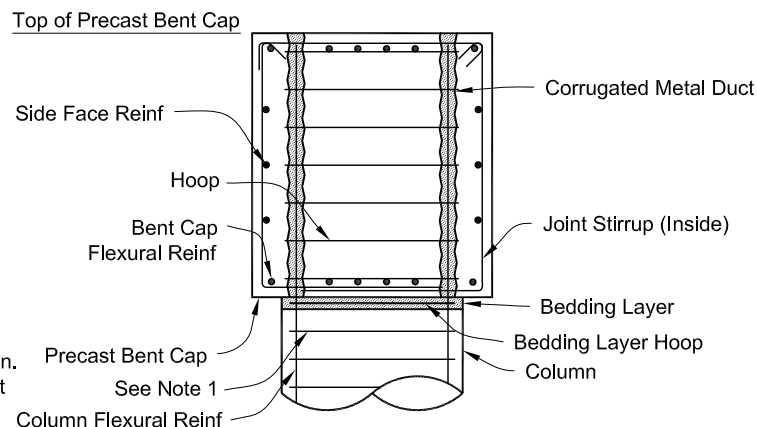
PLAN

SCALE: 1/4" = 1'-0"



ELEVATION

SCALE: 1/4" = 1'-0"



SECTION

SCALE: 1/4" = 1'-0"

Note:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing within bedding layer.
2. For clarity, cast-in-place pier diaphragm and associated dowels anchored into bent cap are not shown.
3. For clarity, all bent cap reinforcement for limit states other than seismic is not shown.



SACRAMENTO
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NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:

SDC A

SUPER. CONNECTION:

NON-INTEGRAL

CONNECTION DETAIL:

GROUTED DUCT

BY: JW/ML

CHK: MS/AW

DATE:

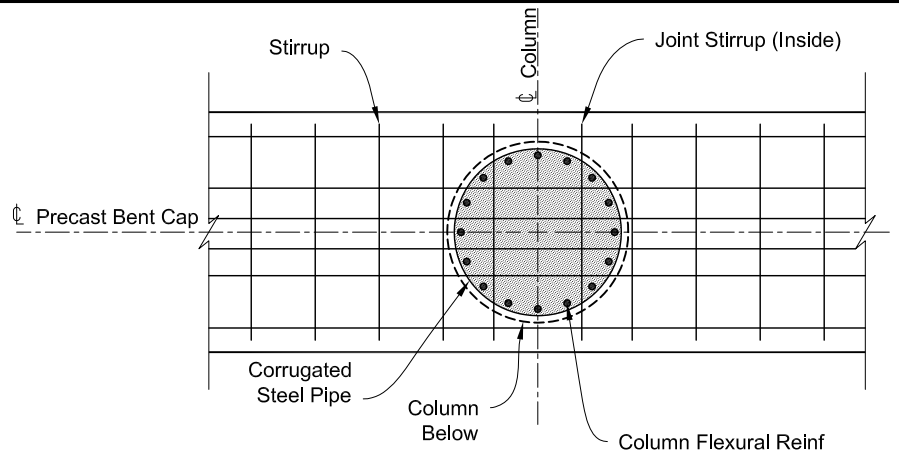
11/24/09

SCALE:

1/4" = 1'-0"

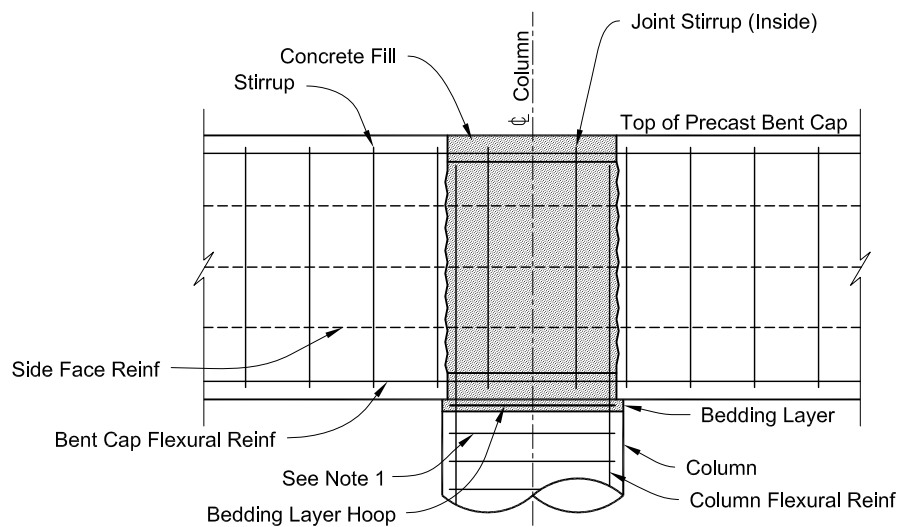
SHEET:

1 of 1



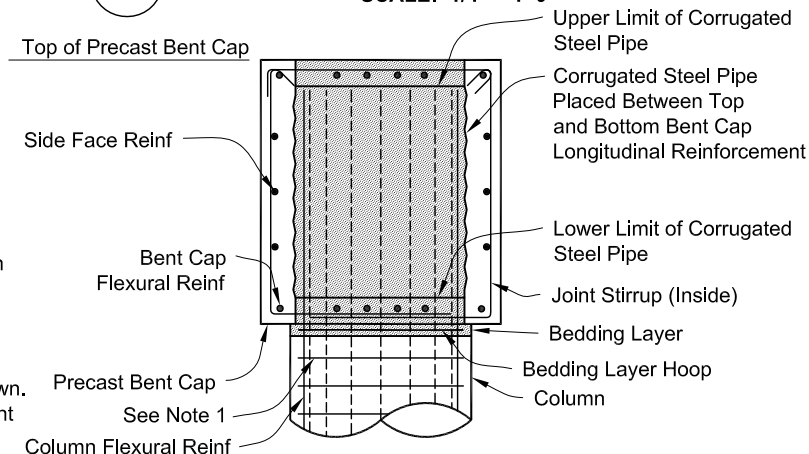
PLAN

SCALE: 1/4" = 1'-0"



ELEVATION

SCALE: 1/4" = 1'-0"



SECTION

SCALE: 1/4" = 1'-0"

Note:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing within bedding layer.
2. For clarity, cast-in-place pier diaphragm and associated dowels anchored into bent cap are not shown.
3. For clarity, all bent cap reinforcement for limit states other than seismic is not shown.



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NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:

SDC A

SUPER. CONNECTION:

NON-INTEGRAL

CONNECTION DETAIL:

CAP POCKET

BY: JW/ML

CHK: MS/AW

DATE:

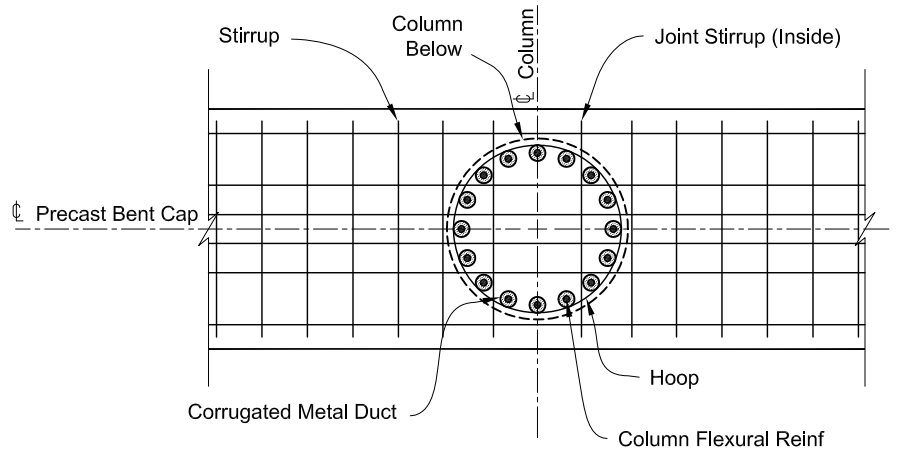
11/24/09

SCALE:

1/4" = 1'-0"

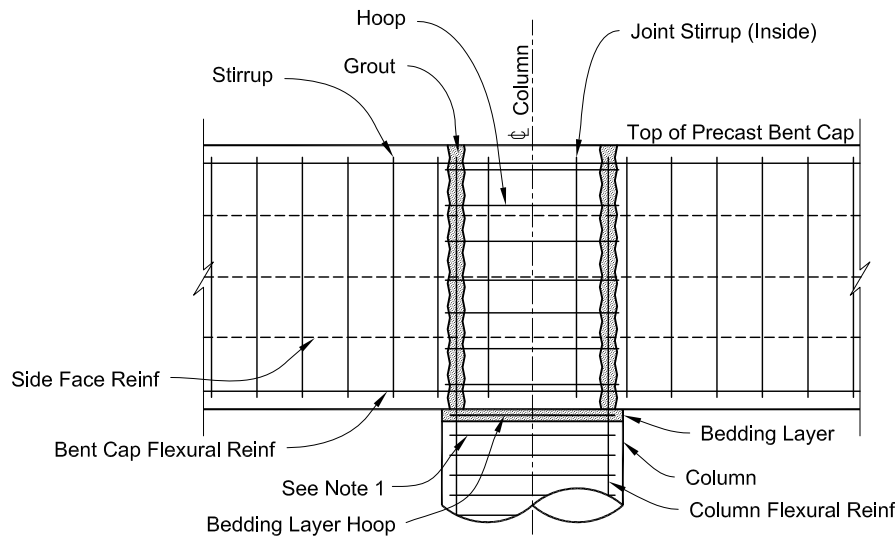
SHEET:

1 of 1



PLAN

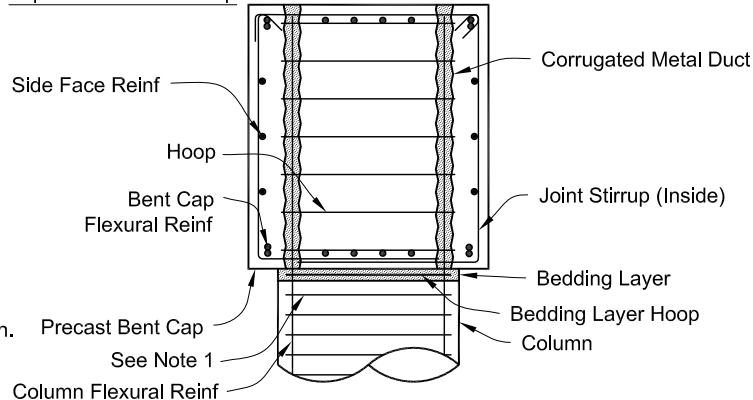
SCALE: 1/4" = 1'-0"



ELEVATION

SCALE: 1/4" = 1'-0"

Top of Precast Bent Cap



SECTION

SCALE: 1/4" = 1'-0"

Note:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing within bedding layer.
2. For clarity, cast-in-place pier diaphragm and associated dowels anchored into bent cap are not shown.
3. Detailing shown corresponds to principal tension in the joint less than $0.11 \sqrt{f'_c}$.
4. For clarity, all bent cap reinforcement for limit states other than seismic is not shown.



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NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:

SDC B

SUPER. CONNECTION:

NON-INTEGRAL

CONNECTION DETAIL:

GROUTED DUCT

BY: JW/ML

CHK: MS/AW

DATE:

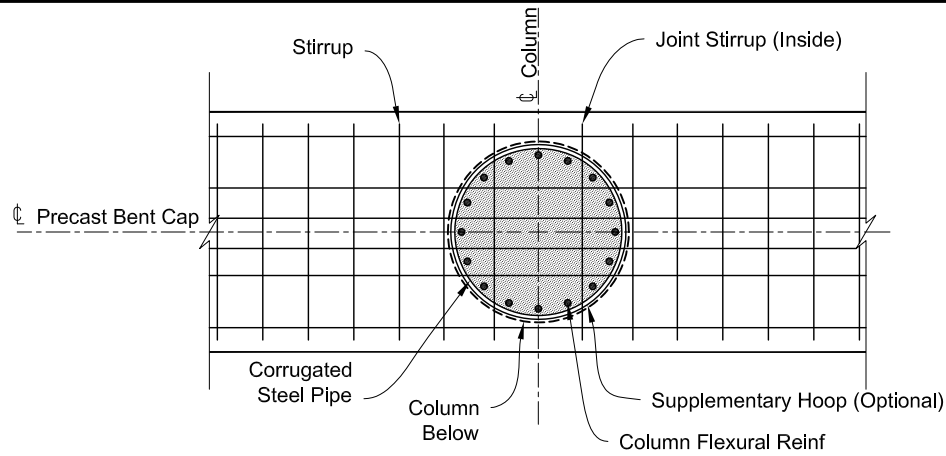
11/24/09

SCALE:

1/4" = 1'-0"

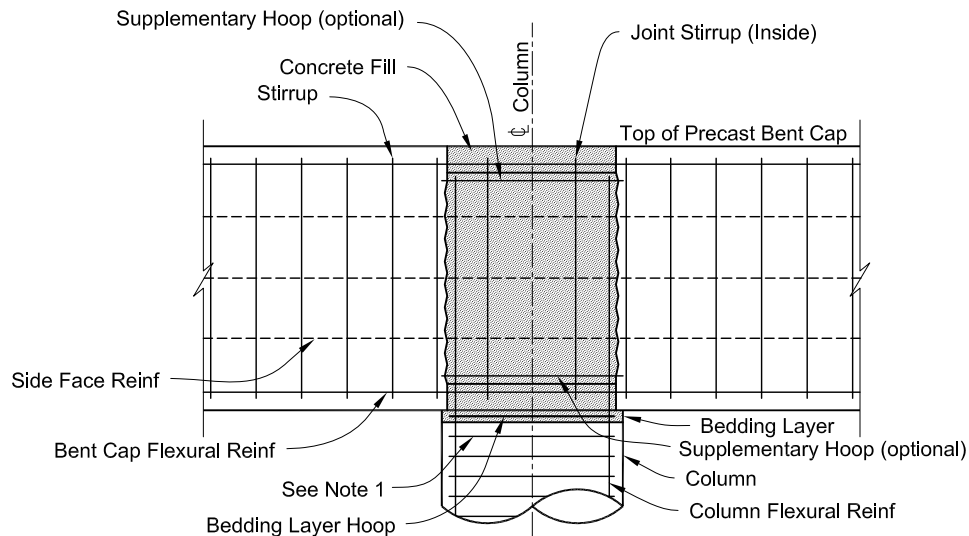
SHEET:

1 of 1



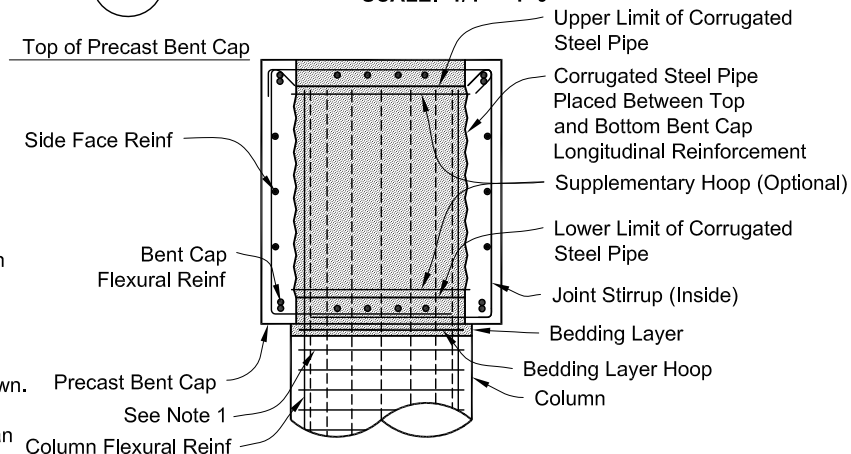
PLAN

SCALE: 1/4" = 1'-0"



ELEVATION

SCALE: 1/4" = 1'-0"



SECTION

SCALE: 1/4" = 1'-0"

Note:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing within bedding layer.
2. For clarity, cast-in-place pier diaphragm and associated dowels anchored into bent cap are not shown.
3. Detailing shown corresponds to principal tension in the joint less than $0.11 \sqrt{f'_c}$.
4. For clarity, all bent cap reinforcement for limit states other than seismic is not shown.



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NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:

SDC B

SUPER. CONNECTION:

NON-INTEGRAL

CONNECTION DETAIL:

CAP POCKET

BY: JW/ML

CHK: MS/AW

DATE:

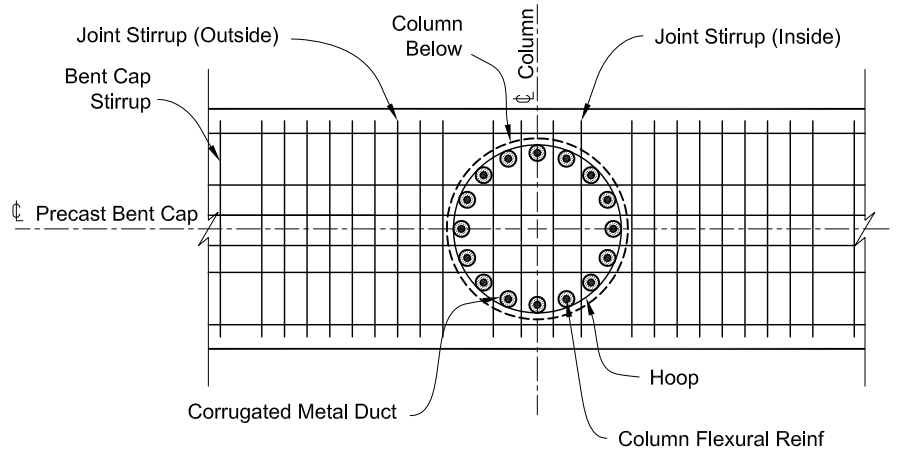
11/24/09

SCALE:

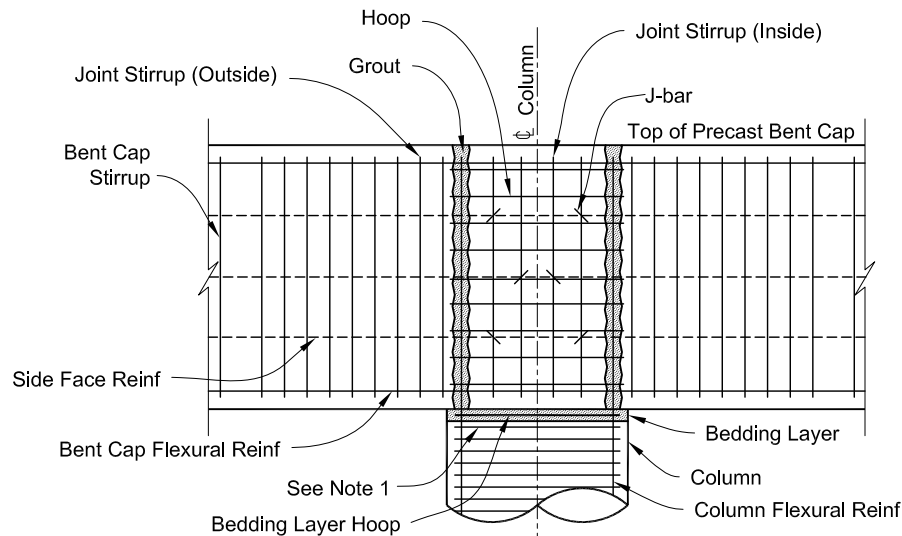
1/4" = 1'-0"

SHEET:

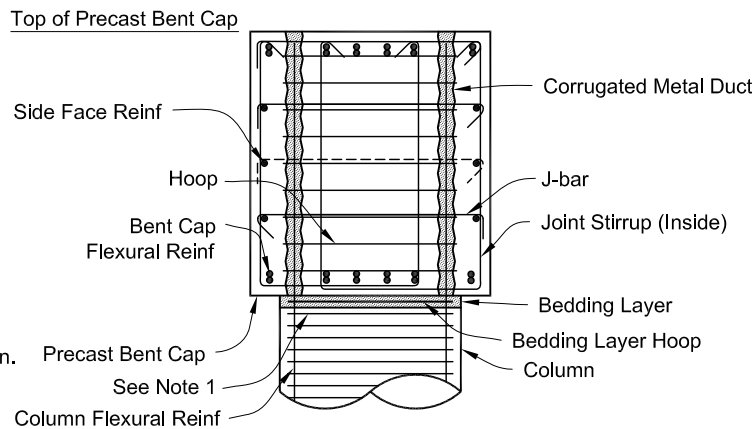
1 of 1



PLAN
SCALE: 1/4" = 1'-0"



ELEVATION
SCALE: 1/4" = 1'-0"



SECTION
SCALE: 1/4" = 1'-0"

Note:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing within bedding layer.
2. For clarity, cast-in-place pier diaphragm and associated dowels anchored into bent cap are not shown.
3. Detailing shown corresponds to principal tension in the joint equal to $0.11 \sqrt{f'_c}$ or greater.
4. For clarity, all bent cap reinforcement for limit states other than seismic is not shown.



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NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:

SDCs B, C, & D

SUPER. CONNECTION:

NON-INTEGRAL

CONNECTION DETAIL:

GROUTED DUCT

BY: JW/ML

CHK: MS/AW

DATE:

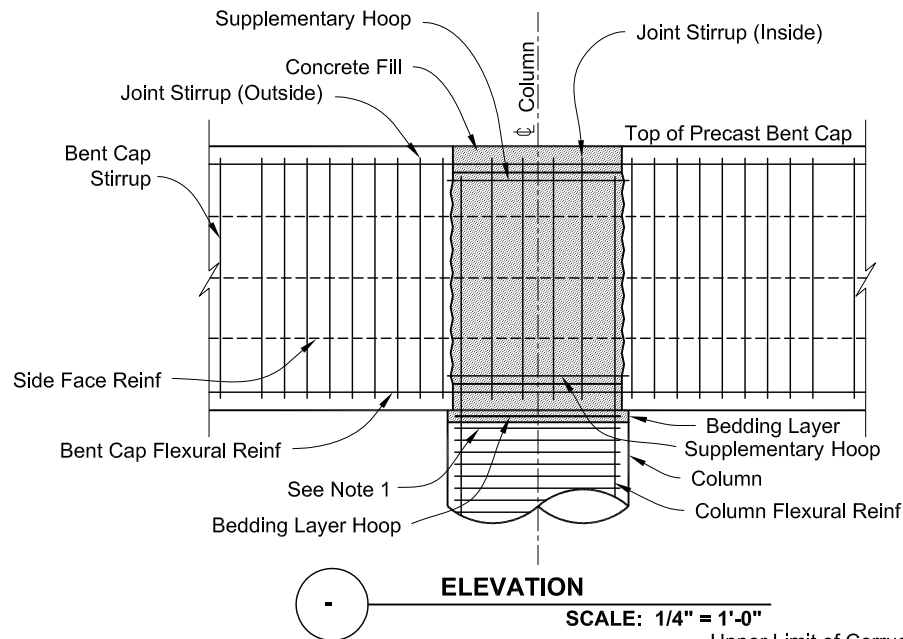
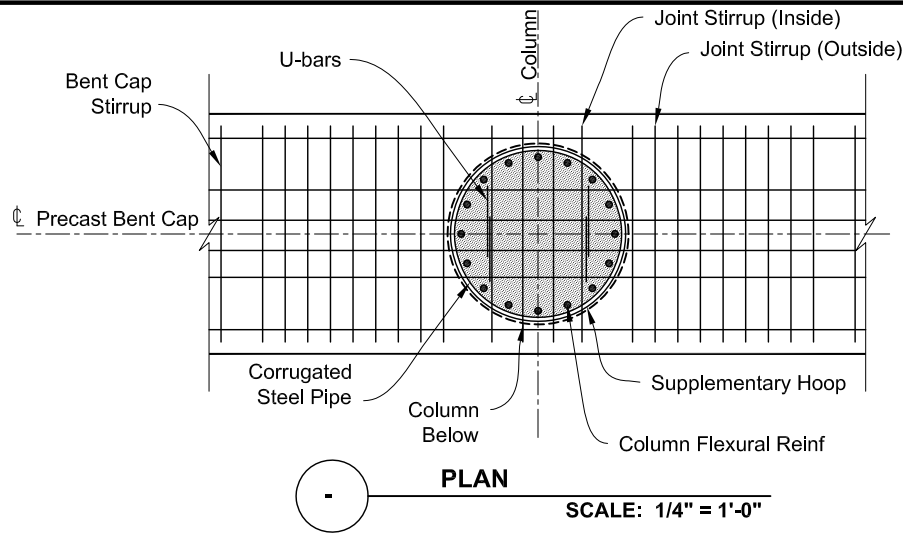
11/24/09

SCALE:

1/4" = 1'-0"

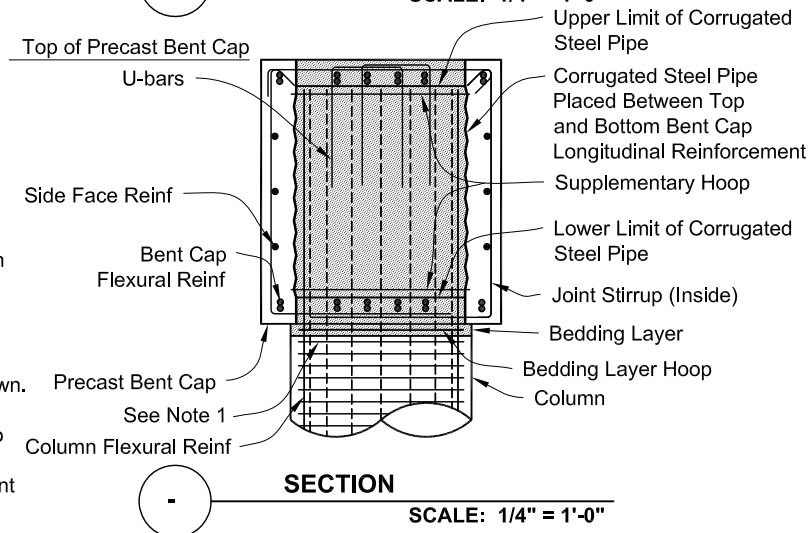
SHEET:

1 of 1



Note:

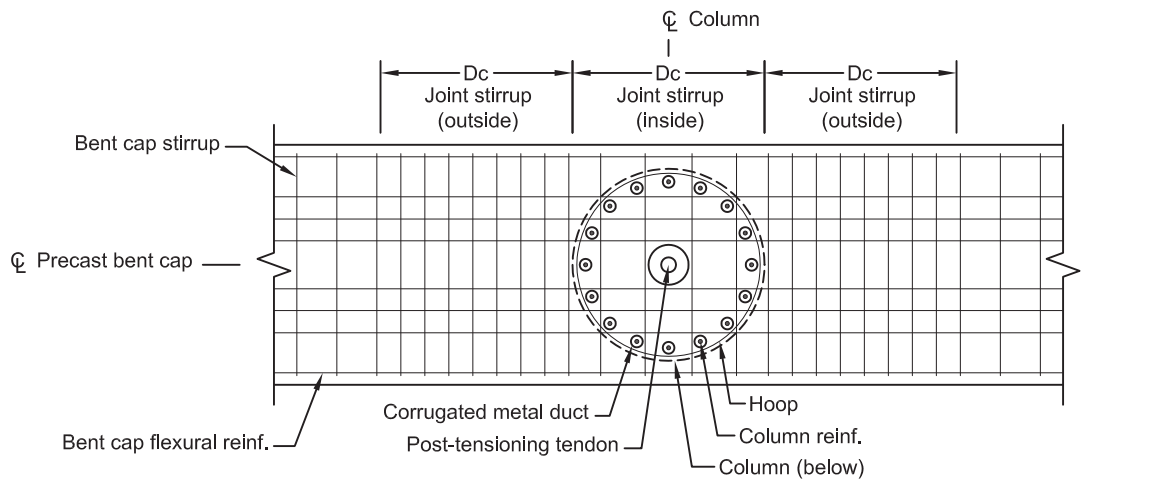
1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing within bedding layer.
2. For clarity, cast-in-place pier diaphragm and associated dowels anchored into bent cap are not shown.
3. Detailing shown corresponds to principal tension in the joint equal to $0.11 \sqrt{f'_c}$ or greater.
4. For clarity, all bent cap reinforcement for limit states other than seismic is not shown.



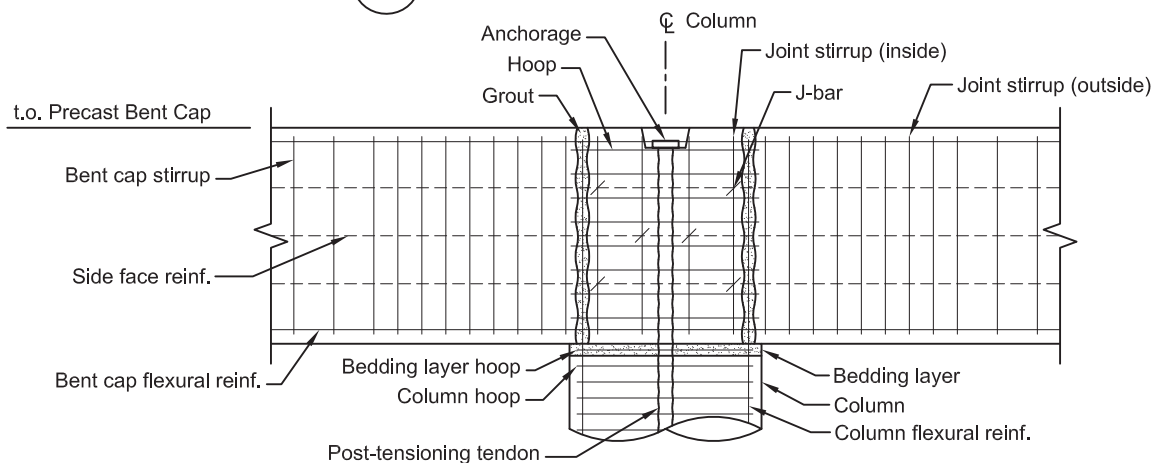
NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY: SDCs B, C, & D		SUPER. CONNECTION: NON-INTEGRAL		CONNECTION DETAIL: CAP POCKET	
BY: JW/ML	CHK: MS/AW	DATE: 11/24/09	SCALE: 1/4" = 1'-0"	SHEET: 1 of 1	



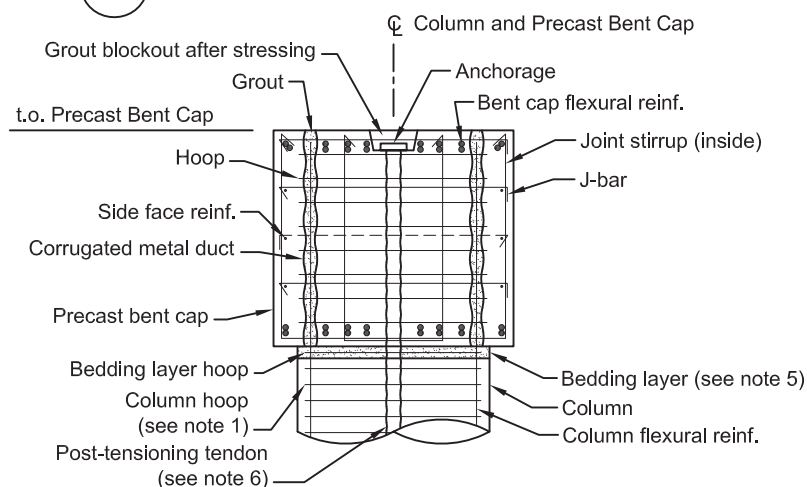
PLAN VIEW



ELEVATION AT COLUMN

Notes:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing
2. For clarity, cast-in-place pier diaphragm and associated dowels are not shown
3. Detailing shown corresponds to principal tension in the joint equal to or greater than $0.11 \sqrt{f_c}$
4. For clarity, all bent cap reinforcement for limit states other than seismic is not shown
5. Bedding layer grout shall have a minimum 3 lb per cy fraction of polypropylene fibers
6. Column post-tensioning shall be unbonded. Use sheathed tendon or otherwise protect tendon from corrosion



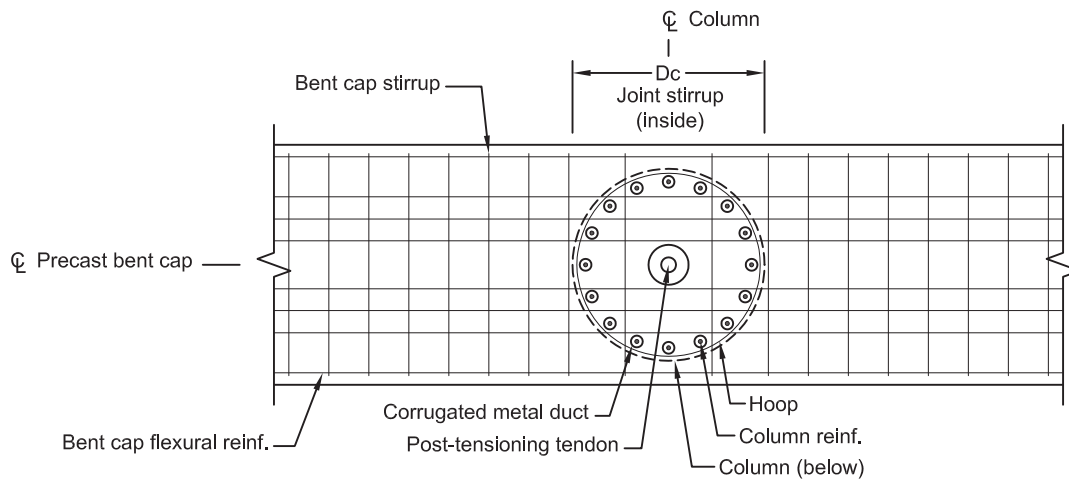
SECTION AT COLUMN CENTERLINE



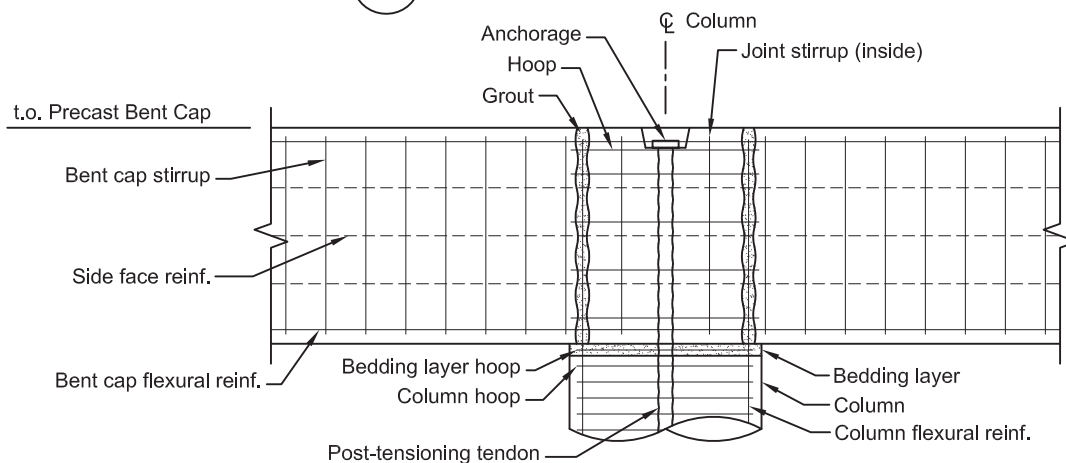
NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:	SUPER. CONNECTION:	CONNECTION DETAIL:
SDC B, C & D	NON-INTEGRAL	CONVENTIONAL HYBRID (High Joint Stress)
BY: MJT	CHK: JR	DATE: 12/31/2009
SCALE: NTS	SHEET: 1 of 1	



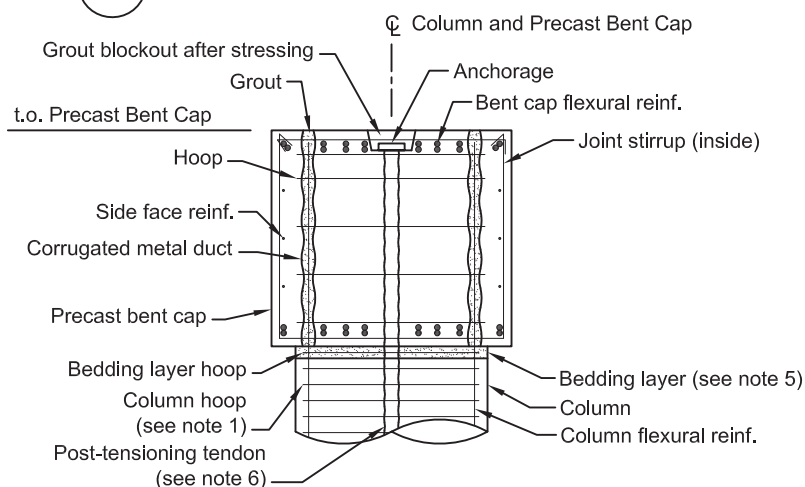
PLAN VIEW



ELEVATION AT COLUMN

Notes:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing
2. For clarity, cast-in-place pier diaphragm and associated dowels are not shown
3. Detailing shown corresponds to principal tension in the joint less than $0.11 \sqrt{f_c}$
4. For clarity, all bent cap reinforcement for limit states other than seismic is not shown
5. Bedding layer grout shall have a minimum 3 lb per cy fraction of polypropylene fibers
6. Column post-tensioning shall be unbonded. Use sheathed tendon or otherwise protect tendon from corrosion



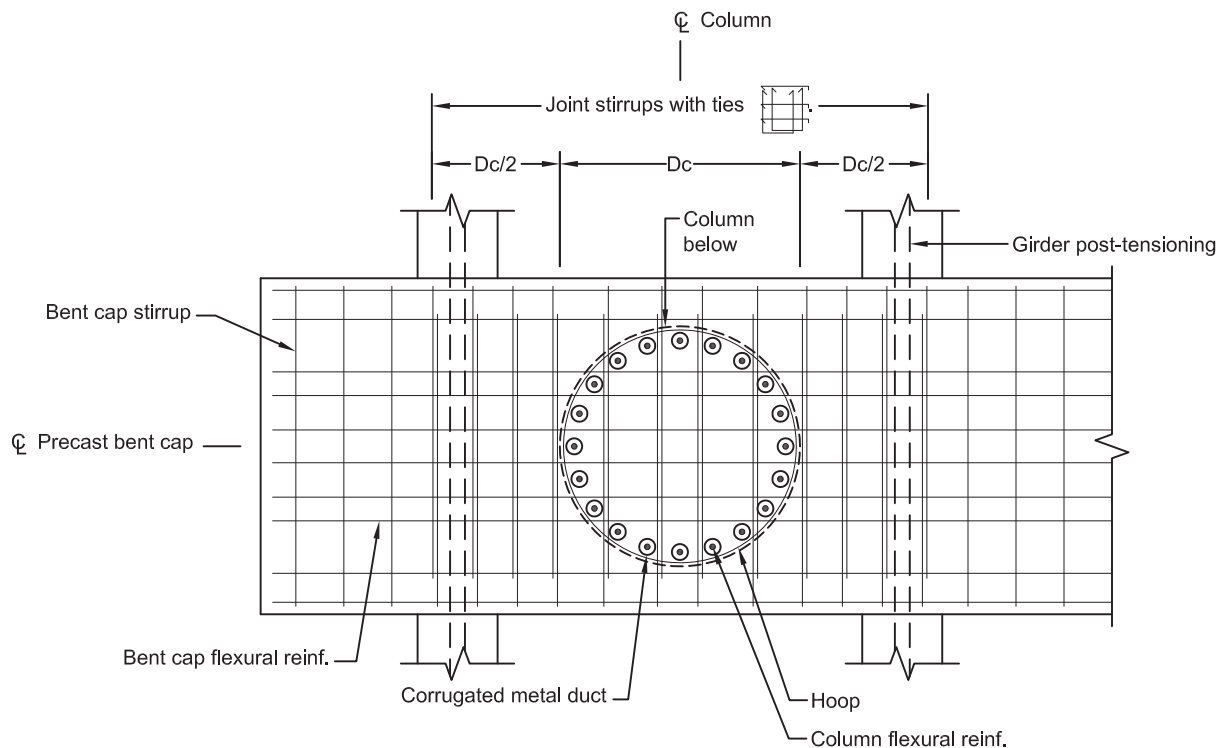
SECTION AT COLUMN CENTERLINE



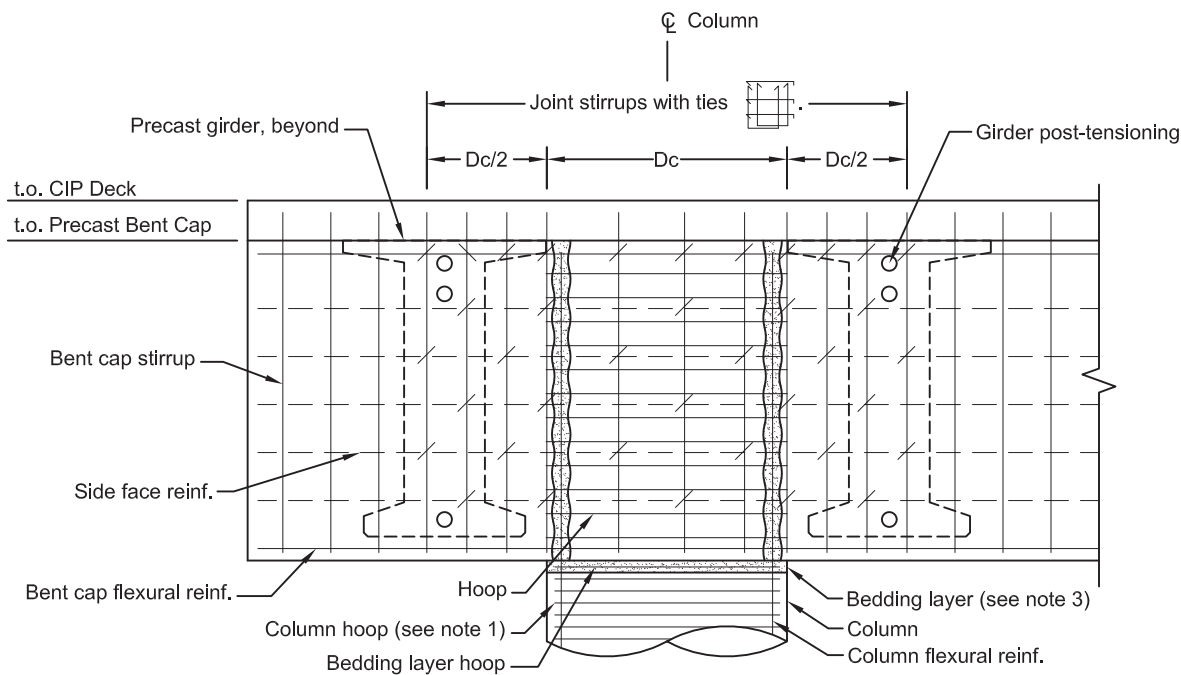
NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:	SUPER. CONNECTION:	CONNECTION DETAIL:
SDC B, C & D	NON-INTEGRAL	CONVENTIONAL HYBRID (Low Joint Stress)
BY: MJT	CHK: JR	DATE: 12/31/2009
SCALE: NTS	SHEET: 1 of 1	



PLAN VIEW



ELEVATION AT COLUMN

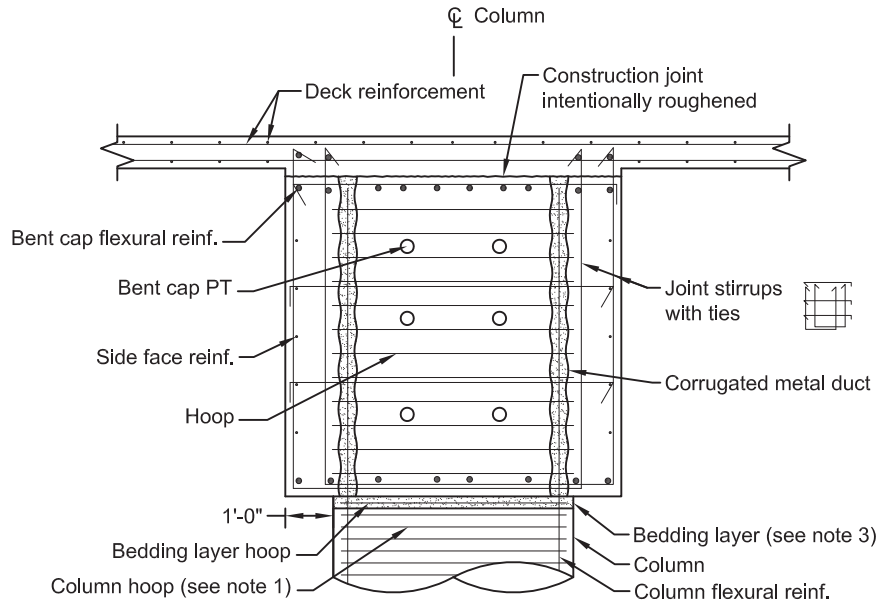
See Sheet 3 for notes



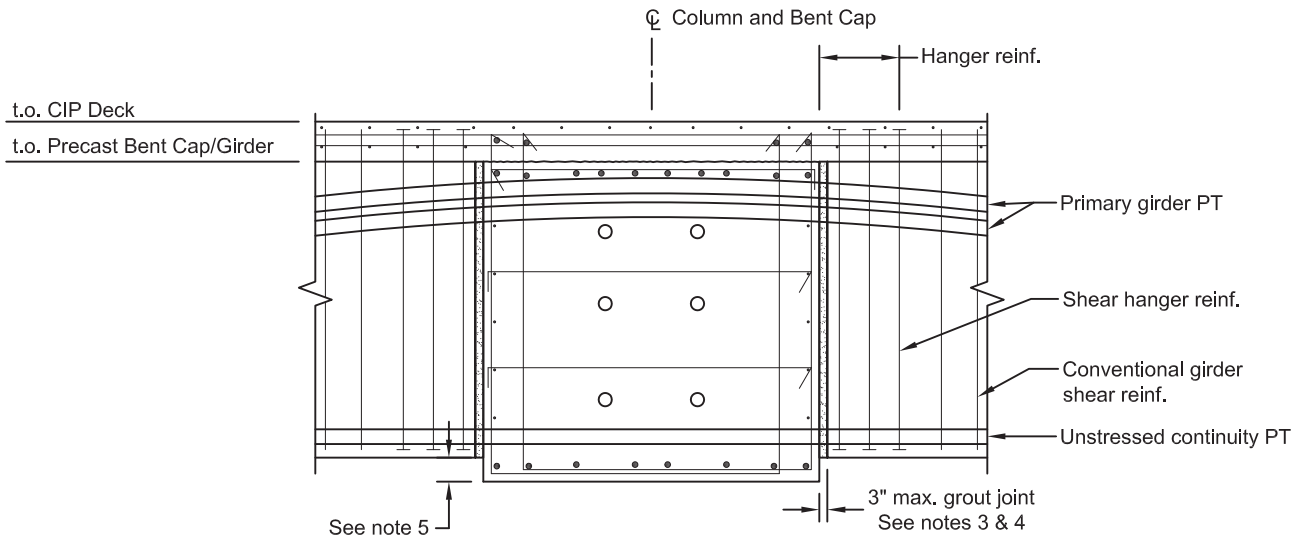
NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY: SDC B, C & D		SUPER. CONNECTION: INTEGRAL		CONNECTION DETAIL: POST-TENSIONED INTEGRAL SYSTEM		
BY:	MJT	CHK:	JR	DATE:	12/31/2009	SCALE: NTS
SHEET:					1 of 6	



SECTION AT COLUMN CENTERLINE
Scale: 1/4" = 1'-0"



SECTION AT GIRDER CENTERLINE
Scale: 1/4" = 1'-0"

See Sheet 3 for notes



NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY:
SDC B, C & D

SUPER. CONNECTION:
INTEGRAL

CONNECTION DETAIL:
POST-TENSIONED INTEGRAL SYSTEM

BY: MJT

CHK: JR

DATE:

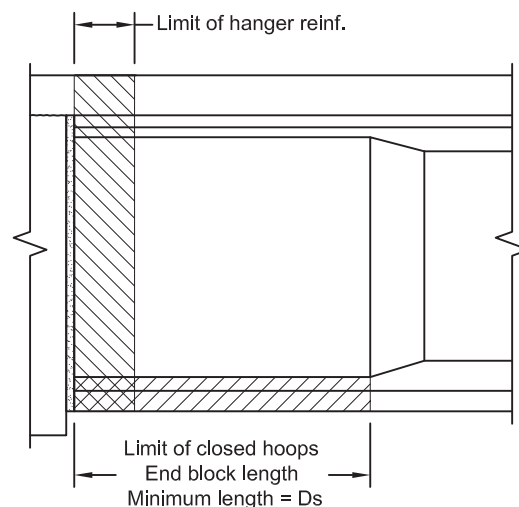
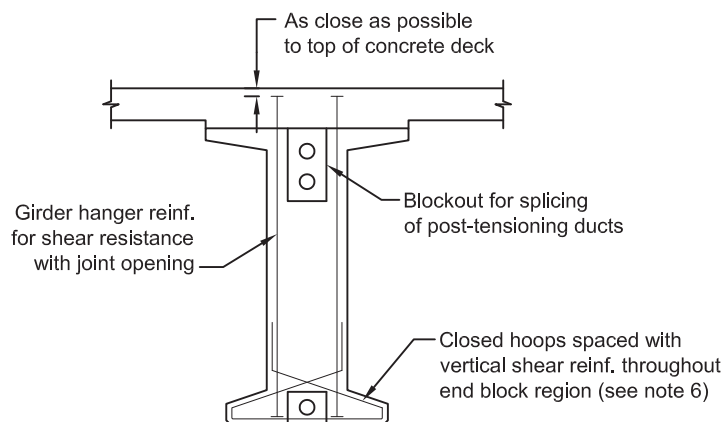
12/31/2009

SCALE:

NTS

SHEET:

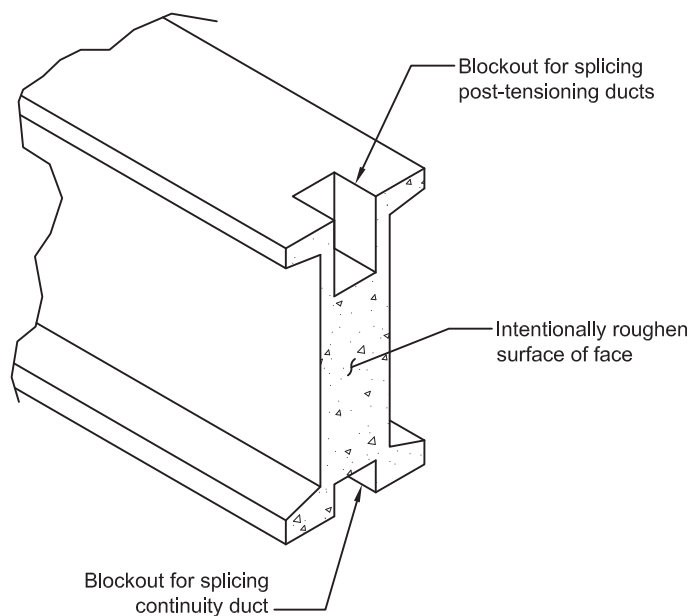
2 of 6



GIRDER END DETAILING

NOTES:

1. First column hoop to be spaced from bedding layer hoop to maintain plastic hinge column hoop spacing
2. For clarity, all bent cap reinforcement for limit states other than seismic not shown
3. Bedding layer and superstructure closure joint grout shall have a minimum 3 lb per cy fraction of polypropylene fibers
4. For superstructure closure joints greater than 3", joint shall be constructed of concrete and reinforced to ensure the integrity of the joint is maintained
5. Extend bent cap depth past bottom of girder to allow for splicing of continuity post-tensioning through bent cap
6. Closed hoops shall be the same size as conventional girder shear reinf. in end block



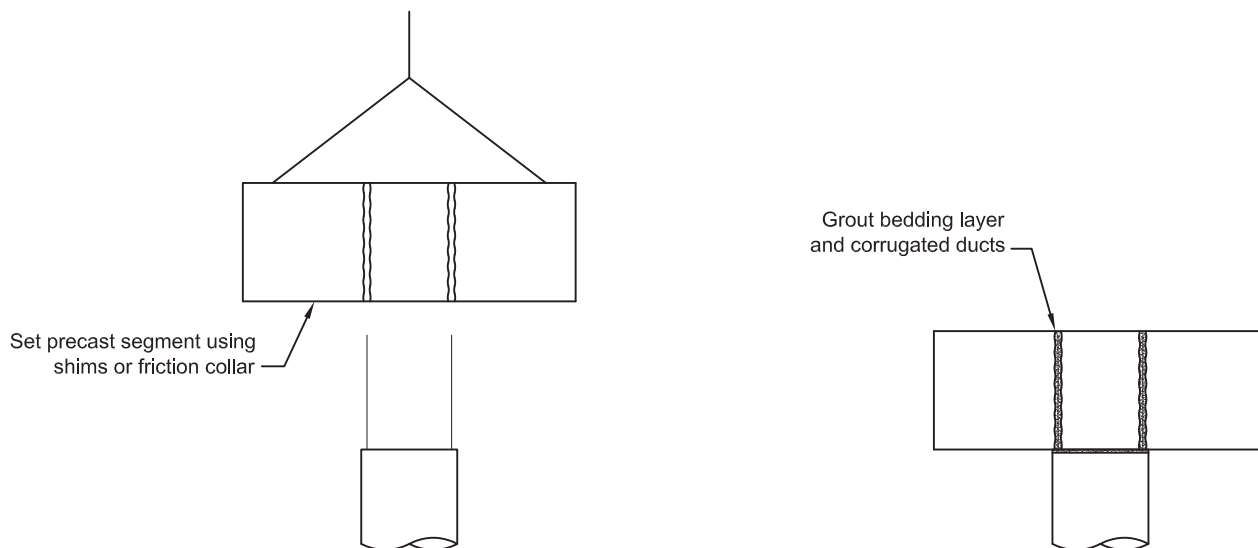
GIRDER END REGION



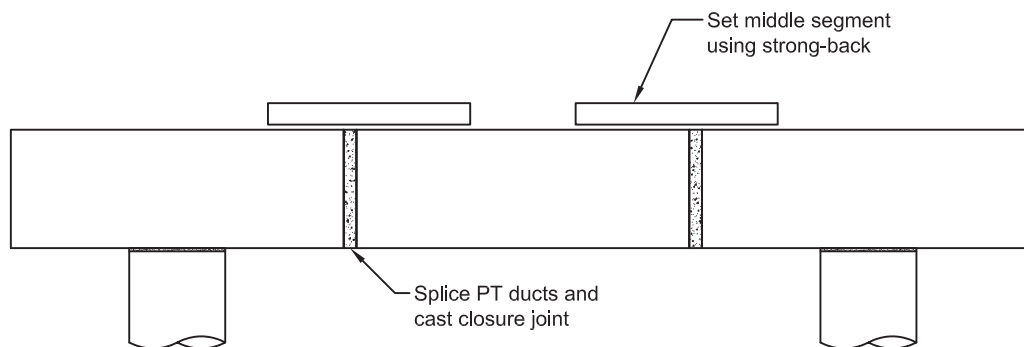
NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

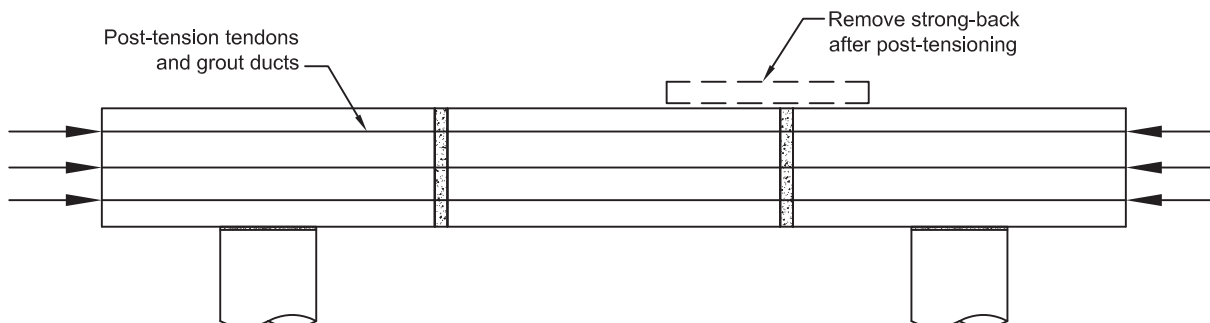
SEISMICITY:	SUPER. CONNECTION:	CONNECTION DETAIL:
SDC B, C & D	INTEGRAL	POST-TENSIONED INTEGRAL SYSTEM
BY: MJT	CHK: JR	DATE: 12/31/2009
SCALE: NTS	SHEET: 3 of 6	



1 CAP CONSTRUCTION



2 CAP CONSTRUCTION



3 CAP CONSTRUCTION

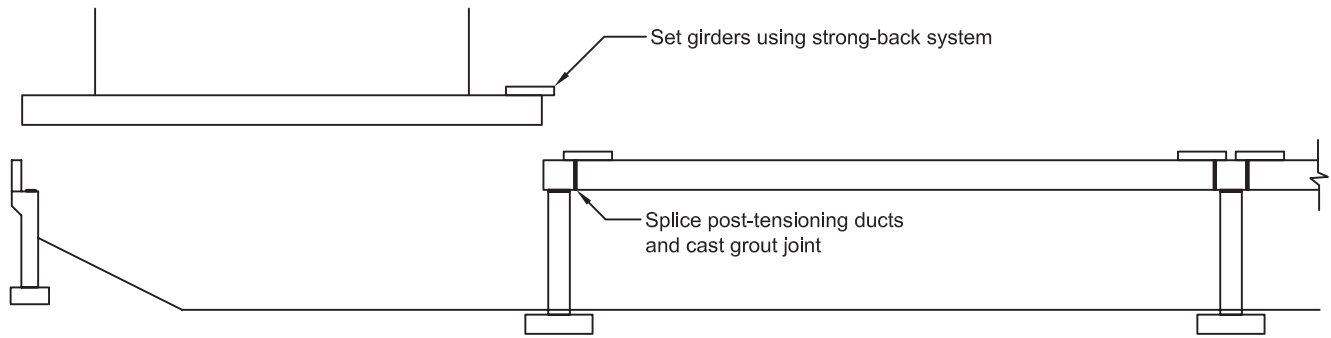
NOTE:
Bent cap can be fabricated as single piece or as segmental member, as shown



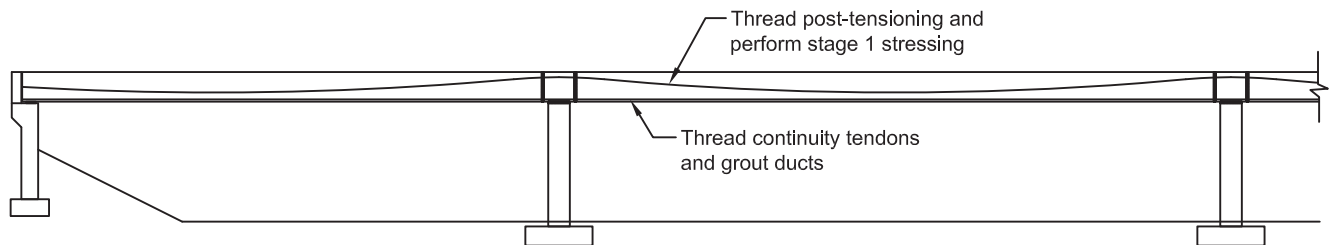
NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

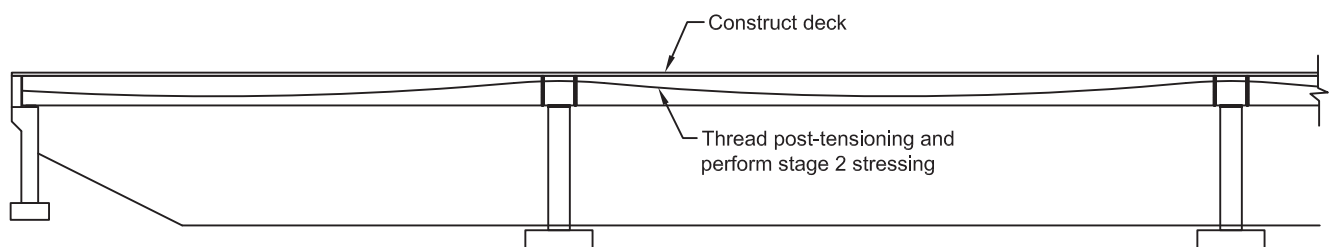
SEISMICITY: SDC B, C & D	SUPER. CONNECTION: INTEGRAL	CONNECTION DETAIL: POST-TENSIONED INTEGRAL SYSTEM
BY: MJT	CHK: JR	DATE: 12/31/2009
SCALE: NTS	SHEET: 4 of 6	



1 MAIN CONSTRUCTION



2 MAIN CONSTRUCTION



3 MAIN CONSTRUCTION

NOTE:

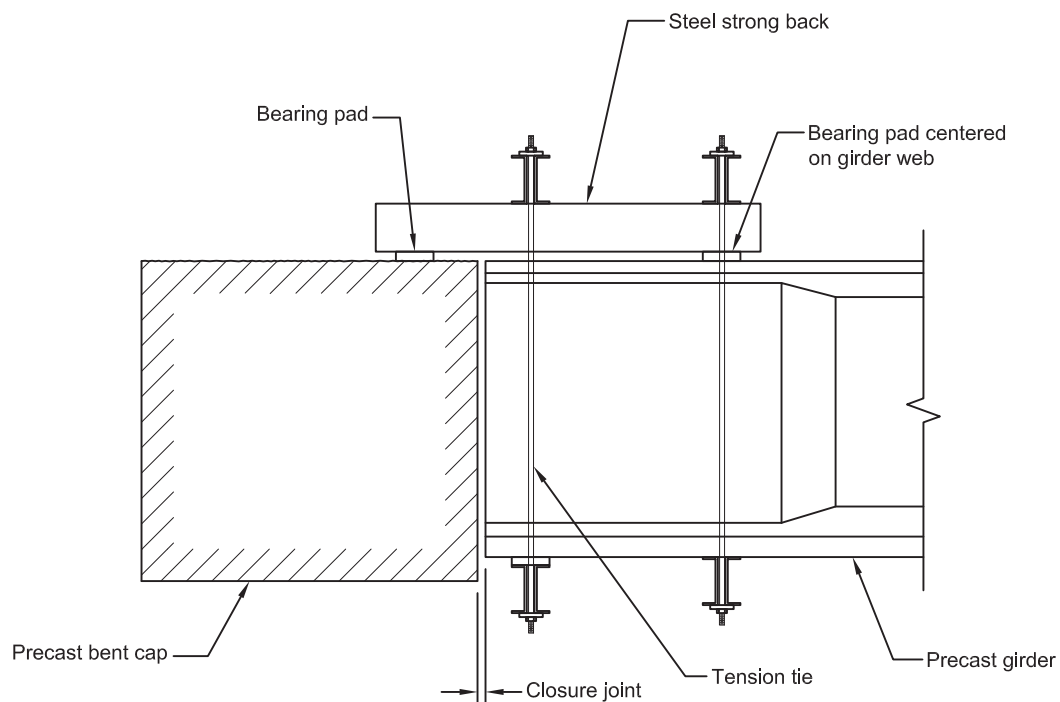
1. Construction staging effects shall be explicitly considered in design of structure for all load cases
2. Deck system can be constructed as cast-in-place or with precast partial depth precast deck panels



NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY: SDC B, C & D		SUPER. CONNECTION: INTEGRAL		CONNECTION DETAIL: POST-TENSIONED INTEGRAL SYSTEM		
BY:	MJT	CHK:	JR	DATE:	12/31/2009	SCALE: NTS
SHEET:					5 of 6	



NOTE:
Design strong back to provide adequate access to
blockouts for splicing of post-tensioning ducts

- STRONG BACK EXAMPLE



NCHRP PROJECT 12-74

EXAMPLE PRECAST BENT CAP CONNECTION DETAILS

SEISMICITY: SDC B, C & D	SUPER. CONNECTION: INTEGRAL	CONNECTION DETAIL: POST-TENSIONED INTEGRAL SYSTEM
BY: MJT	CHK: JR	DATE: 12/31/2009
SCALE: NTS	SHEET: 6 of 6	