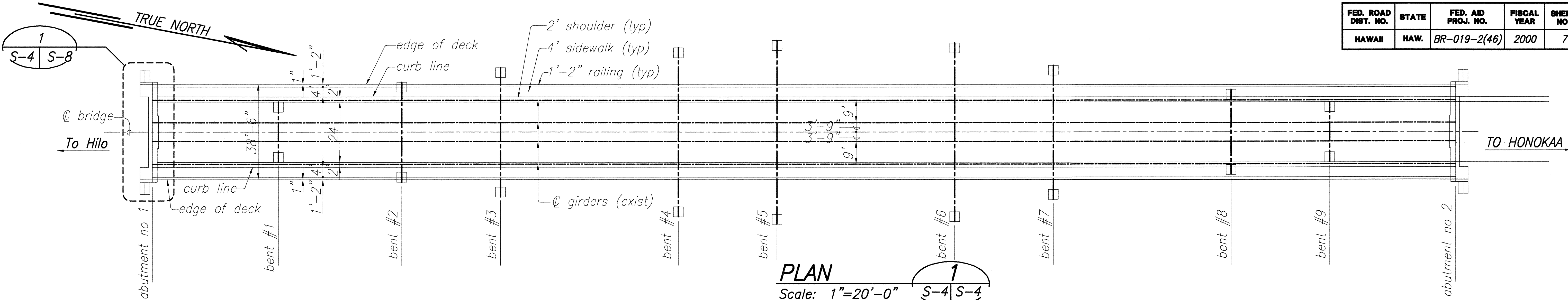


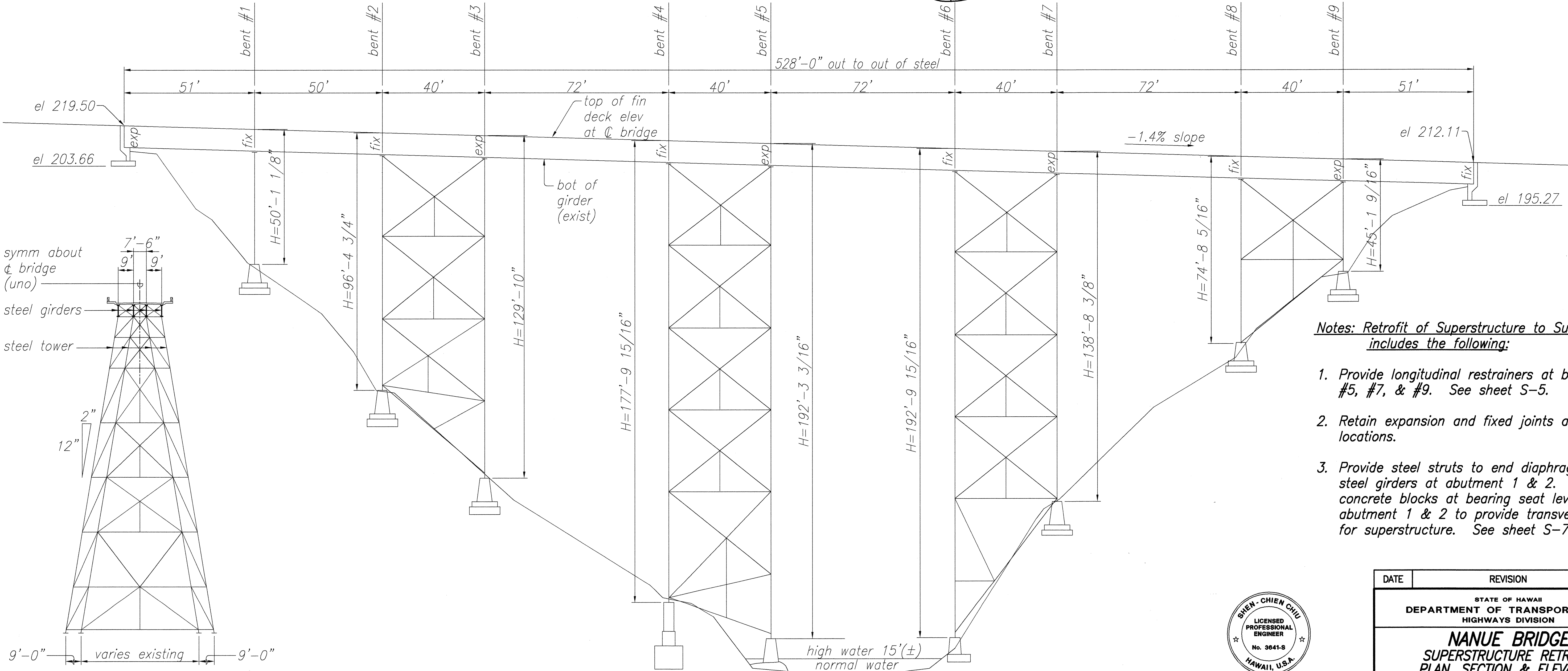
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	7	26



PLAN

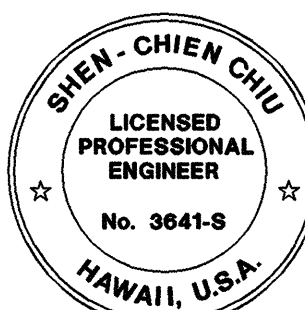
Scale: 1"=20'-0"

1
S-4 S-4



Notes: Retrofit of Superstructure to Substructure includes the following:

1. Provide longitudinal restrainers at bents #3, #5, #7, & #9. See sheet S-5.
2. Retain expansion and fixed joints at existing locations.
3. Provide steel struts to end diaphragms of steel girders at abutment 1 & 2. Add concrete blocks at bearing seat level of abutment 1 & 2 to provide transverse restraint for superstructure. See sheet S-7.



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Shien-Chien Chiu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	NANUE BRIDGE SUPERSTRUCTURE RETROFIT PLAN, SECTION & ELEVATION
	SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-4 OF 23 SHEETS	

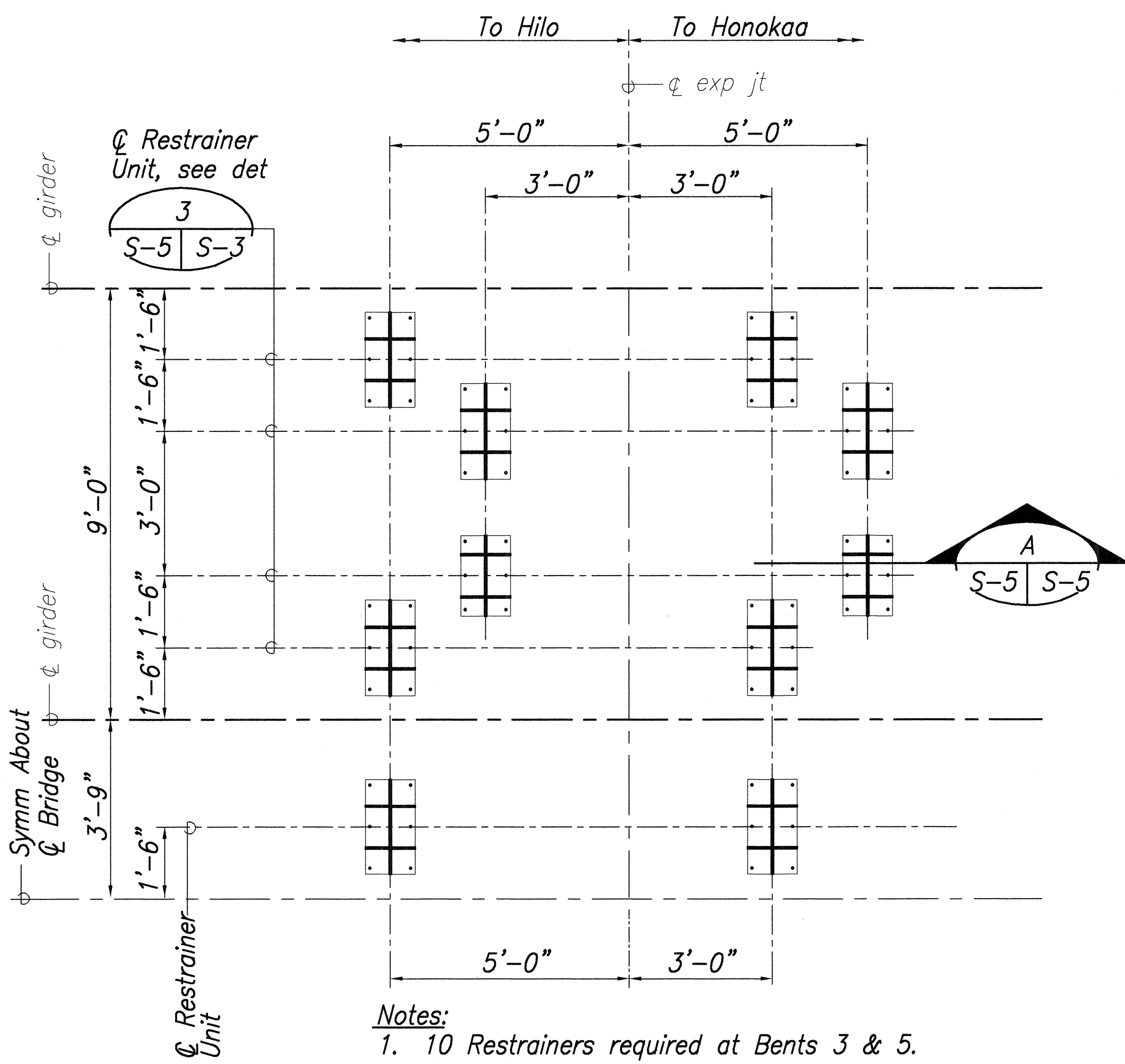
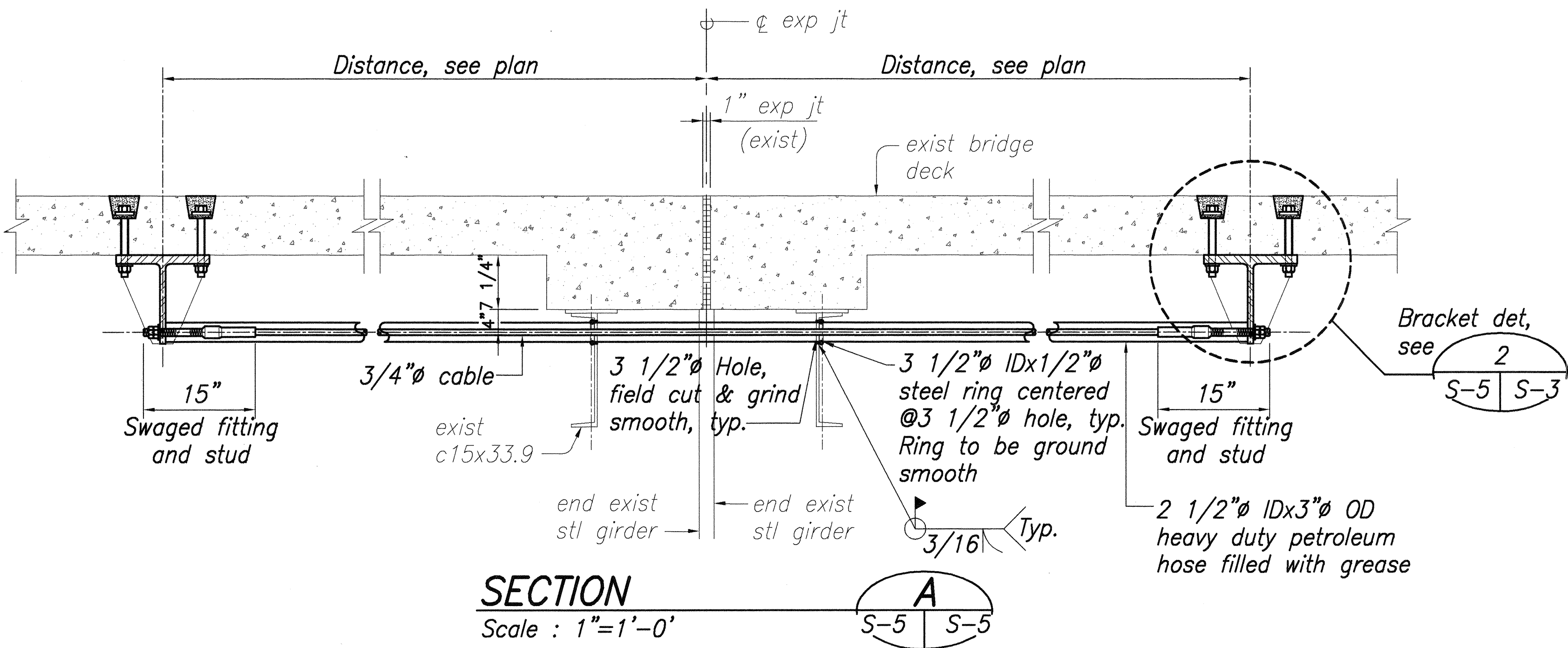
SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
No.	

NS1-1.DWG 08/04/99 15:51 FINAL L:\DWG\6041-01\NEWSTRUCT\NANUE

TYPICAL BENT ELEVATION **B**
Scale: 1"=30'-0"
Note: Existing Condition Shown

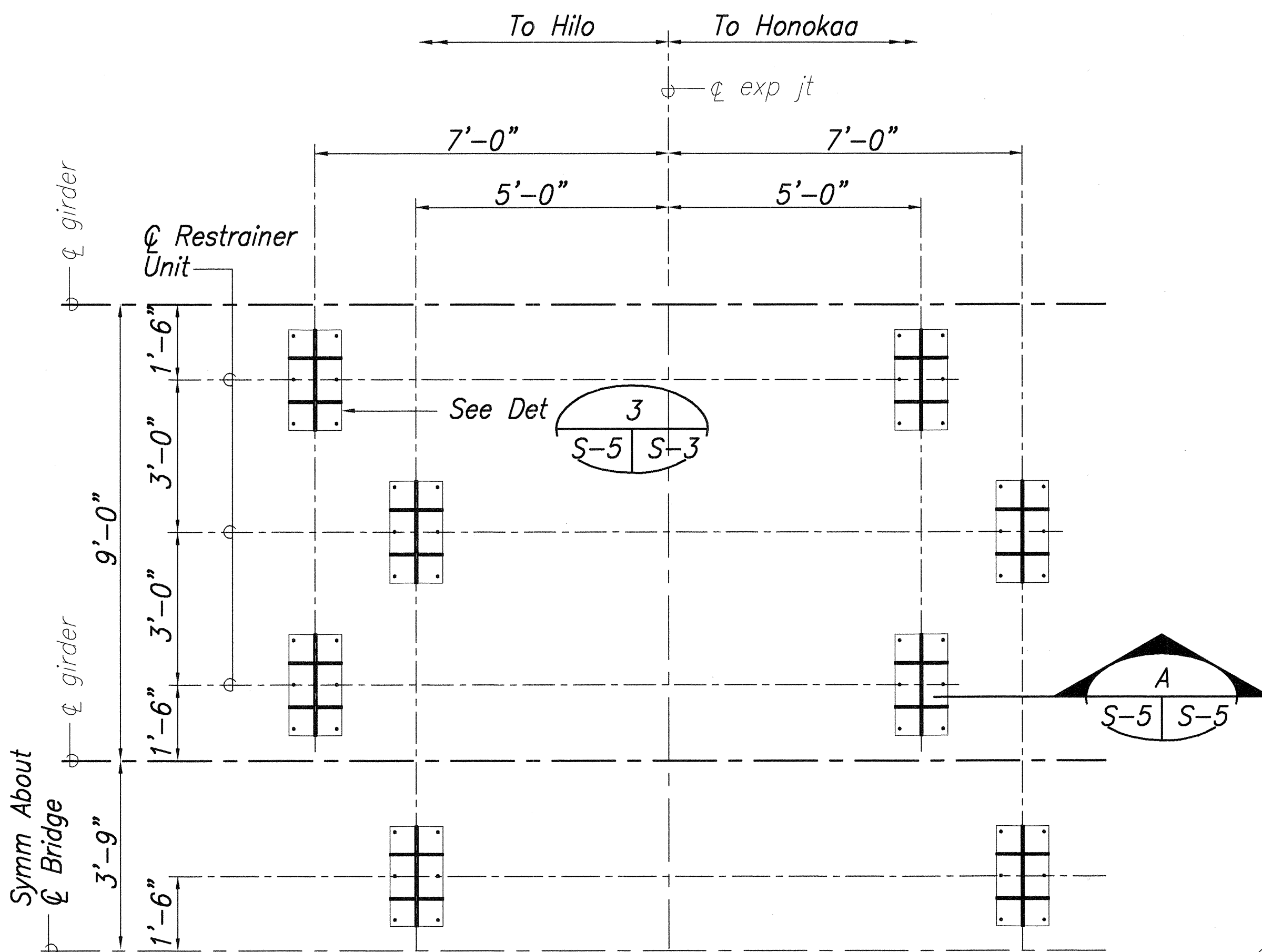
EXISTING CONDITION
SECTION **A**
Scale: 1"=20'-0"
Note: Section Taken at C of Bridge

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	8	26



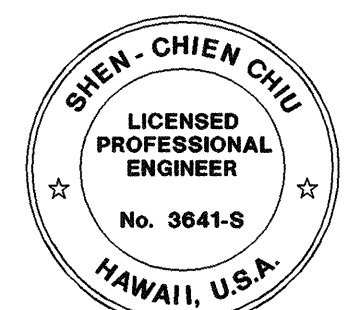
- Notes:
- 10 Restrainers required at Bents 3 & 5.
 - Cable Restrainers not shown.

REFLECTED DECK PLAN AT BENTS 3 & 5
Scale: 1/2"=1'-0"



- Notes:
- 8 Restrainers required at Bents 7 & 9.
 - Cable Restrainers not shown.

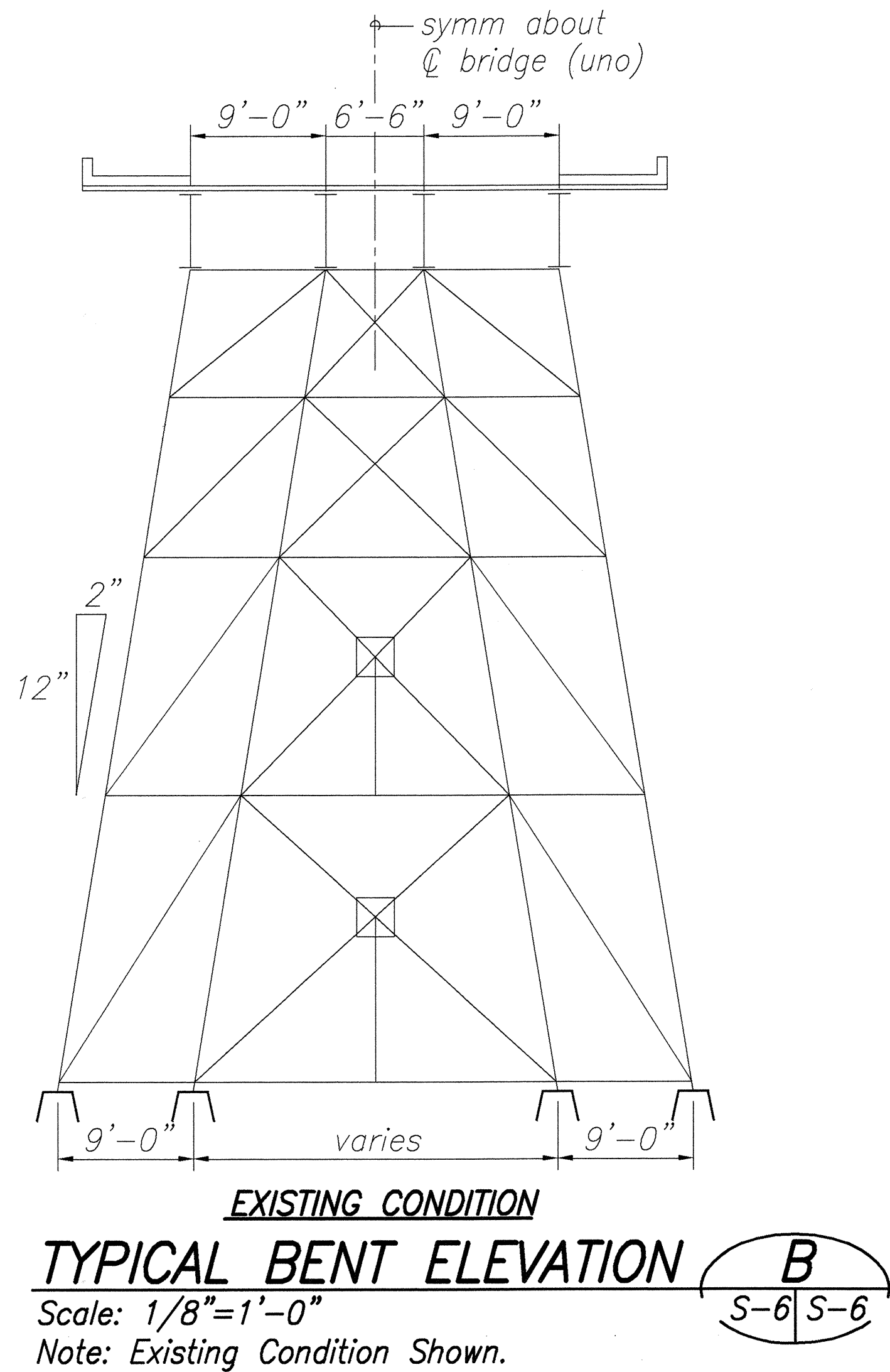
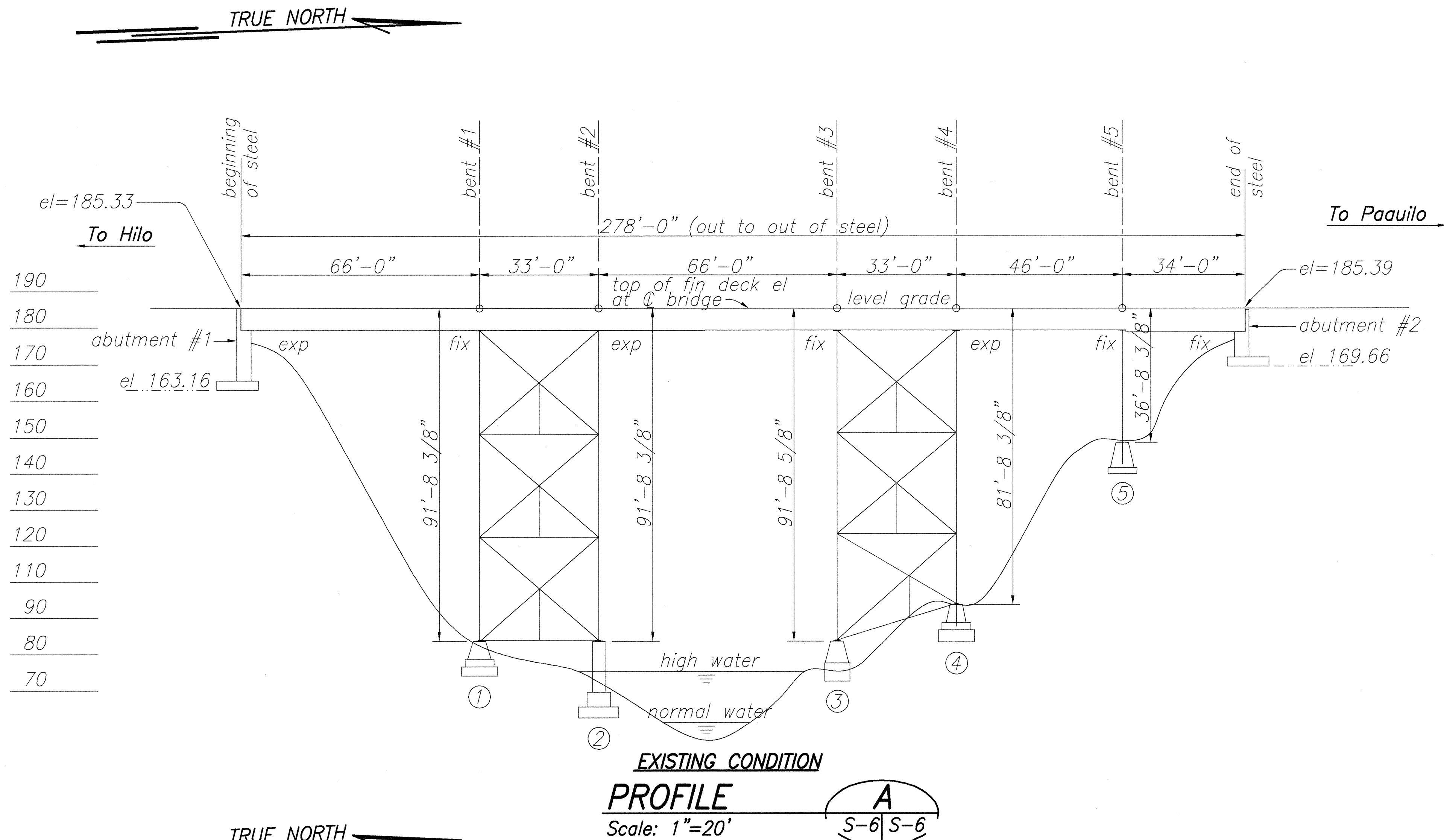
REFLECTED DECK PLAN AT BENTS 7 & 9
Scale: 1/2"=1'-0"



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Shen-Chien Chu

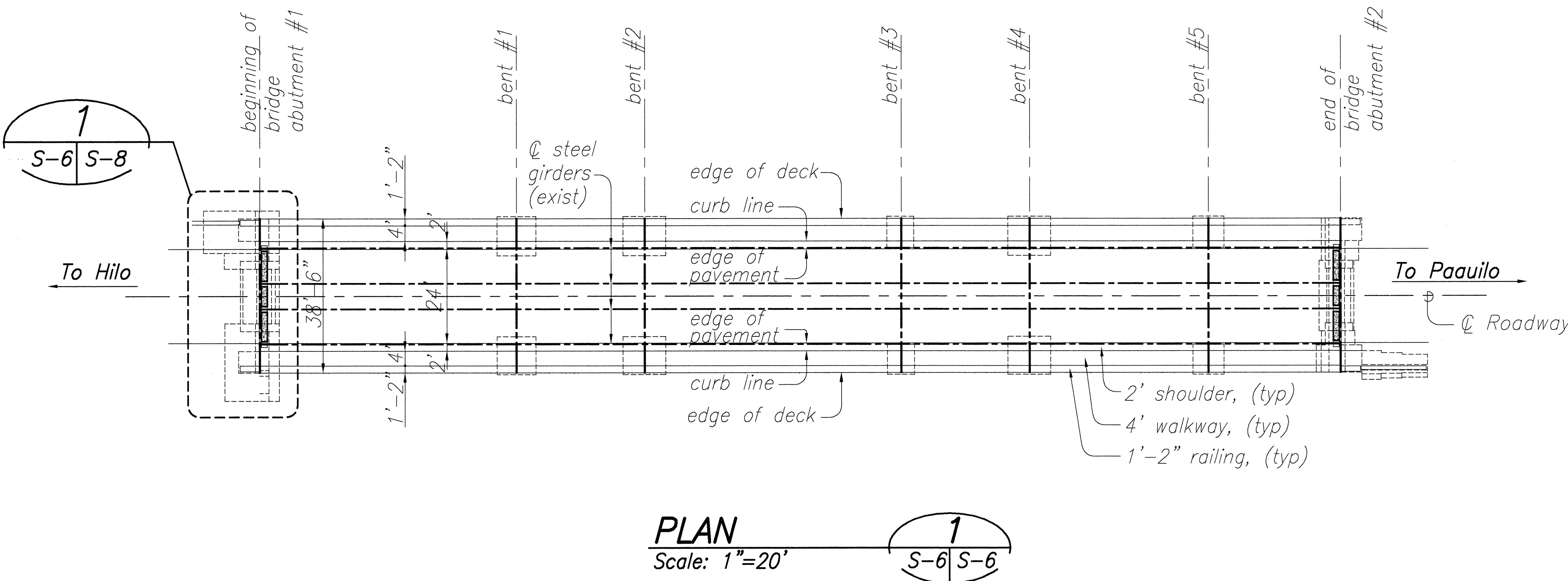
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
NANUE BRIDGE SUPERSTRUCTURE RETROFIT PLAN OF LONGITUDINAL RESTRAINERS	
SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)	
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-5 OF 23 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	9	26



Notes: Retrofit of Superstructure to Substructure include the following:

1. Provide longitudinal restrainers at bents #2 & #4, see sheet S-7.
2. Retain expansion and fixed joints at existing locations.
3. Provide steel struts to end diaphragms of steel girders at abutment 1 & 2 and add concrete blocks at bearing seat level of abutment 1&2 to provide transverse restraint for superstructure. See sheet S-8.

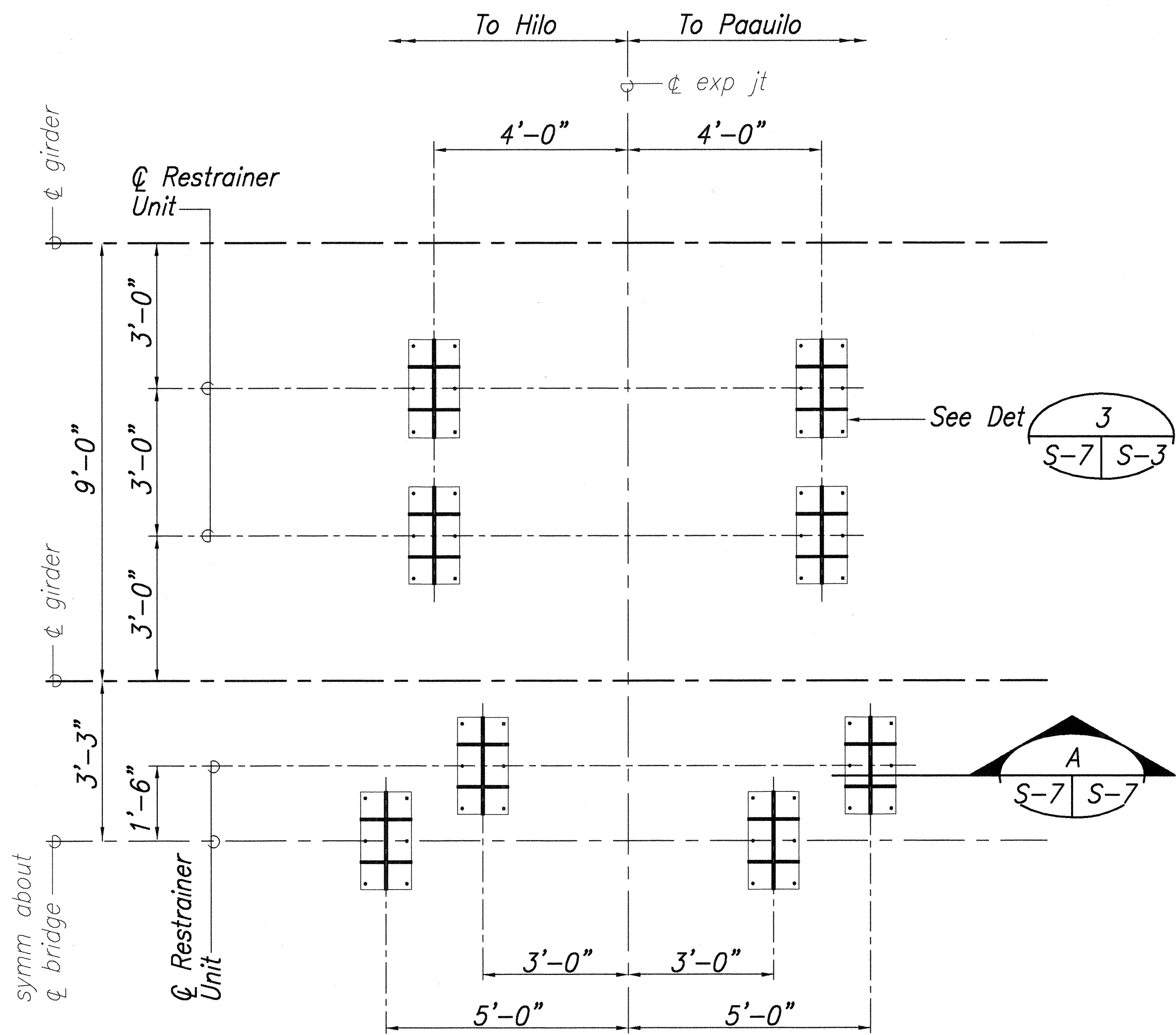
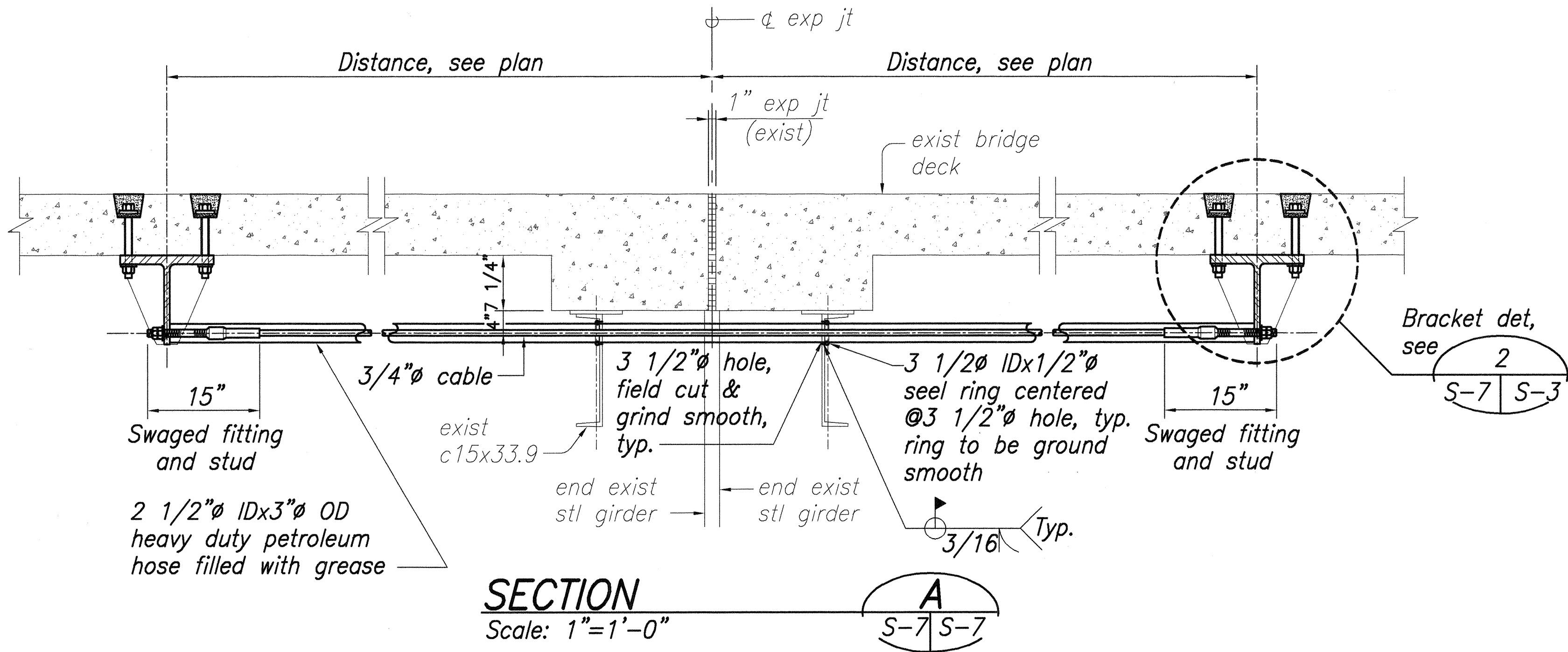


SIEN-CHIEN CHIU
LICENSED PROFESSIONAL ENGINEER
No. 3641-S
HAWAII, U.S.A.

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Siem-Chien Chiu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	UMAUMA BRIDGE SUPERSTRUCTURE RETROFIT PLAN, SECTION & ELEVATION
	SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII
	F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-6 OF 23 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	10	26



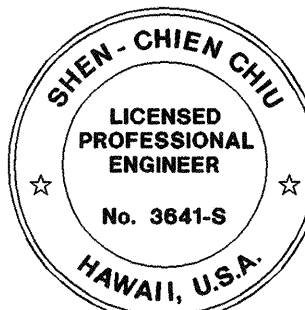
Note:
1. Cable Restrainers not shown.

REFLECTED DECK PLAN AT BENTS 2 & 4

Scale: 1/2"=1'-0"

1

S-7 S-7



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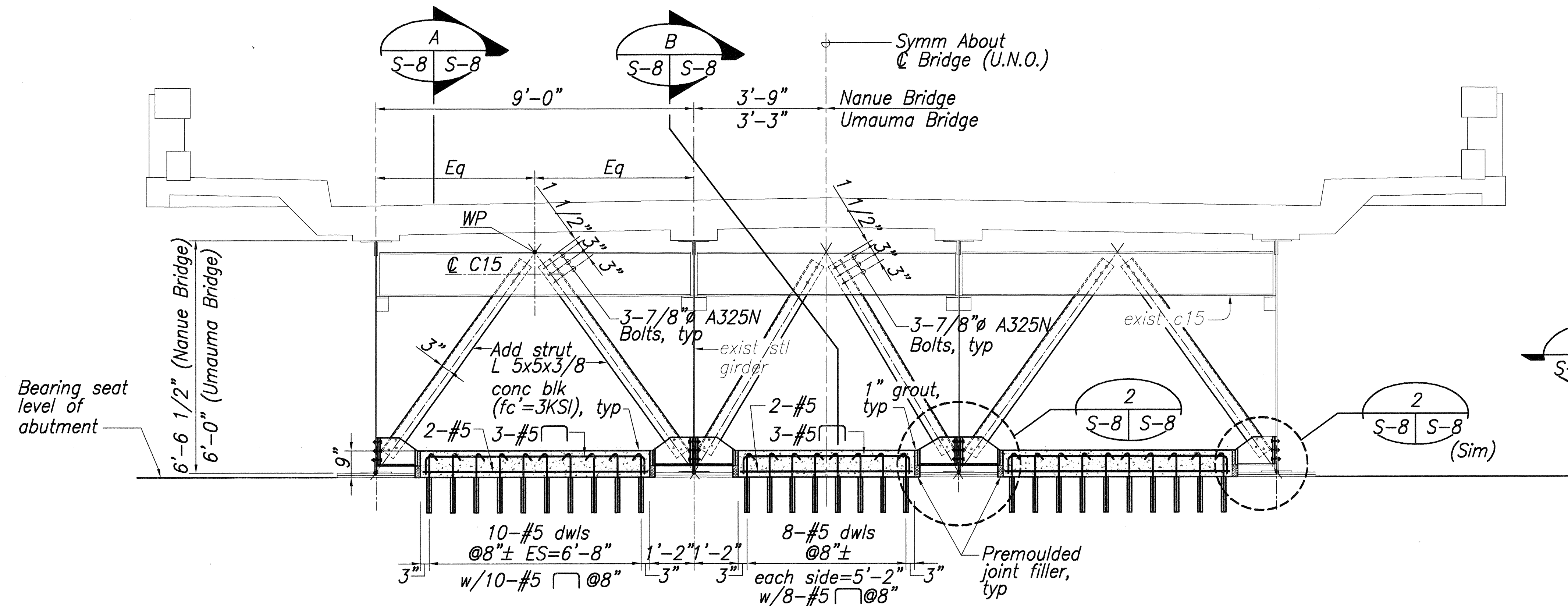
Siem-Chien Chiu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	UMAUMA BRIDGE SUPERSTRUCTURE RETROFIT PLAN OF LONGITUDINAL RESTRAINERS
	SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-7 OF 23 SHEETS	

SURVEY PLOTTED BY	DATE
DRAWN BY	
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CHECKED BY	
NO.	

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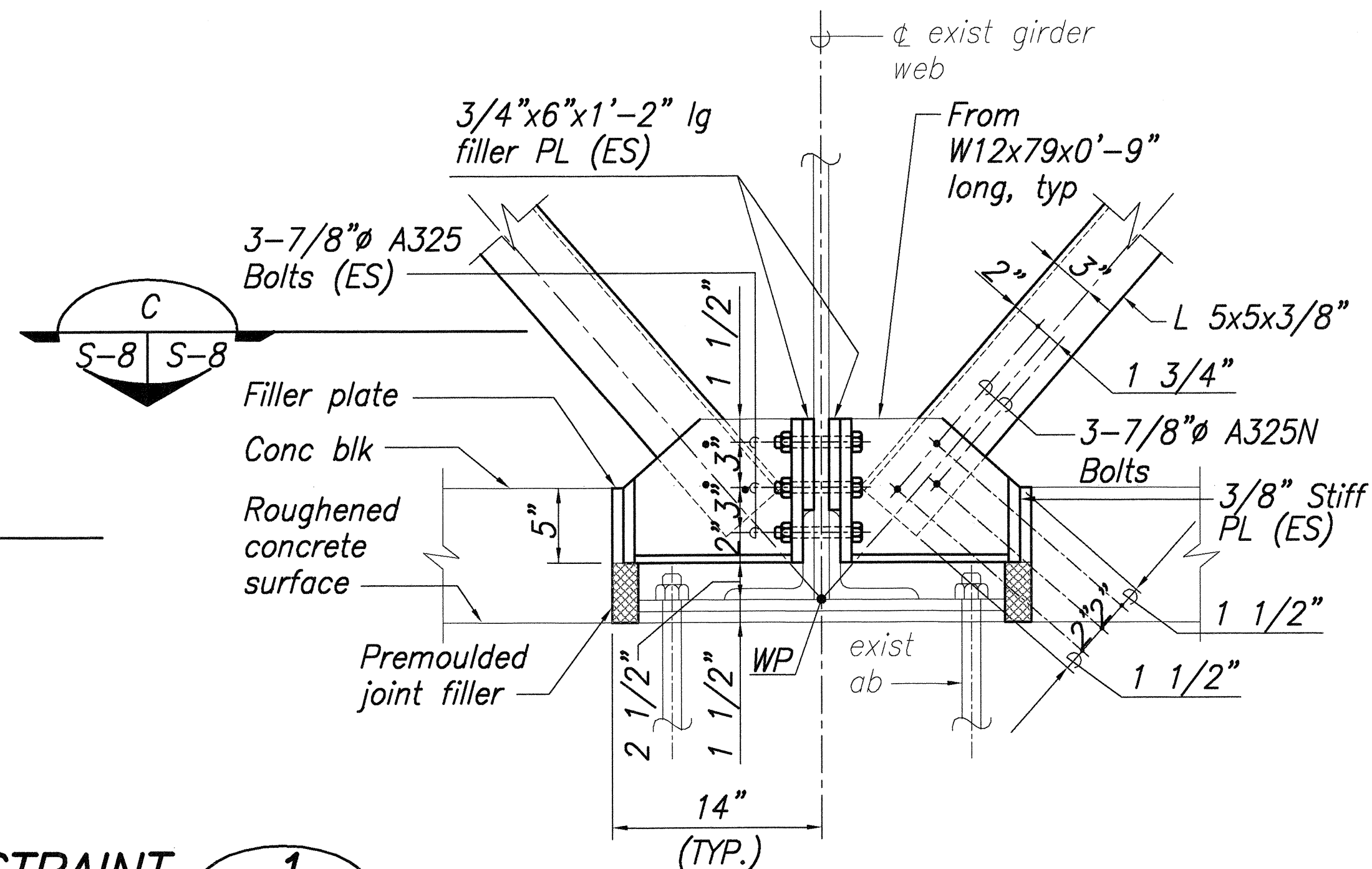
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	11	26



ELEVATION

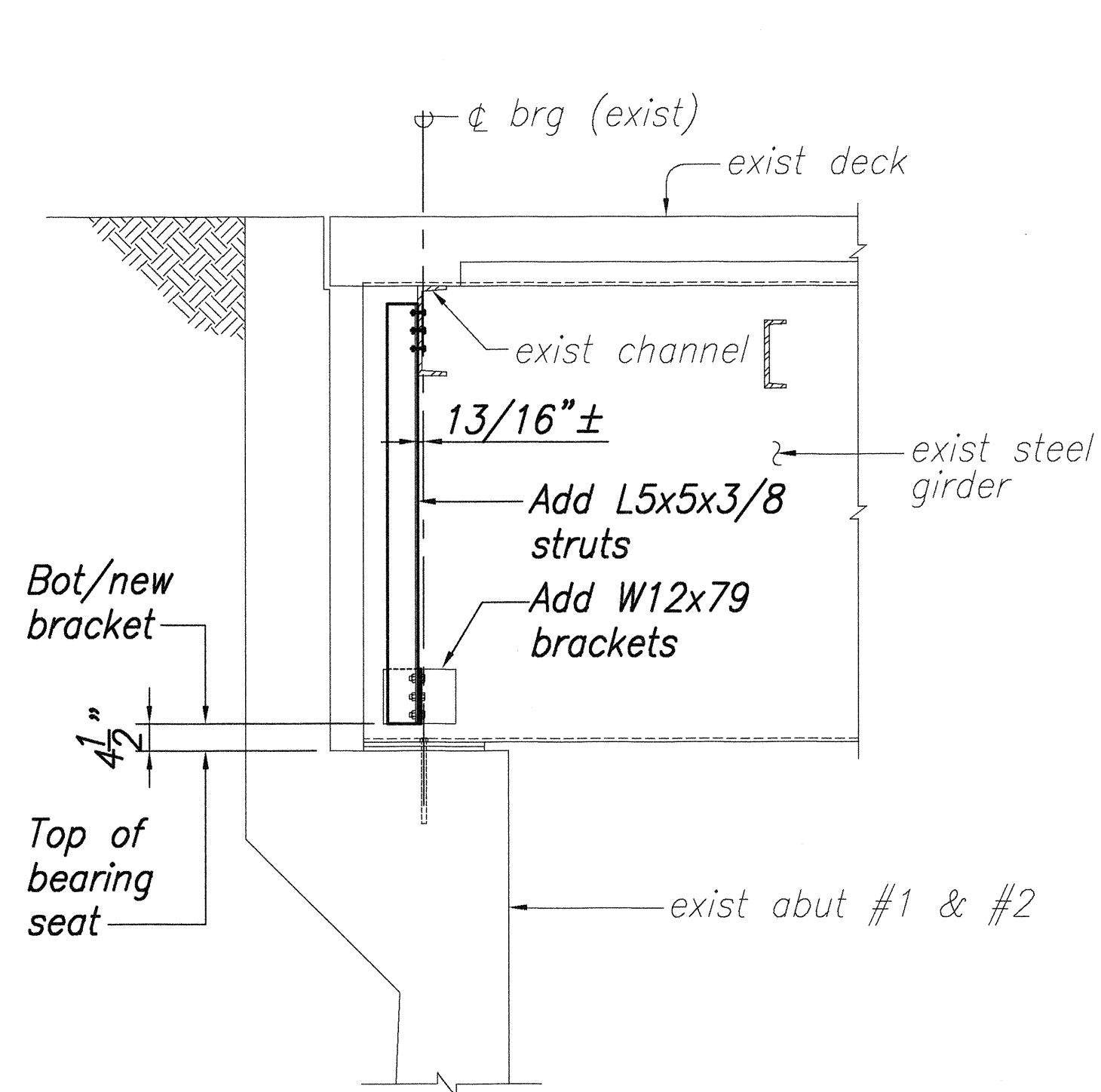
DETAIL OF ADDITIONAL STRUT TO EXIST. END DIAPHRAGM & CONCRETE BLOCK RESTRAINT

Scale: 1/2"=1'-0"



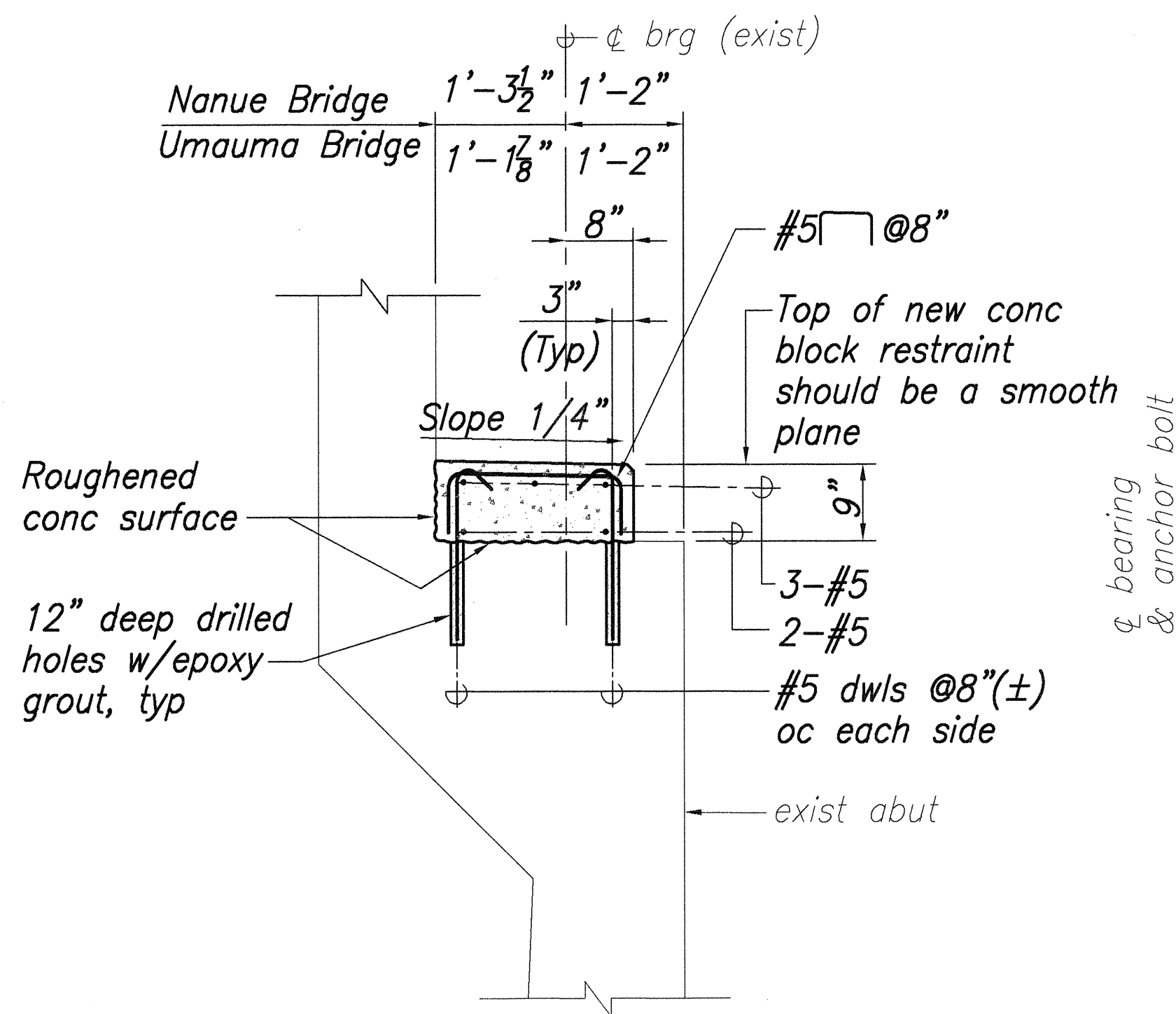
CONNECTION DETAIL

Scale: 1 1/2"=1'-0"



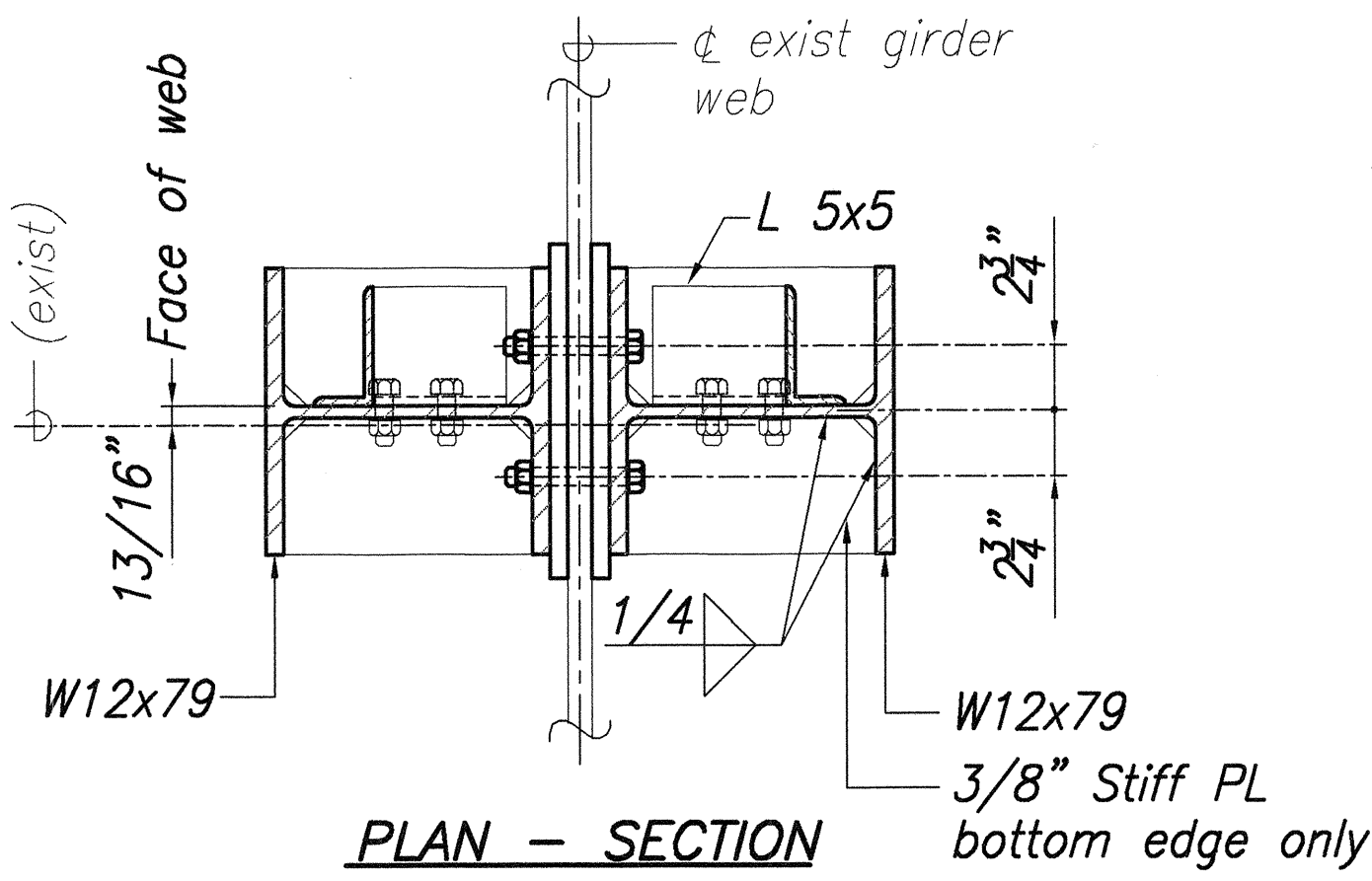
SECTION AT ABUTMENT A

Scale: 1/2"=1'-0"



SECTION AT ABUTMENT B

Scale: 3/4"=1'-0"



SECTION C

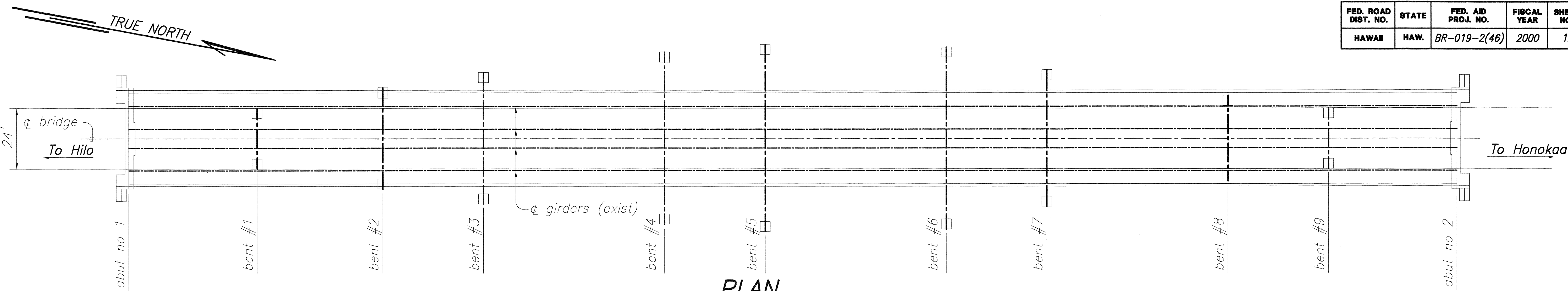
Scale: 1 1/2"=1'-0"



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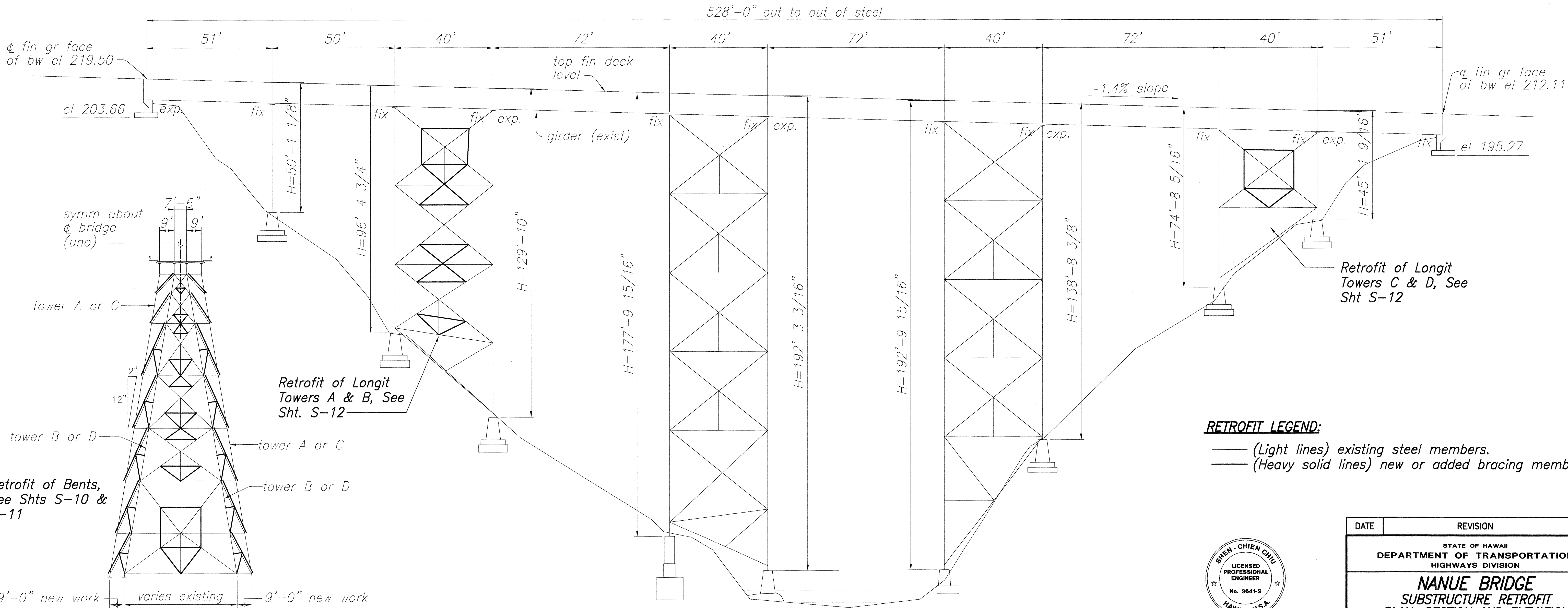
DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION NANUE & UMAUMA BRIDGE SUPERSTRUCTURE RETROFIT SECTIONS AND DETAILS SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46) Scale: As Noted Date: AUG. 17, 1999 SHEET No. S-8 OF 23 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	12	26



PLAN

Scale: 1"=20'-0"



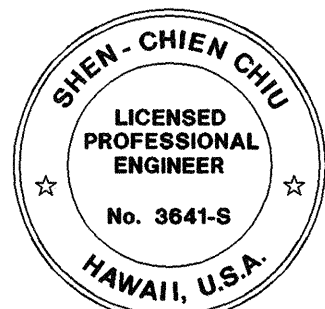
EXISTING CONDITION

SECTION

Scale: 1"=20'-0"

RETROFIT LEGEND:

- (Light lines) existing steel members.
- (Heavy solid lines) new or added bracing members.



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DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
NANUE BRIDGE SUBSTRUCTURE RETROFIT PLAN, SECTION AND ELEVATION	
SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)	
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-9 OF 23 SHEETS	

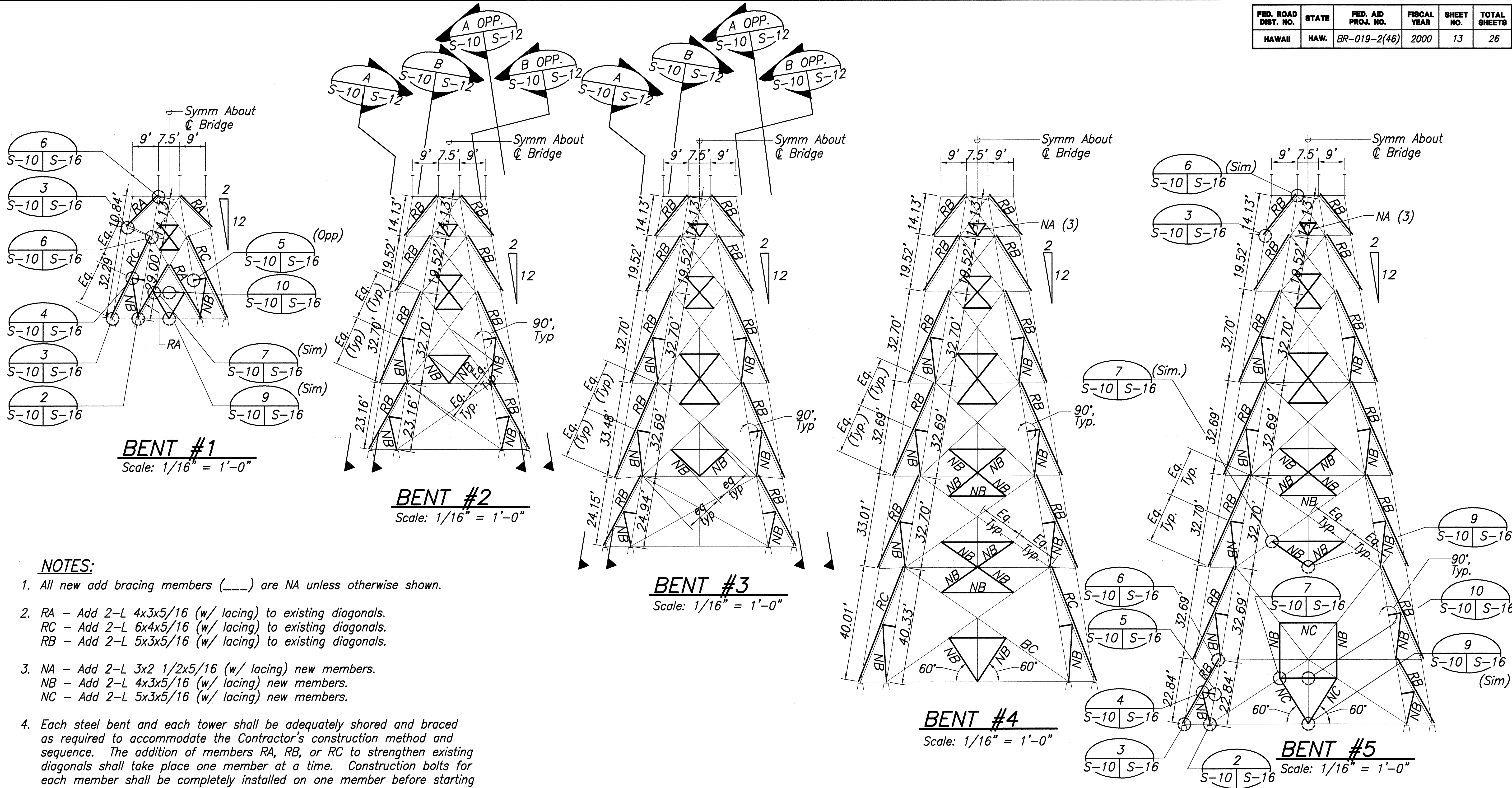
TYPICAL BENT ELEVATION

Scale: 1"=30'-0"

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NO.	

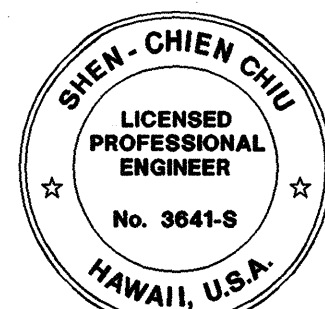
NS2-1.DWG 08/04/99 15:57 FINAL L:\DWG\6041-01\NEWSTRUCT\NANUE

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	13	26



NOTES:

- All new add bracing members (—) are NA unless otherwise shown.
- RA - Add 2-L 4x3x5/16 (w/ lacing) to existing diagonals.
RC - Add 2-L 6x4x5/16 (w/ lacing) to existing diagonals.
RB - Add 2-L 5x3x5/16 (w/ lacing) to existing diagonals.
- NA - Add 2-L 3x2 1/2x5/16 (w/ lacing) new members.
NB - Add 2-L 4x3x5/16 (w/ lacing) new members.
NC - Add 2-L 5x3x5/16 (w/ lacing) new members.
- Each steel bent and each tower shall be adequately shored and braced as required to accommodate the Contractor's construction method and sequence. The addition of members RA, RB, or RC to strengthen existing diagonals shall take place one member at a time. Construction bolts for each member shall be completely installed on one member before starting work on another member. The addition of members NA, NB, and NC for interior diagonals shall take place one member at a time, either during or after the addition of members RA, RB, or RC at each connection.
- All surfaces of each existing diagonal to be strengthened by members RA, RB, or RC shall be cleaned and prepared to accept the paint system indicated in the Special Provisions. In addition the surface of each gusset plate and all surfaces of each member a minimum of 6 inches around the connections affected by the work shall be cleaned and prepared for painting. Areas cleaned shall receive the paint system indicated in the Special Provisions. Cleaning and painting shall be considered incidental to Structural Steel.

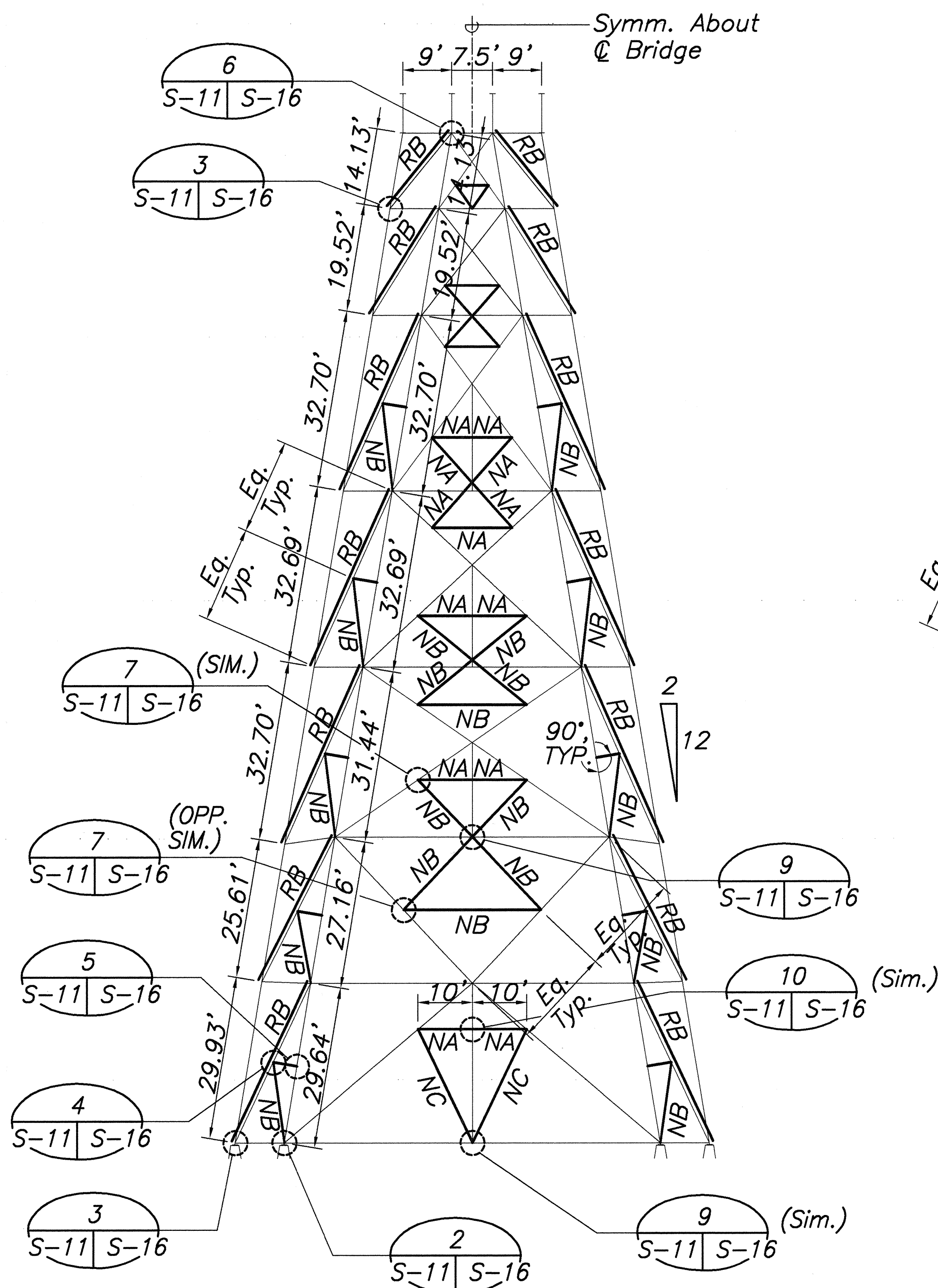


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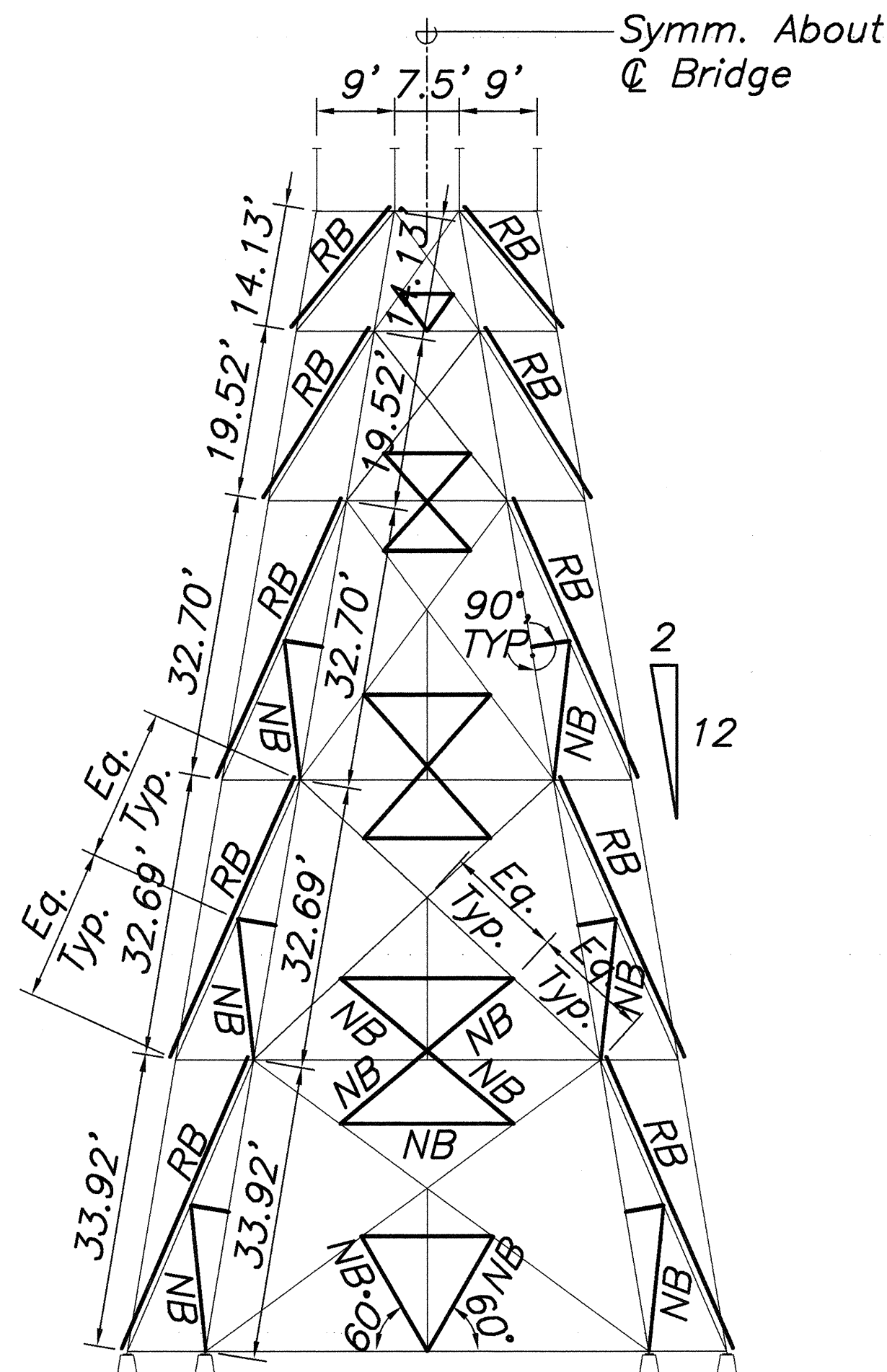
Shien-Chien Chiu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	NANUE BRIDGE SUBSTRUCTURE RETROFIT TRANSV. BENTS #1, #2, #3, #4 & #5 SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-10 OF 23 SHEETS	

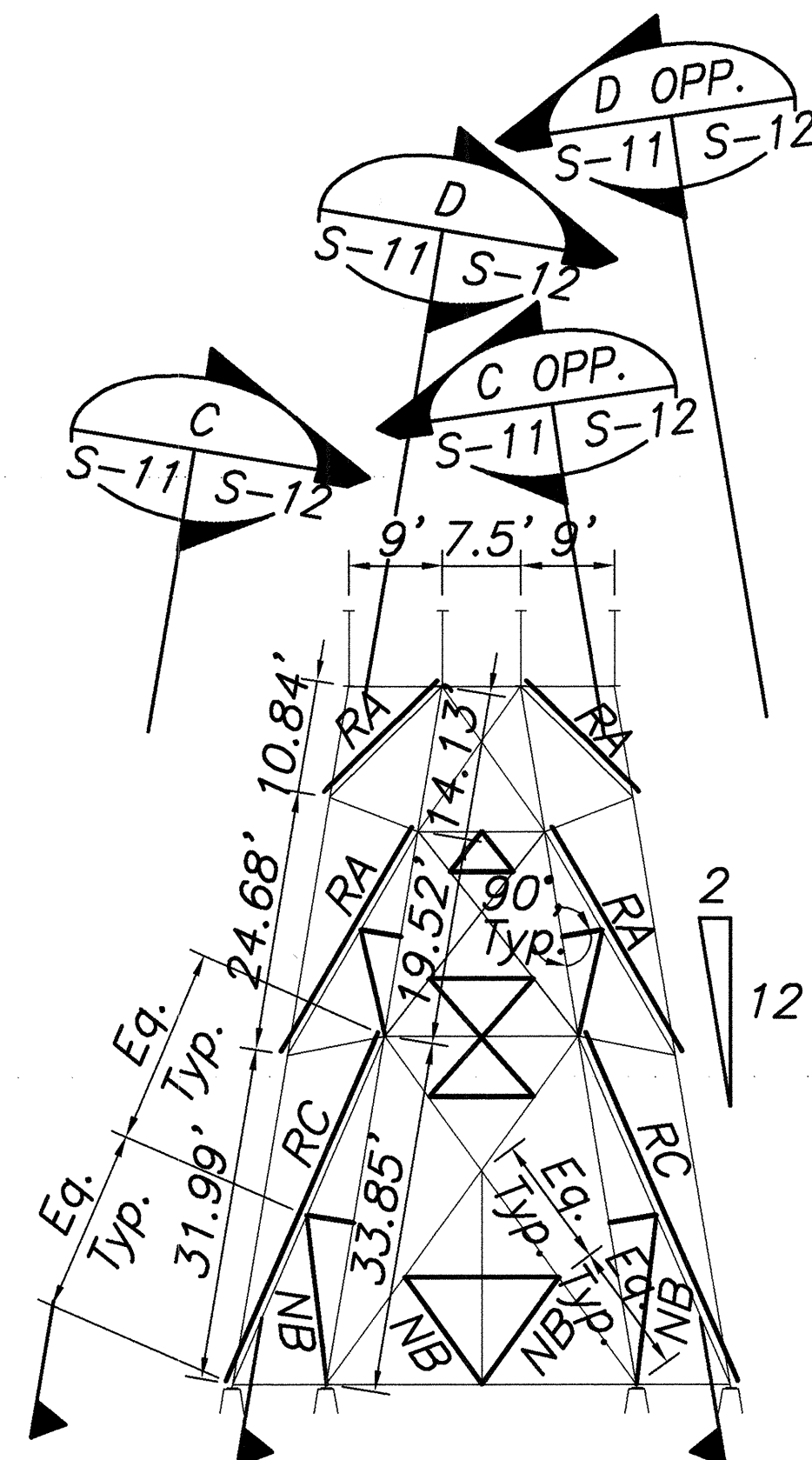
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	14	26



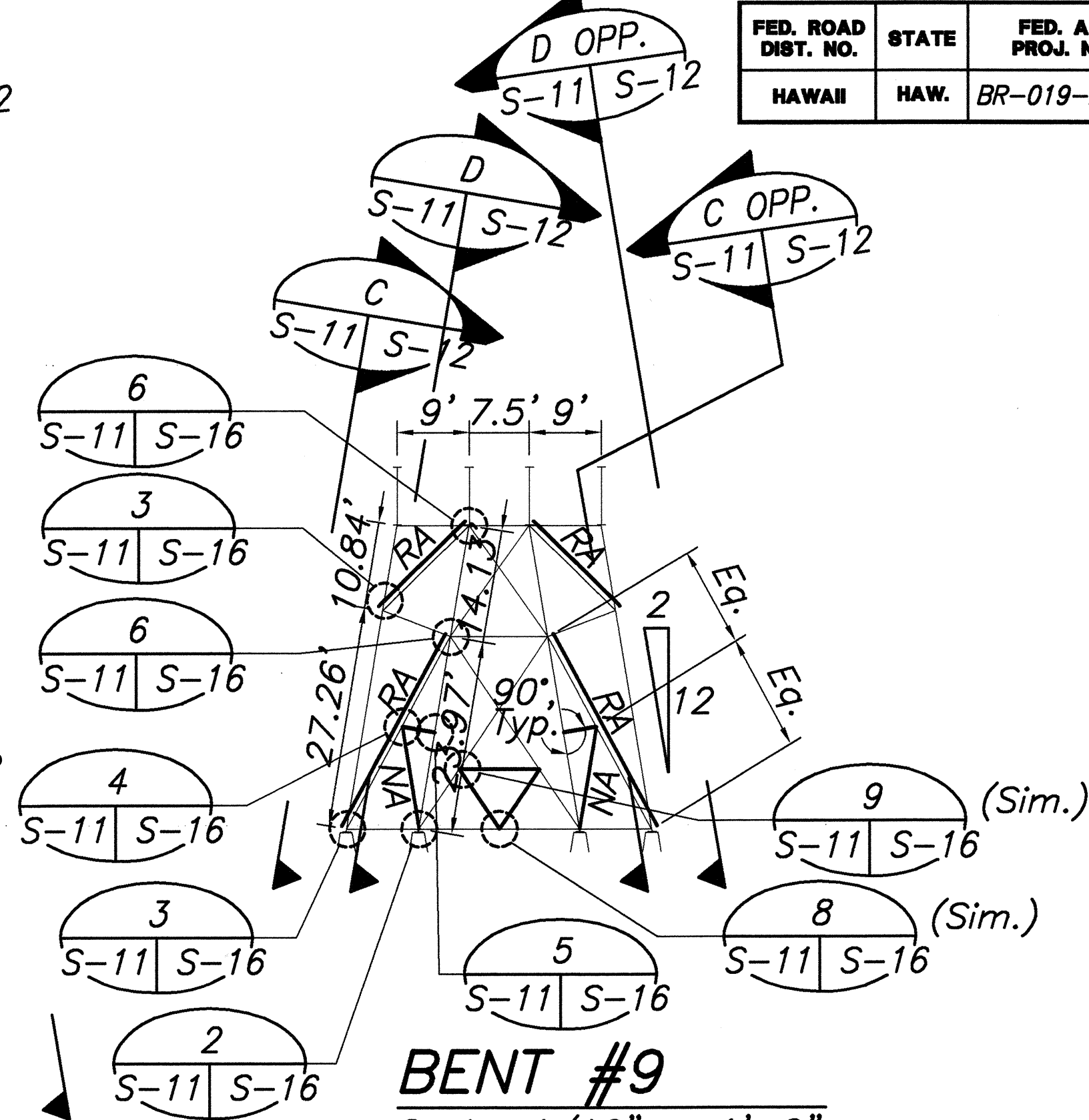
BENT #6
Scale: 1/16" = 1'-0"



BENT #7
Scale: 1/16" = 1'-0"



BENT #8
Scale: 1/16" = 1'-0"



BENT #9
Scale: 1/16" = 1'-0"

- NOTES:**
- All new add bracing members are NA unless otherwise shown.
 - RA - Add 2-L 4x3x5/16 (w/lacing) to existing diagonals.
RC - Add 2-L 6x4x5/16 (w/lacing) to existing diagonals.
RB - Add 2-L 5x3x5/16 (w/lacing) to existing diagonals.
 - NA - Add 2-L 3x2 1/2x5/16 (w/lacing) new members.
NB - Add 2-L 4x3x5/16 (w/lacing) new members.
NC - Add 2-L 5x3x5/16 (w/lacing) new members.
 - Each steel bent and each tower shall be adequately shored and braced as required to accommodate the Contractor's construction method and sequence. The addition of members RA, RB, or RC to strengthen existing diagonals shall take place one member at a time. Connection bolts for each member shall be completely installed on one member before starting work on another member. The addition of members NA, NB, and NC for interior diagonals shall take place one member at a time, either during or after the addition of members RA, RB, or RC at each connection.
 - All surfaces of each existing diagonal to be strengthened by members RA, RB, or RC shall be cleaned and prepared to accept the paint system indicated in the Special Provisions. In addition the surface of each gusset plate and all surfaces of each member a minimum of 6 inches around the connections affected by the work shall be cleaned and prepared for painting. Areas cleaned shall receive the paint system indicated in the Special Provisions. Cleaning and painting shall be considered incidental to Structural Steel.

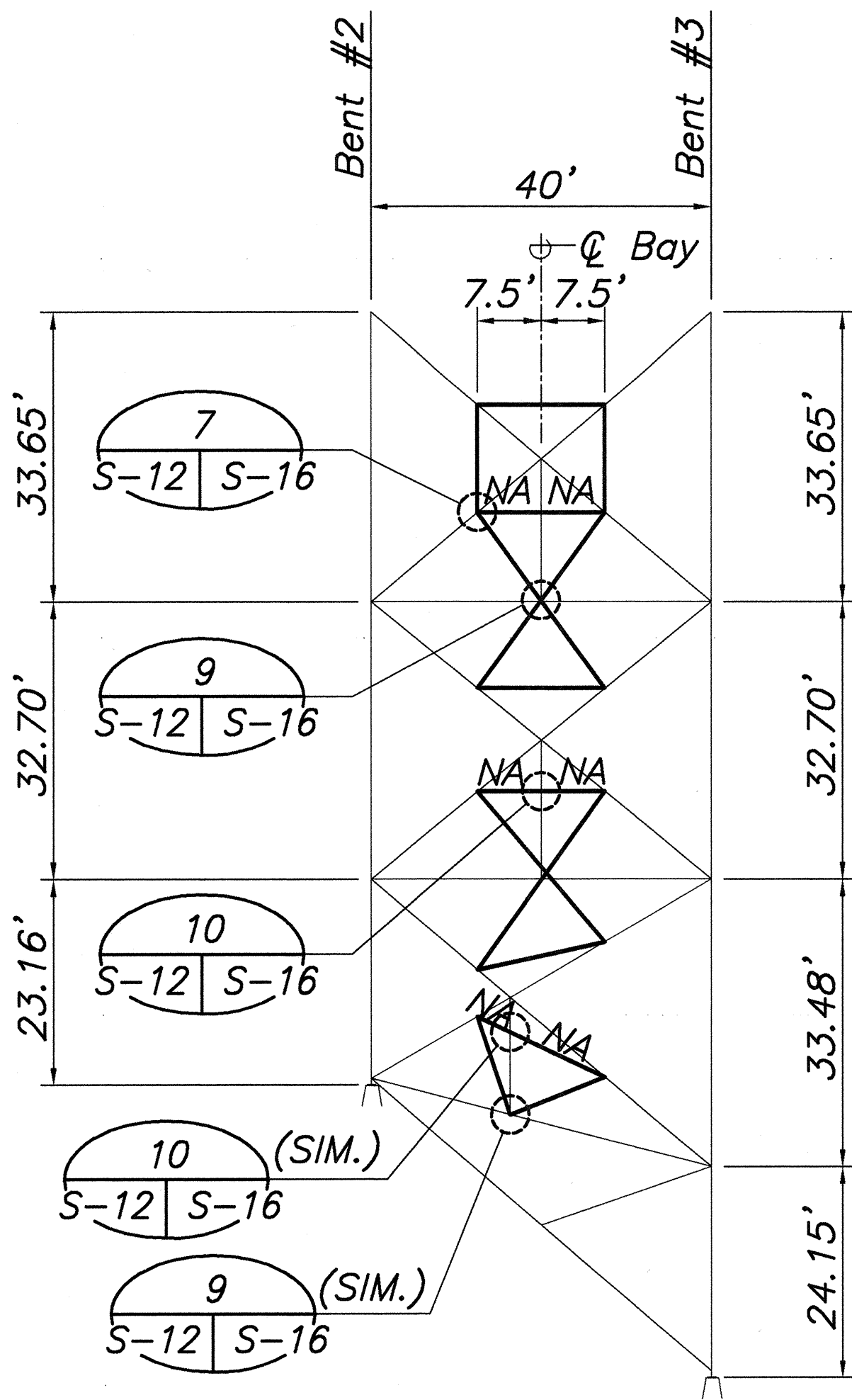


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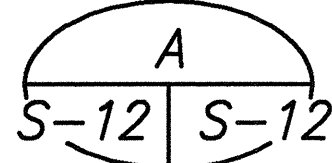
Shen-Chien Chiu

DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
NANUE BRIDGE SUBSTRUCTURE RETROFIT TRANSV. BENTS #6, #7, #8 & #9	
SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)	
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-11 OF 23 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	15	26

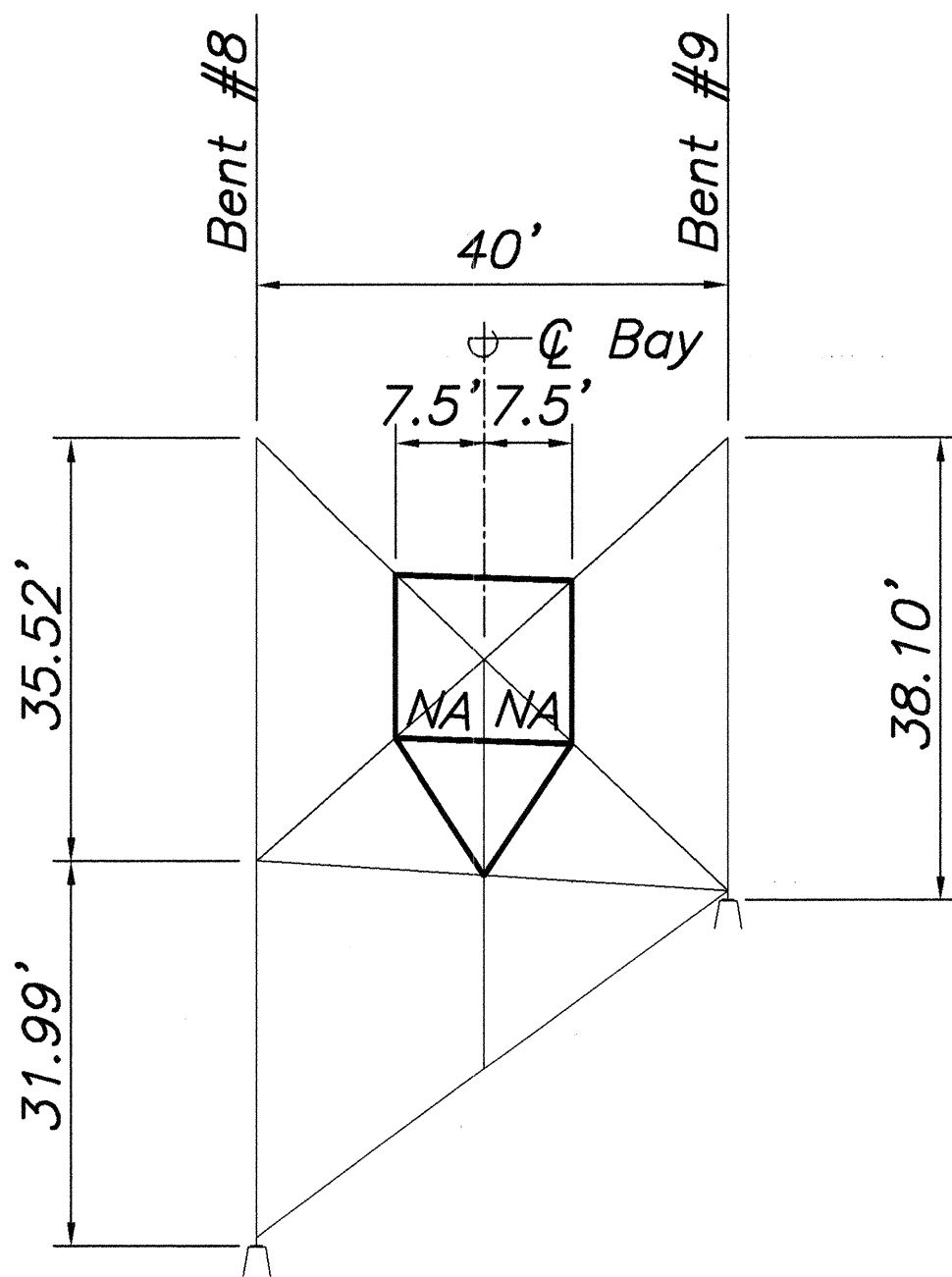


Note: Joint Detail Similar to

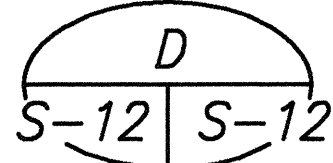


ELE.-TOWER A **A**
Scale: 1/16"=1'-0"
S-10

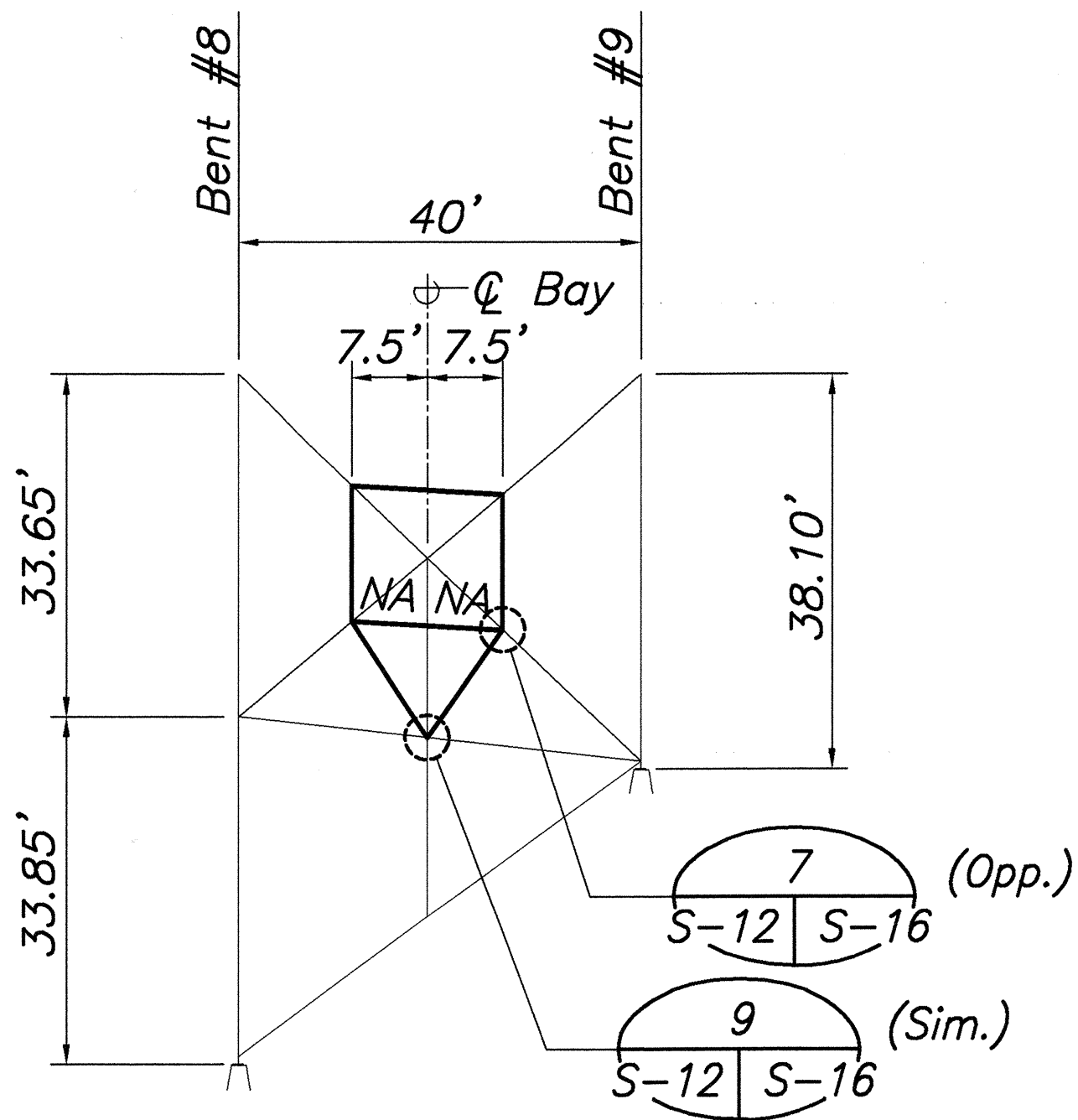
ELE.-TOWER B **B**
Scale: 1/16"=1'-0"
S-10



Note: Joint Detail Similar to



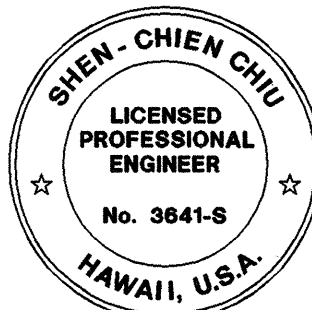
ELE.-TOWER C **C**
Scale: 1/16"=1'-0"
S-11



ELE.-TOWER D **D**
Scale: 1/16"=1'-0"
S-11

NOTES:

- See Retrofit Legends on Sheet S-9
- All new members are "NB", unless otherwise indicated.
- See Note 3 on Sheet S-10 for size of new members.
- Each steel bent and each tower shall be adequately shored and braced as required to accommodate the Contractor's construction method and sequence. The addition of members RA, RB, or RC to strengthen existing diagonals shall take place one member at a time. Connection bolts for each member shall be completely installed on one member before starting work on another member. The addition of members NA, NB, and NC for interior diagonals shall take place one member at a time, either during or after the addition of members RA, RB, or RC at each connection.
- All surfaces of each existing diagonal to be strengthened by members RA, RB, or RC shall be cleaned and prepared to accept the paint system indicated in the Special Provisions. In addition the surface of each gusset plate and all surfaces of each member a minimum of 6 inches around the connections affected by the work shall be cleaned and prepared for painting. Areas cleaned shall receive the paint system indicated in the Special Provisions. Cleaning and painting shall be considered incidental to Structural Steel.

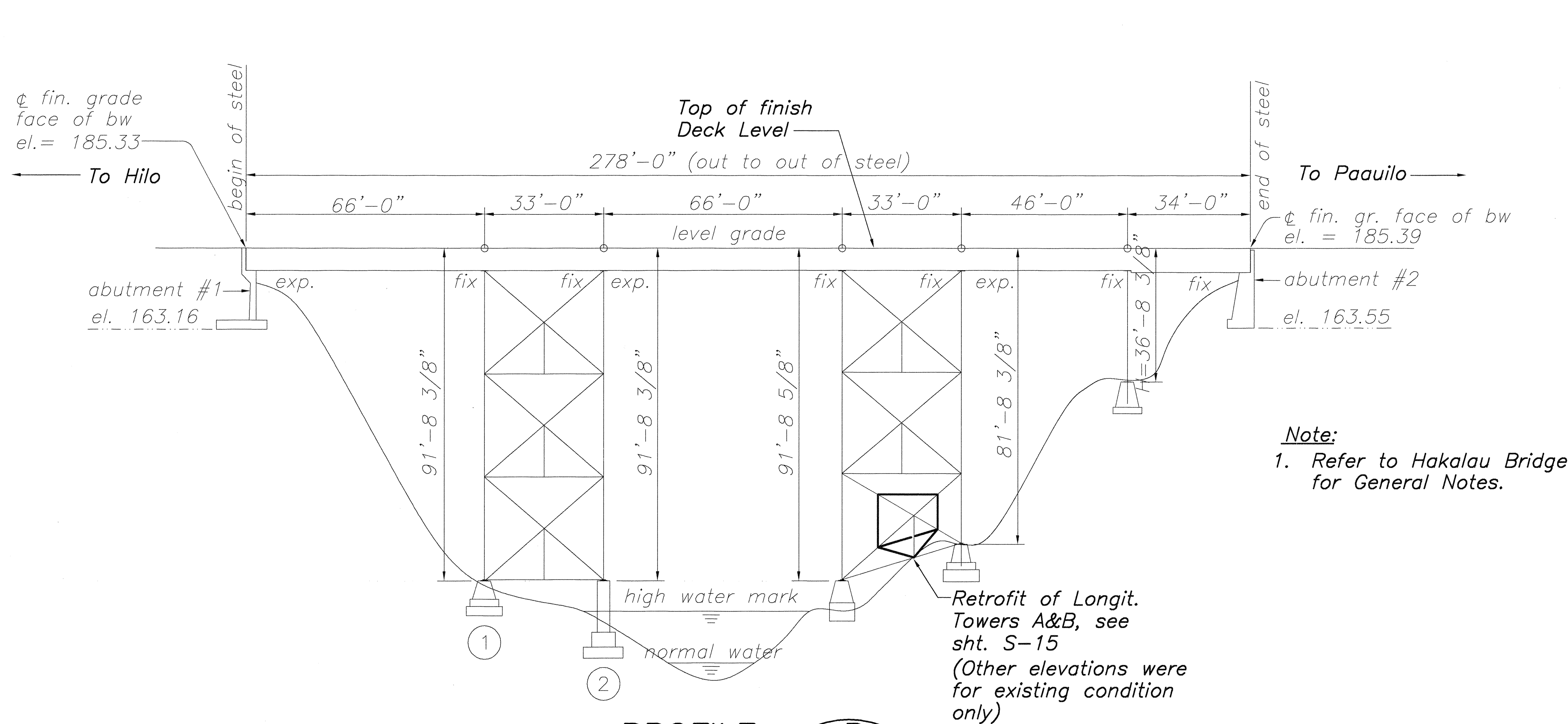


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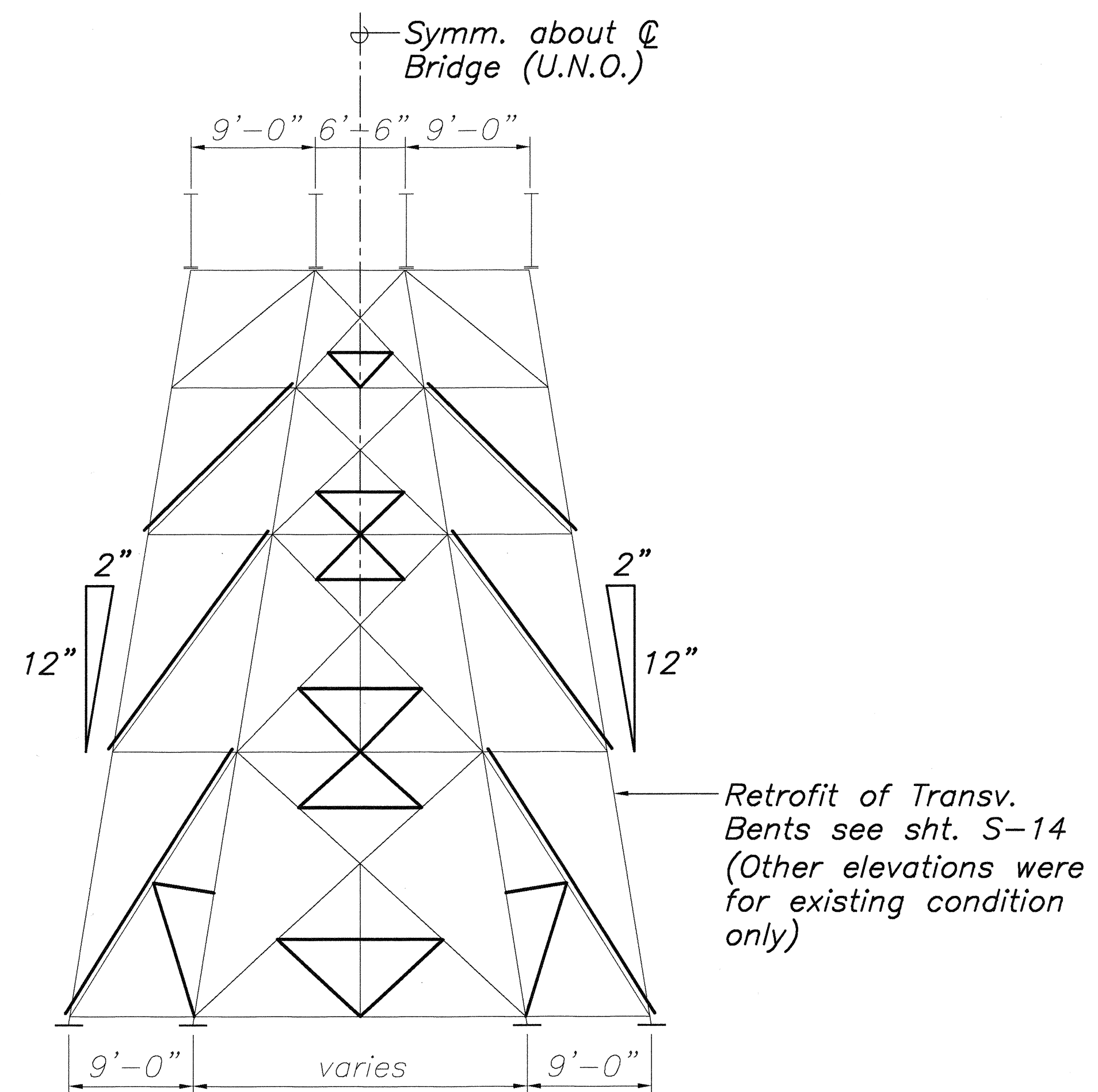
Shien-Chien Chiu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	NANUE BRIDGE SUBSTRUCTURE RETROFIT TRANSVERSE TOWERS A-D
	SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-12 OF 23 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	16	26

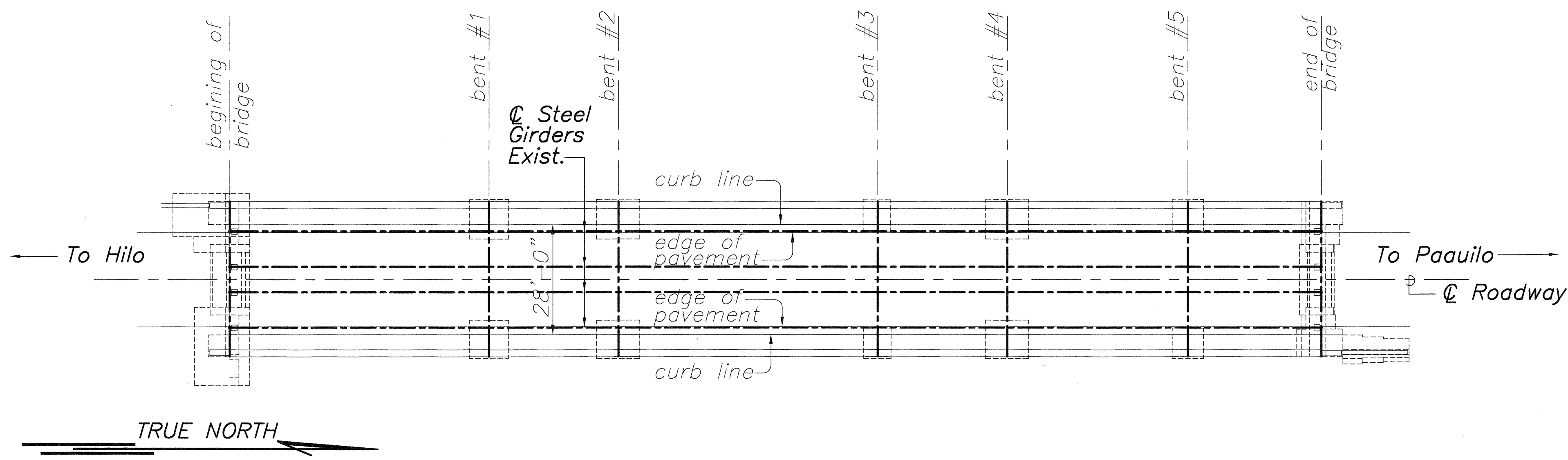


PROFILE B
Scale: 1"=20' S-13 S-13



TYPICAL BENT ELEVATION C
Scale: 1/8"=1'-0" S-13 S-13

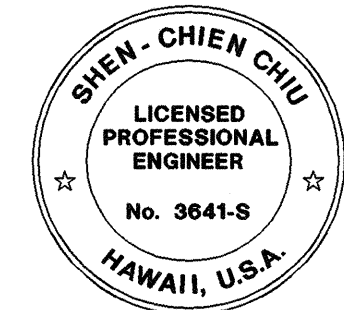
RETROFIT LEGEND:
 (Light lines) Existing steel members.
 (Heavy solid lines) New or added bracing members.



DETAIL A
Scale: 1"=20' S-13 S-13

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NO.	

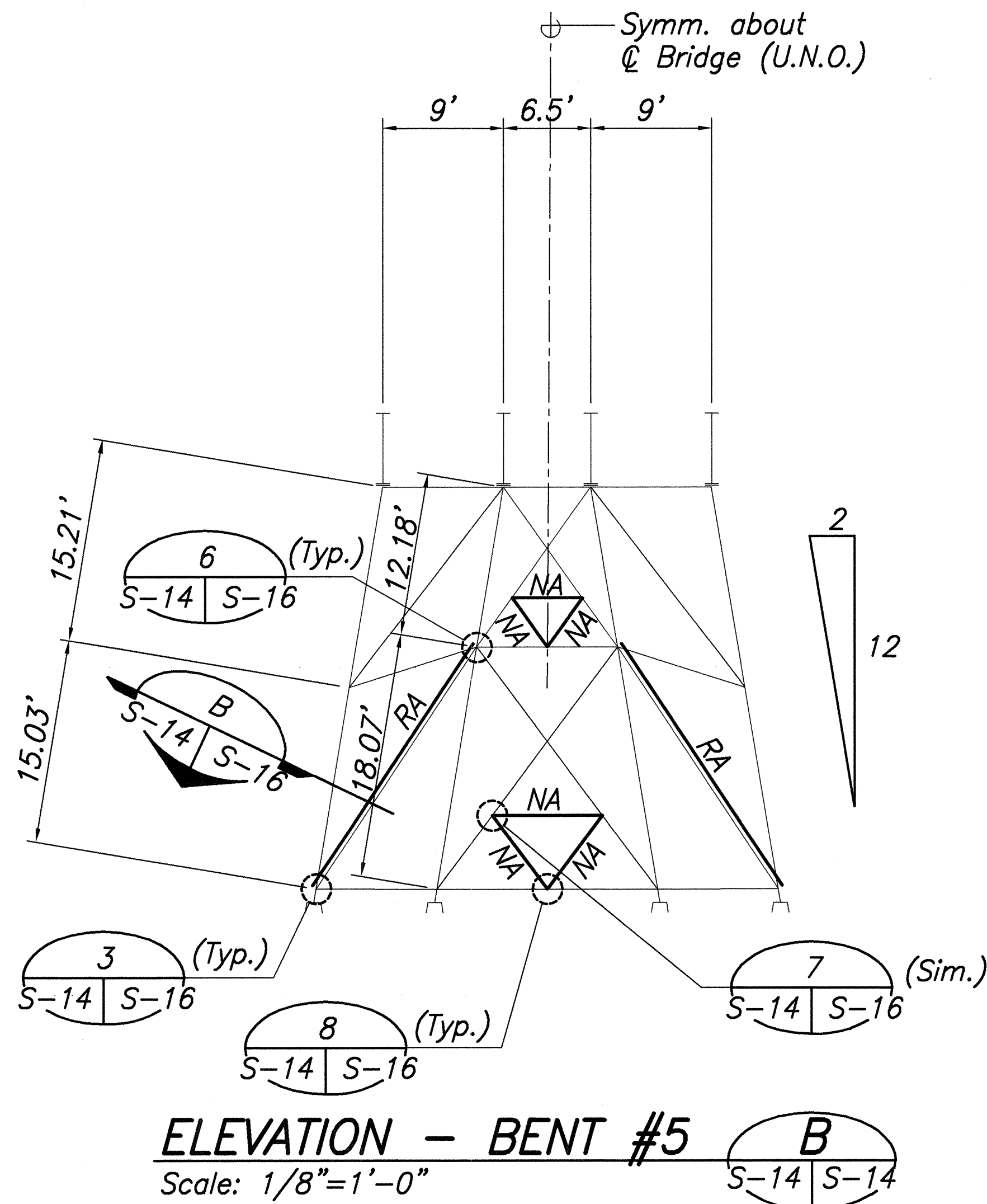
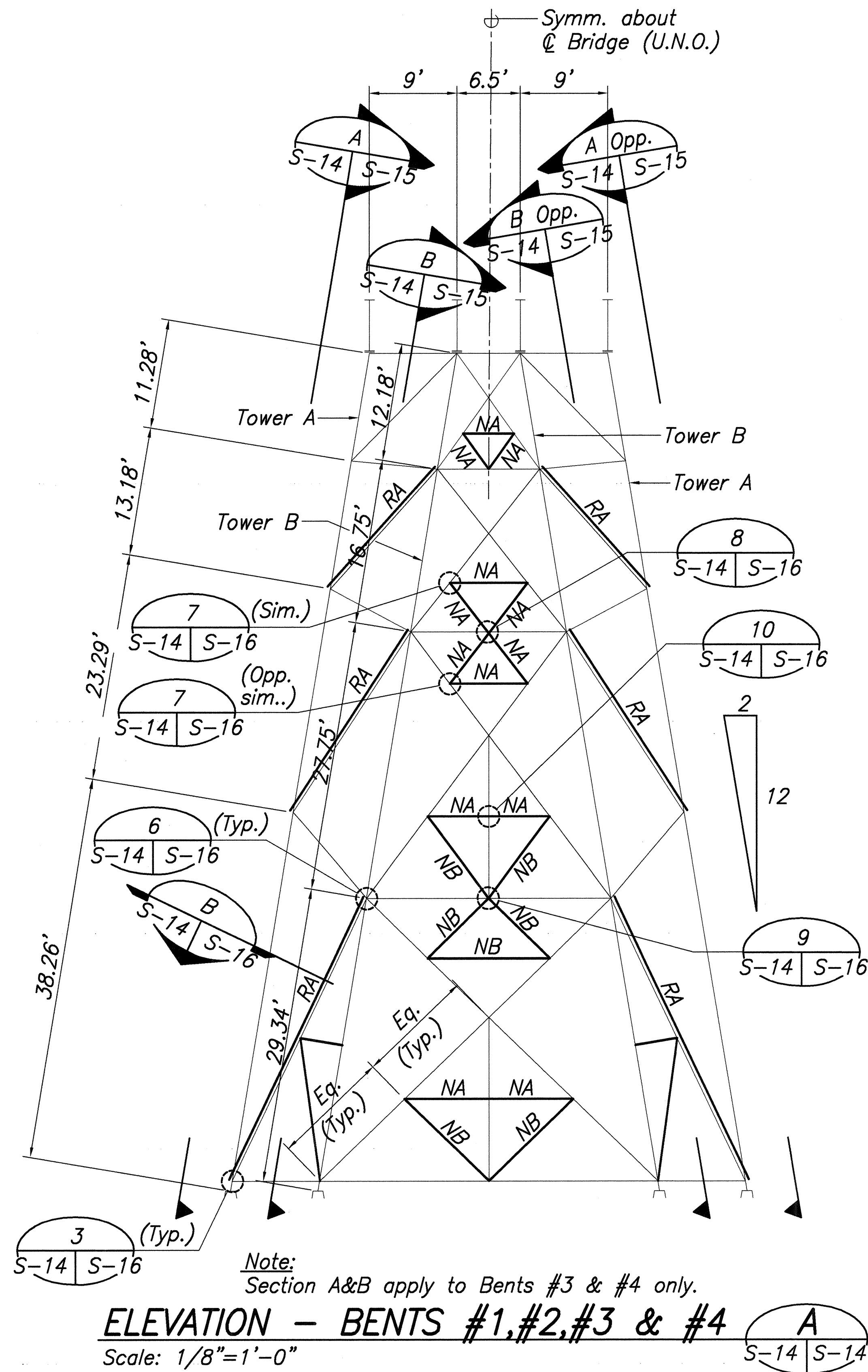
US2-1.DWG 08/04/99 07:45 FINAL L:\DWG\6041-01\NEW STRUCT\UMA



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 Shien-Chien Chiu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION UMAUMA BRIDGE SUBSTRUCTURE RETROFIT PLAN, SECTION AND ELEVATION SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46) Scale: As Noted Date: AUG. 17, 1999 SHEET No. S-13 OF 23 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	17	26

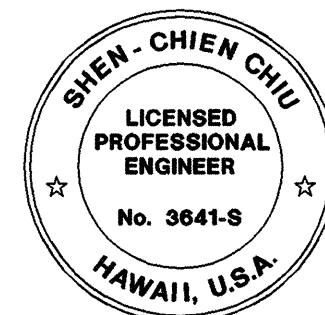


NOTES:

- Each steel bent and each tower shall be adequately shored and braced as required to accommodate the Contractor's construction method and sequence. The addition of members RA, RB, or RC to strengthen existing diagonals shall take place one member at a time. Connection bolts for each member shall be completely installed on one member before starting work on another member. The addition of members NA, NB, and NC for interior diagonals shall take place one member at a time, either during or after the addition of members RA, RB, or RC at each connection.
- All surfaces of each existing diagonal to be strengthened by members RA, RB, or RC shall be cleaned and prepared to accept the paint system indicated in the Special Provisions. In addition the surface of each gusset plate and all surfaces of each member a minimum of 6 inches around the connections affected by the work shall be cleaned and prepared for painting. Areas cleaned shall receive the paint system indicated in the Special Provisions. Cleaning and painting shall be considered incidental to Structural Steel.

RETROFIT LEGEND:

- (Light lines) Existing steel members.
- (Heavy solid lines) Add bracing members.
- RA Add 2-L 4x3x5/16 (w/lacing) to existing members.
- NA Add 2-L 3x2 1/2x5/16 (w/lacing) new members.
- NB Add 2-L 4x3x5/16 new members.

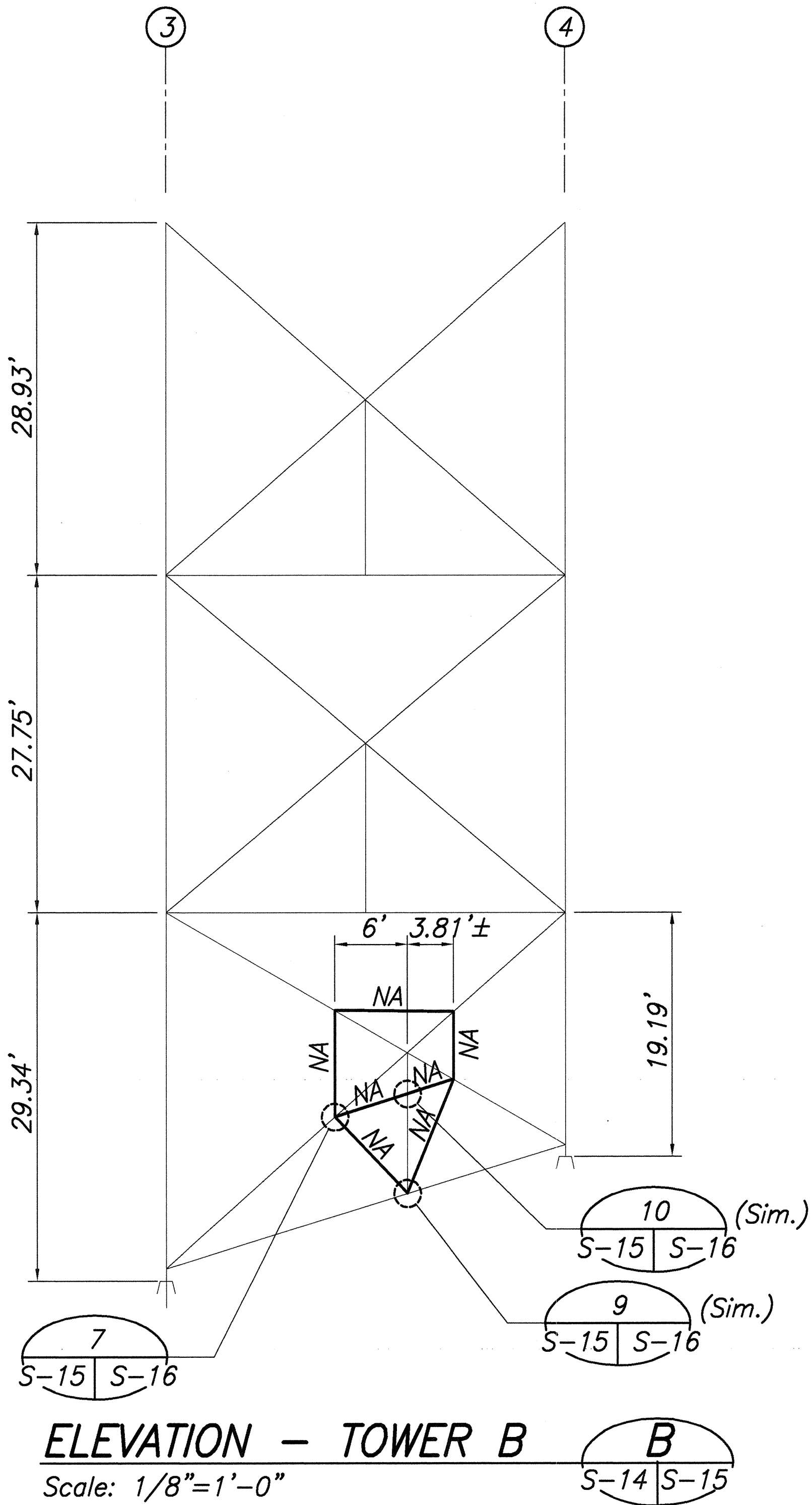
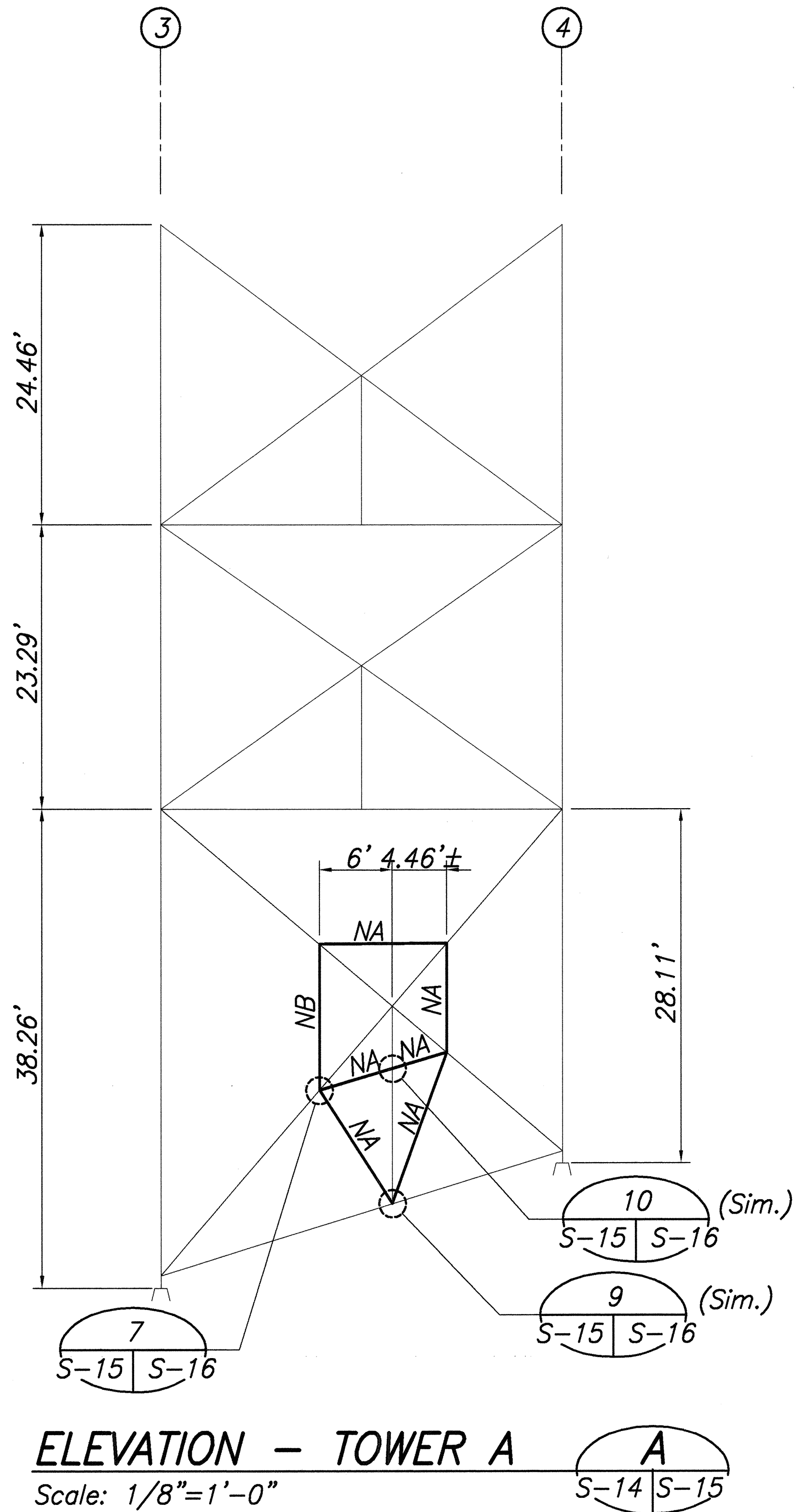


THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION

Shien-Chien Chu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	UMAUMA BRIDGE SUBSTRUCTURE RETROFIT RETROFIT OF BENTS #1, #2, #3 & #4 SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-14 OF 23 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	18	26



- NOTES:**
- Each steel bent and each tower shall be adequately shored and braced as required to accommodate the Contractor's construction method and sequence. The addition of members RA, RB, or RC to strengthen existing diagonals shall take place one member at a time. Connection bolts for each member shall be completely installed on one member before starting work on another member. The addition of members NA, NB, and NC for interior diagonals shall take place one member at a time, either during or after the addition of members RA, RB, or RC at each connection.
 - All surfaces of each existing diagonal to be strengthened by members RA, RB, or RC shall be cleaned and prepared to accept the paint system indicated in the Special Provisions. In addition the surface of each gusset plate and all surfaces of each member a minimum of 6 inches around the connections affected by the work shall be cleaned and prepared for painting. Areas cleaned shall receive the paint system indicated in the Special Provisions. Cleaning and painting shall be considered incidental to Structural Steel.

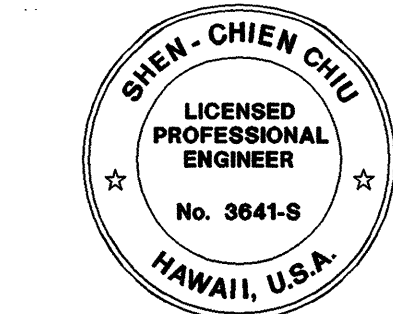
ORIGINAL PLAN	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NO.	

US2-3.DWG 08/04/99 9:55 FINAL L:\DWG\6041-01\NEW STRUCT\UMA

RETROFIT LEGEND:

— (Light lines) Existing steel members.
— (Heavy solid lines) Add bracing members.

NA Add 2-L 3x2 1/2x5/16 (w/lacing) new members.
NB Add 2-L 4x3x5/16 (w/lacing) new members.

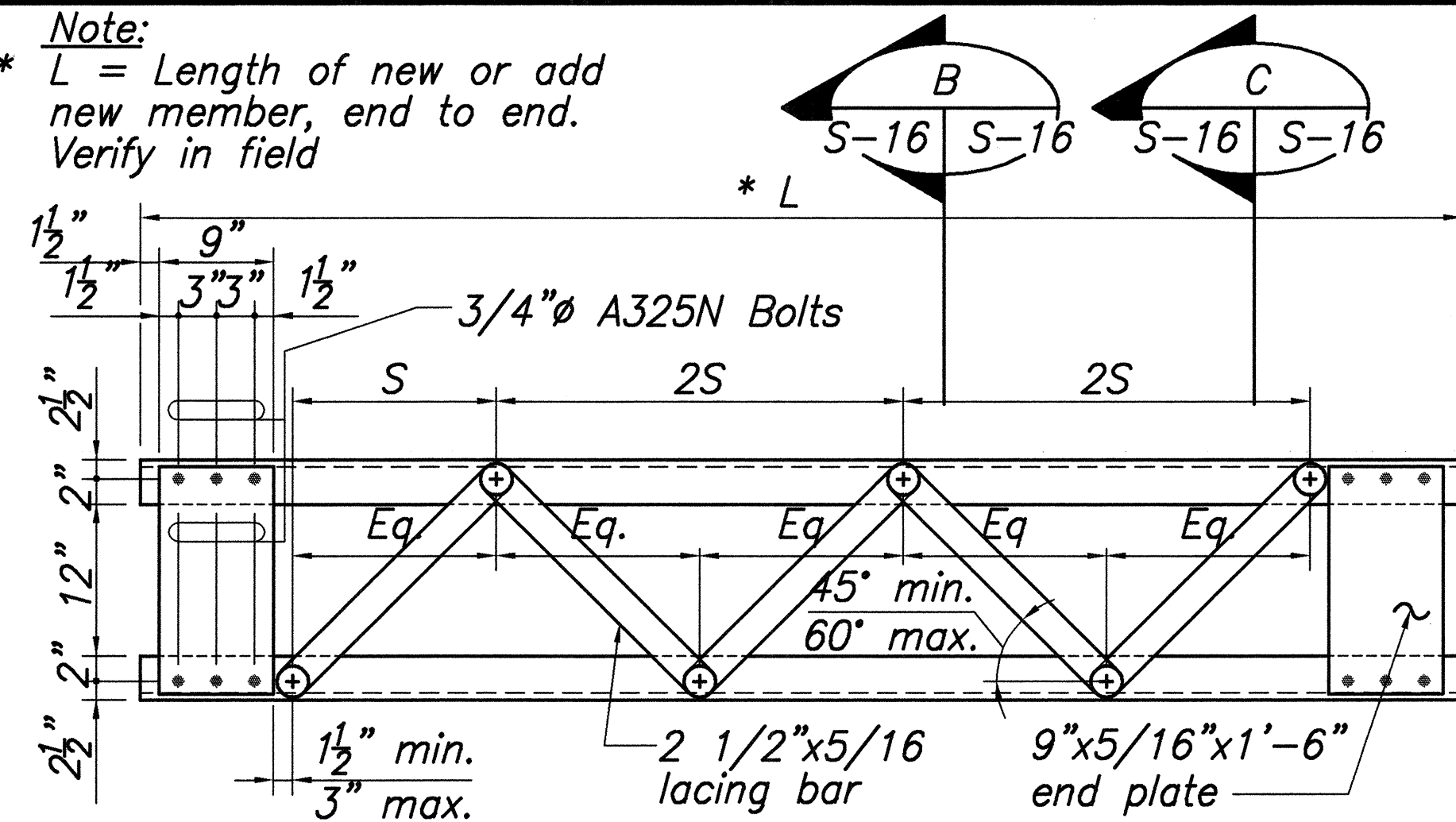


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Shen-Chien Chin

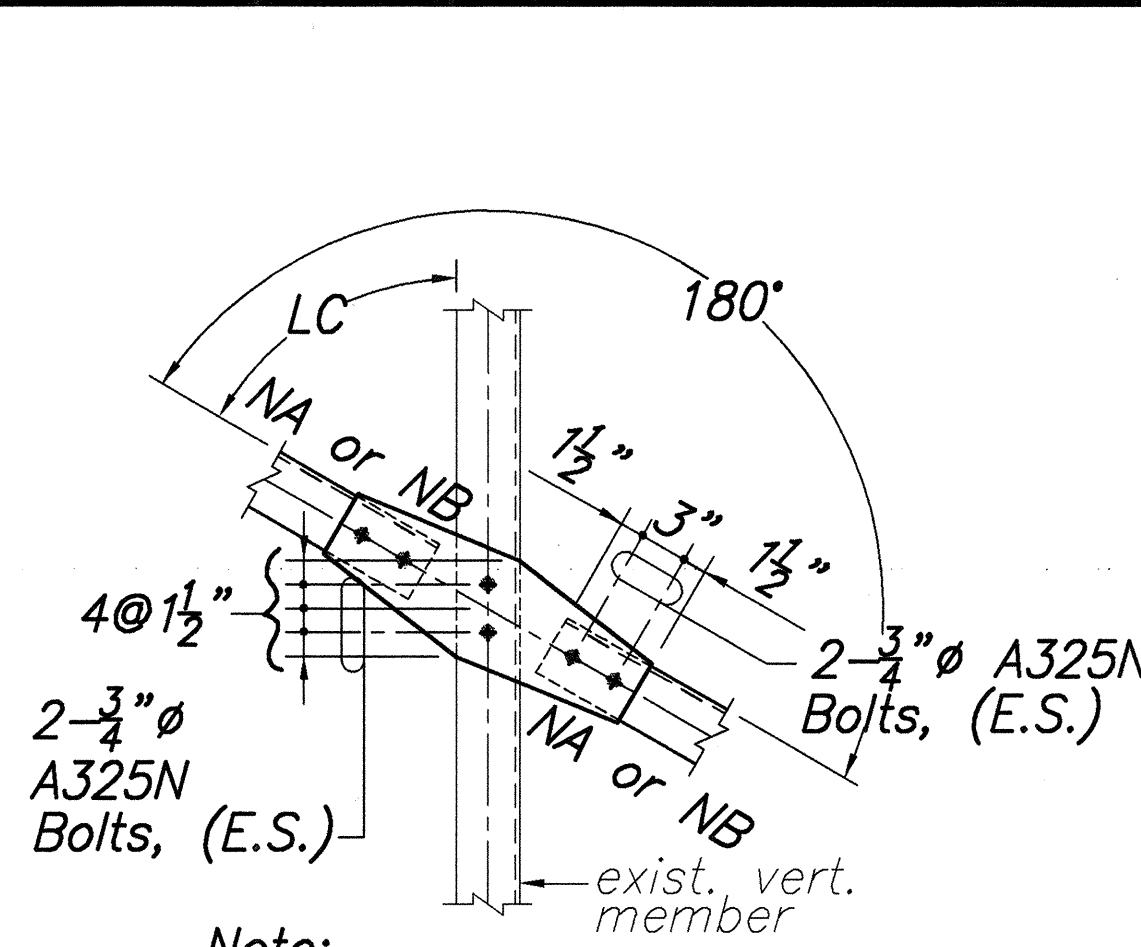
DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	UMAUMA BRIDGE SUBSTRUCTURE RETROFIT RETROFIT OF TOWERS A,B,C & D SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-15 OF 23 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-019-2(46)	2000	19	26

Note:
* L = Length of new or add new member, end to end.
Verify in field

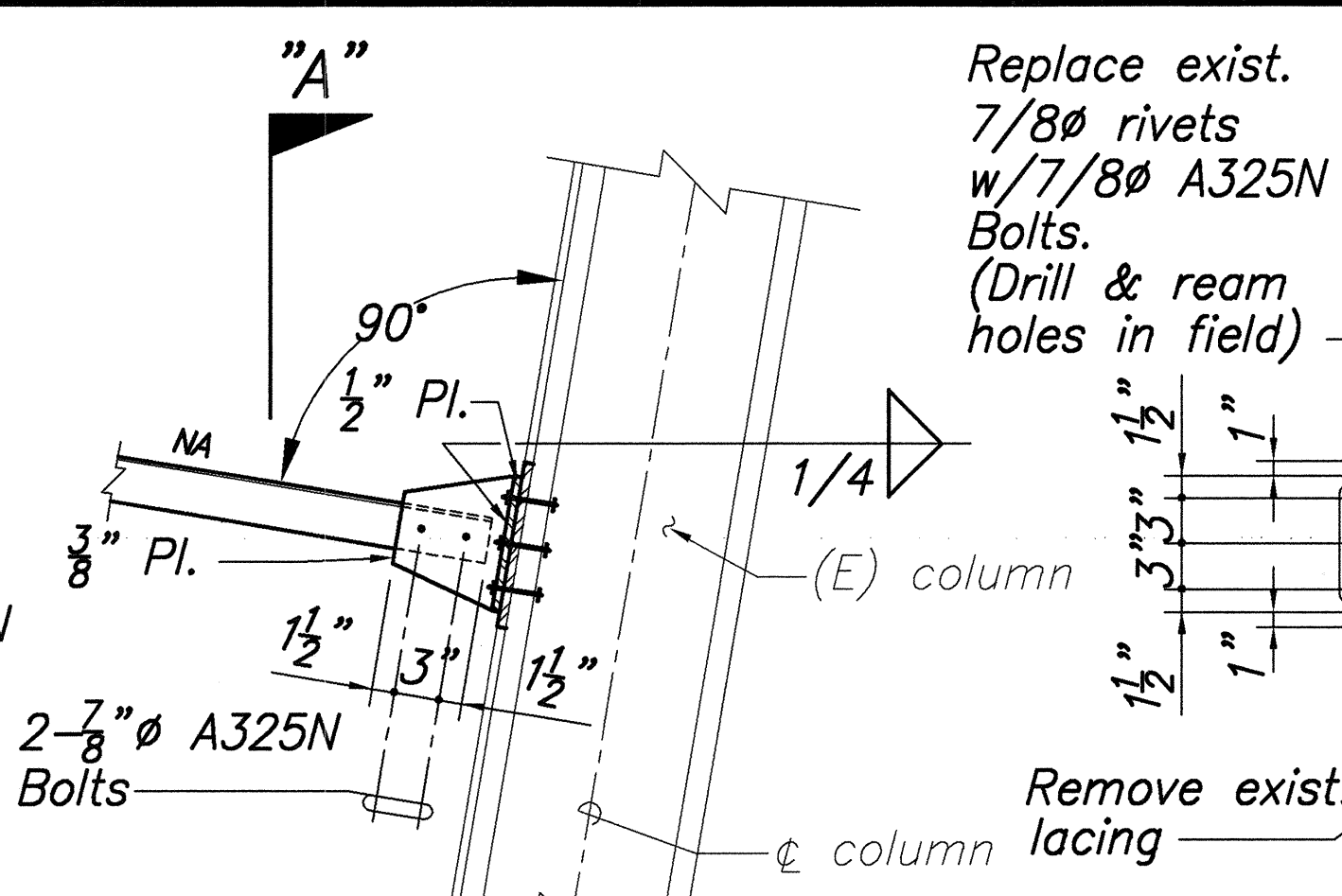


BOTTOM PLAN (Looking up)
LACING & STAY PLATE LAYOUT PLAN
OF NA, NB, RA, RB, & RC
Scale: None

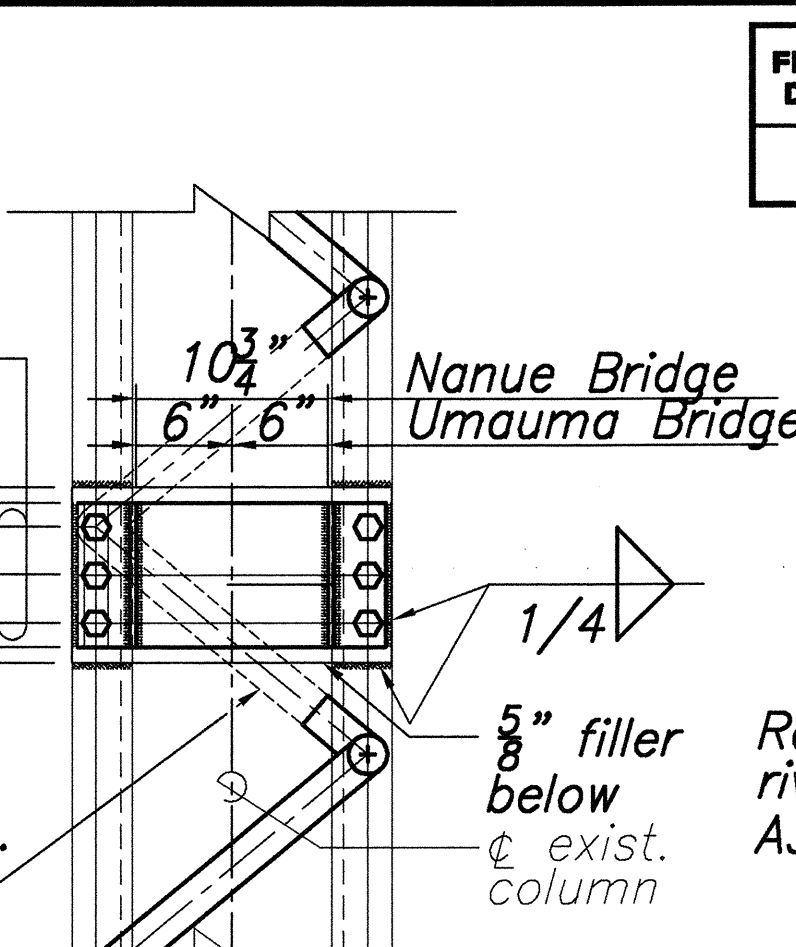


Note:
1. Determine angle "LC" from plans.
2. NA or NB, see plan.

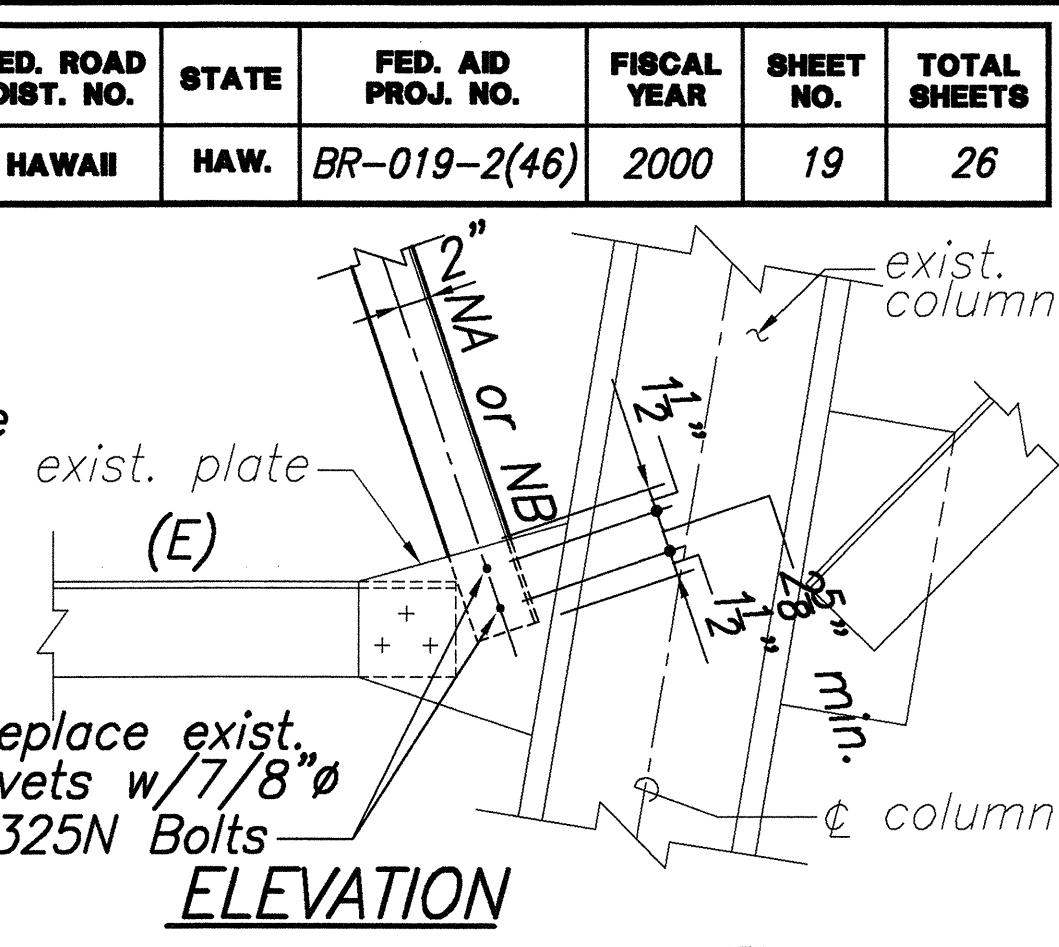
DETAIL 10
Scale: 1"=1'-0"
S-16 S-16
S-10, S-11, S-12
S-14, S-15



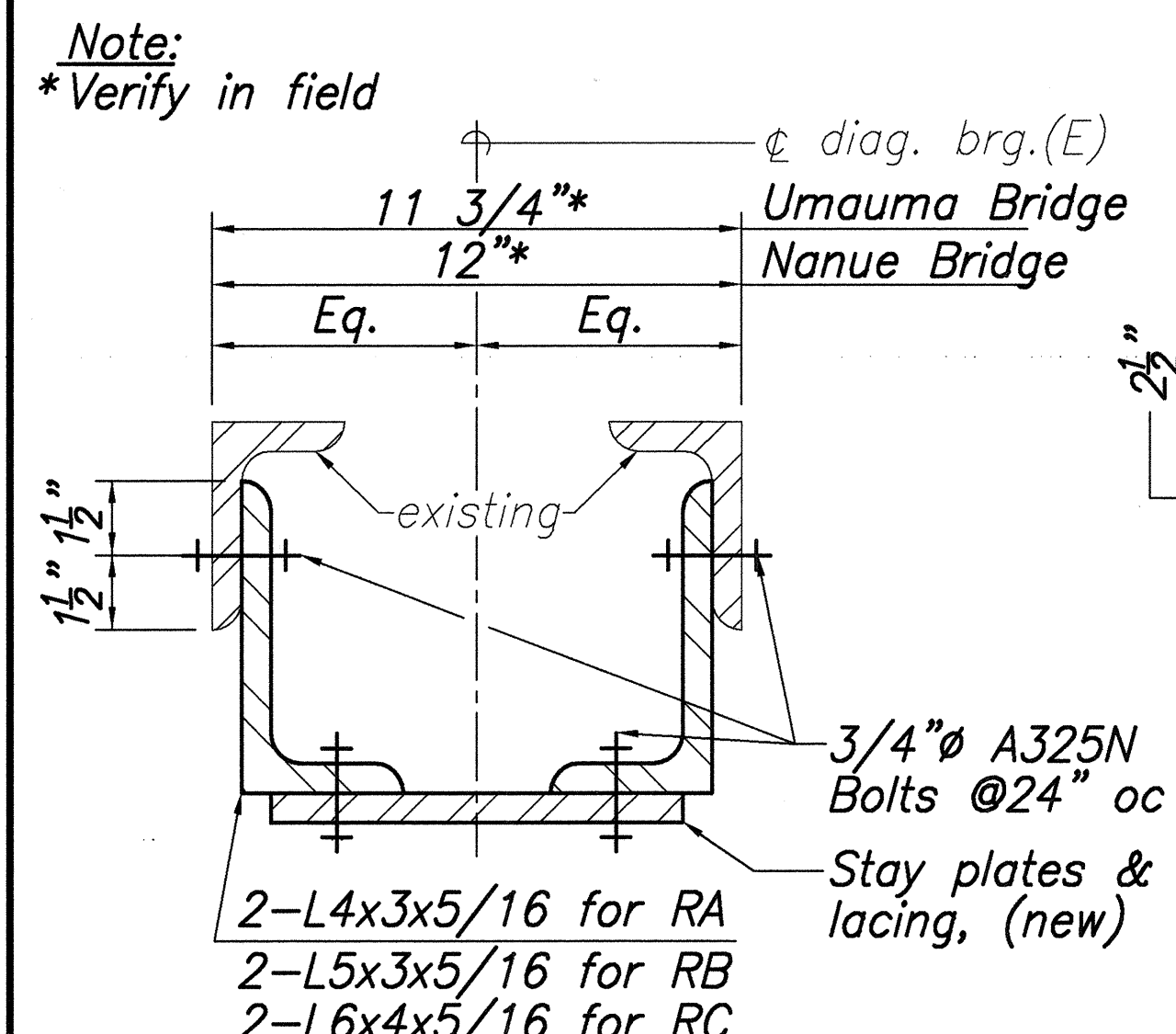
ELEVATION
DETAIL 5
Scale: 1"=1'-0"
S-16 S-16
S-10, S-11



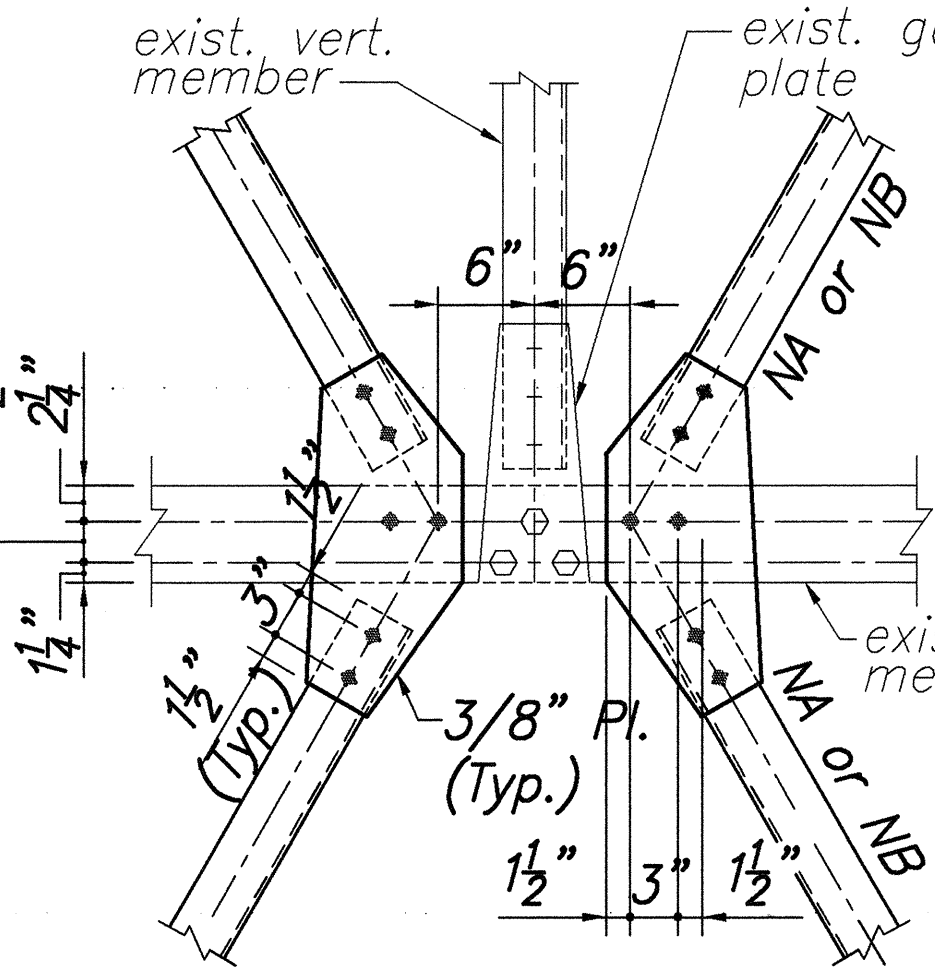
SECTION "A"
Note:
* See General Structural Note, #10 on sheet S-1 for information to determine the W.P.



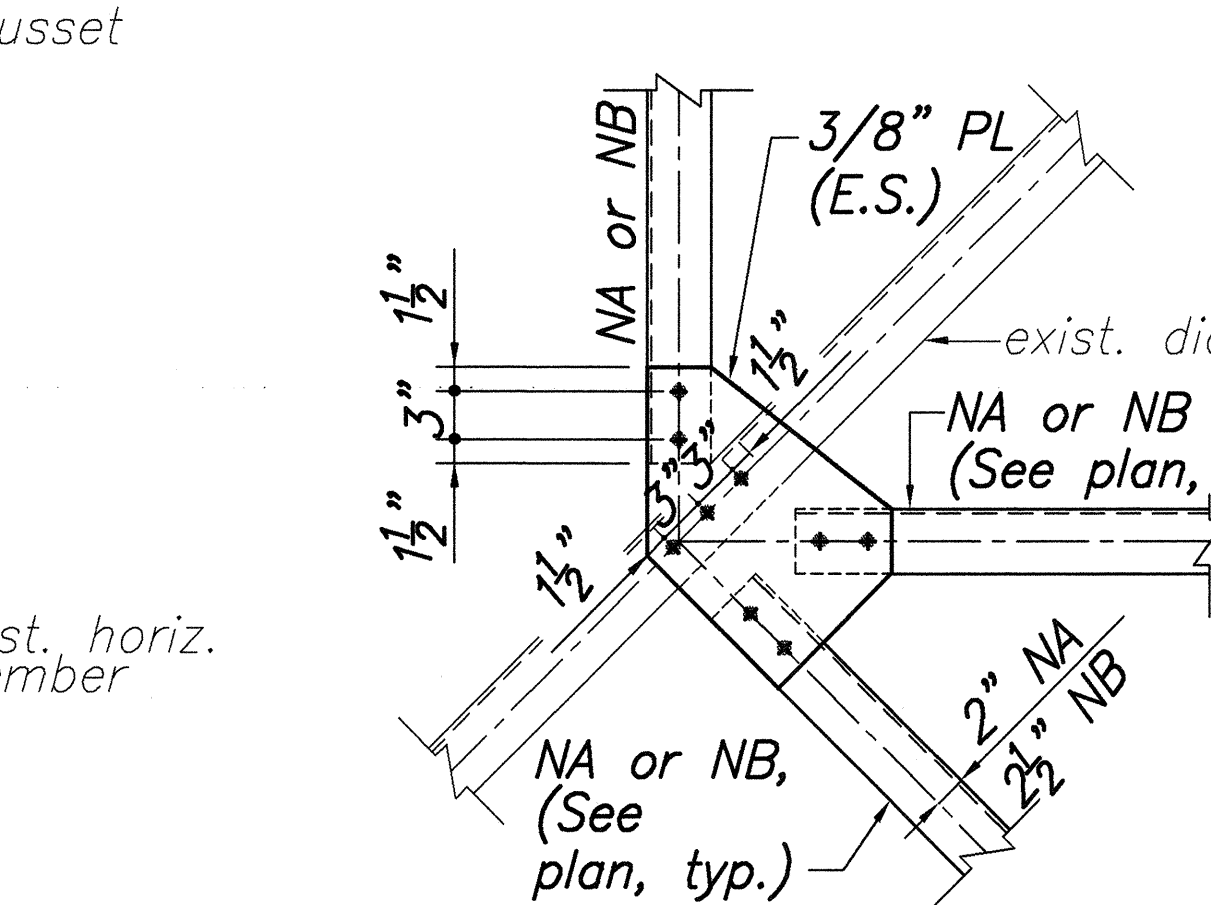
ELEVATION
DETAIL 2
Scale: 1"=1'-0"
S-15 S-15
S-9, S-10, S-11



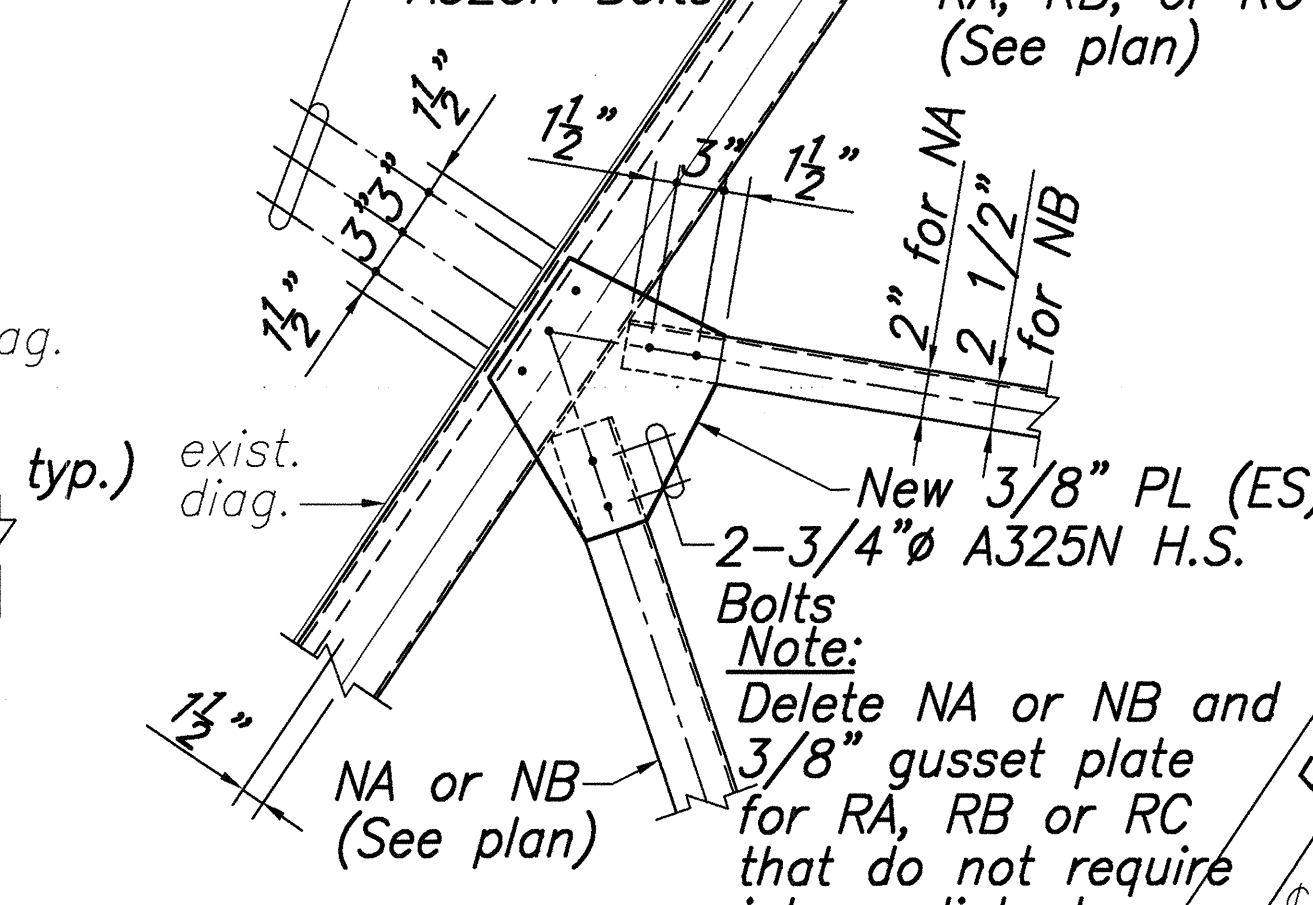
SECTION B
Scale: None
S-16 S-16
S-14



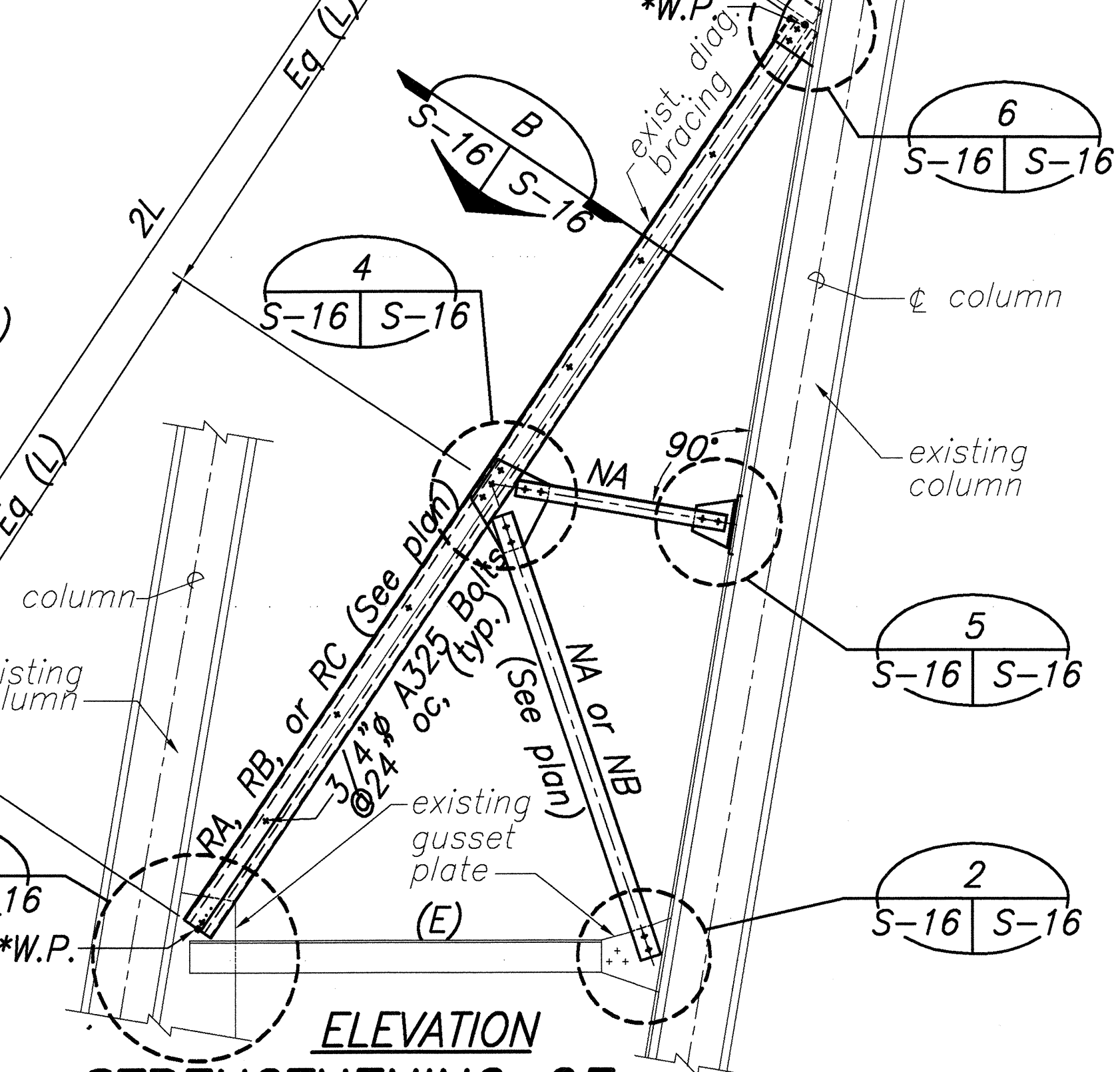
DETAIL 9
Scale: 1"=1'-0"
S-16 S-16
S-10, S-11, S-12
S-14, S-15



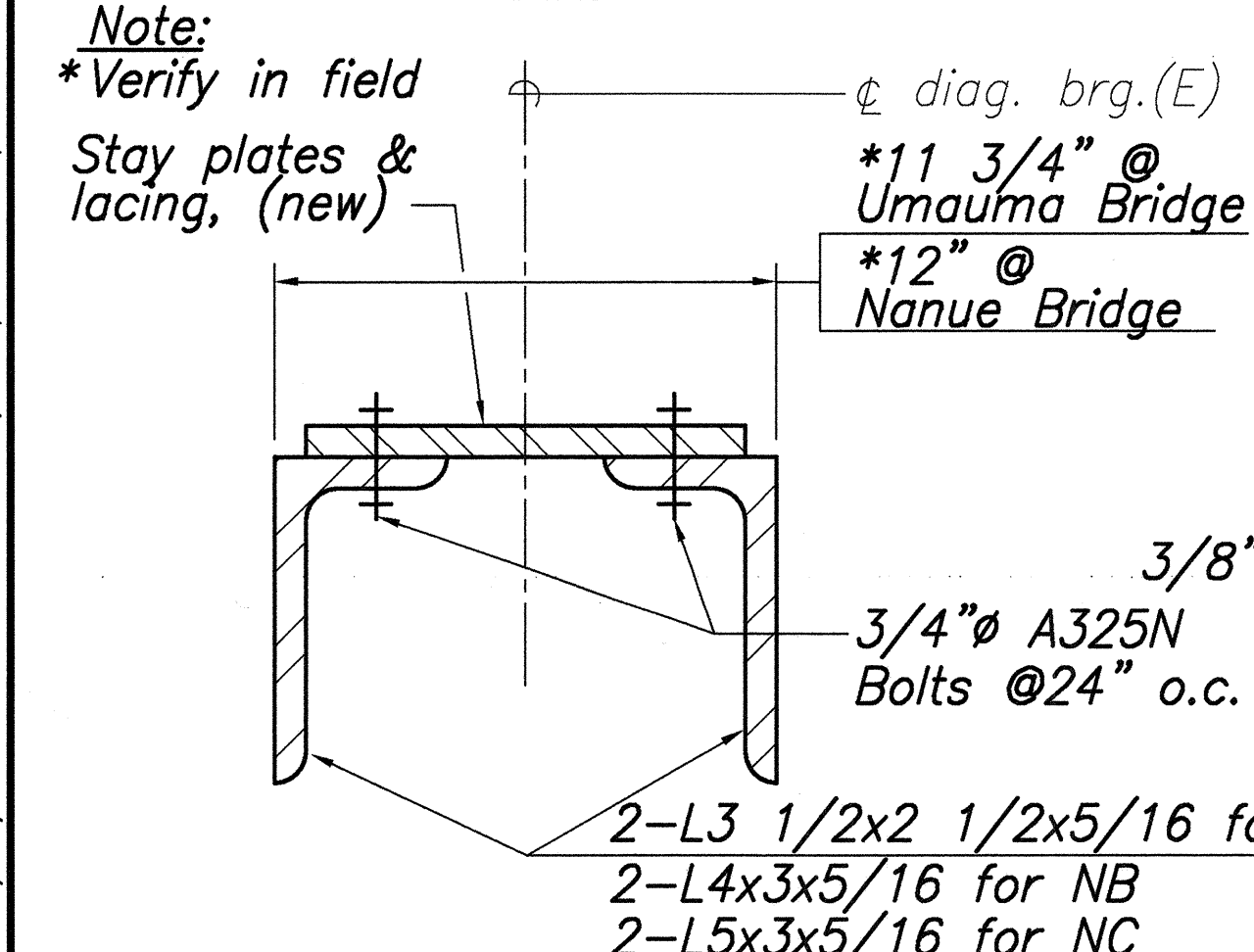
DETAIL 7
Scale: 1"=1'-0"
S-16 S-16
S-10, S-11, S-12
S-14, S-15



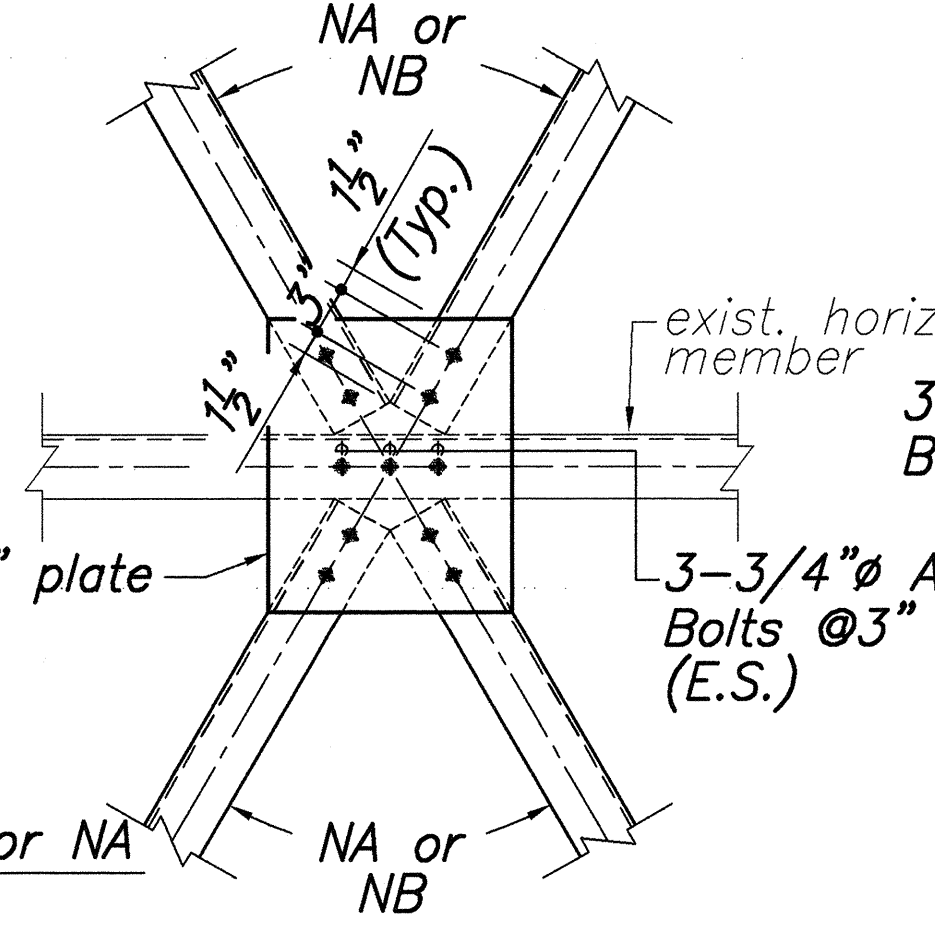
DETAIL 4
Scale: 1"=1'-0"
S-16 S-16
S-10, S-11



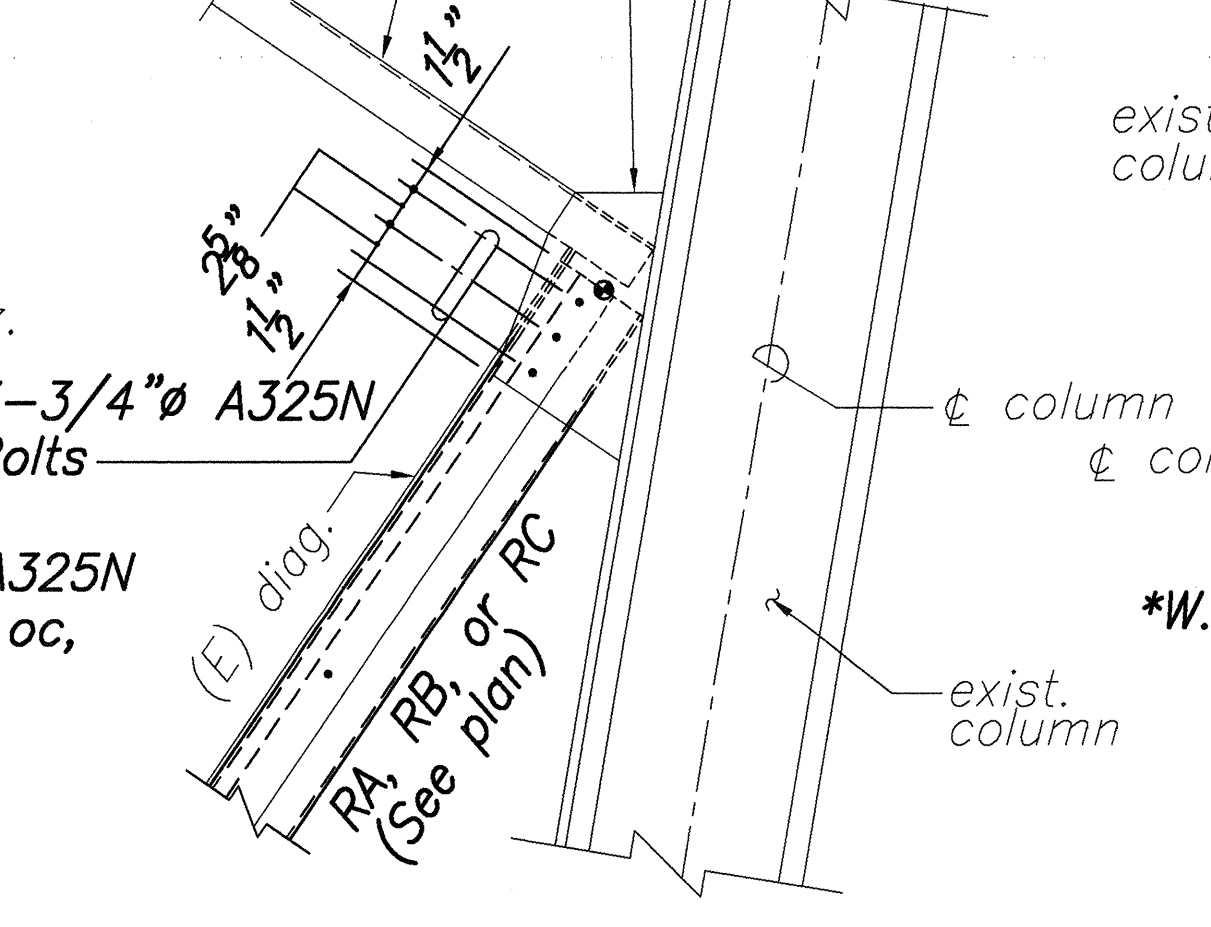
ELEVATION
STRENGTHENING OF EXIST. DIAG. BRACING
Scale: 1/2"=1'-0"
S-16 S-16



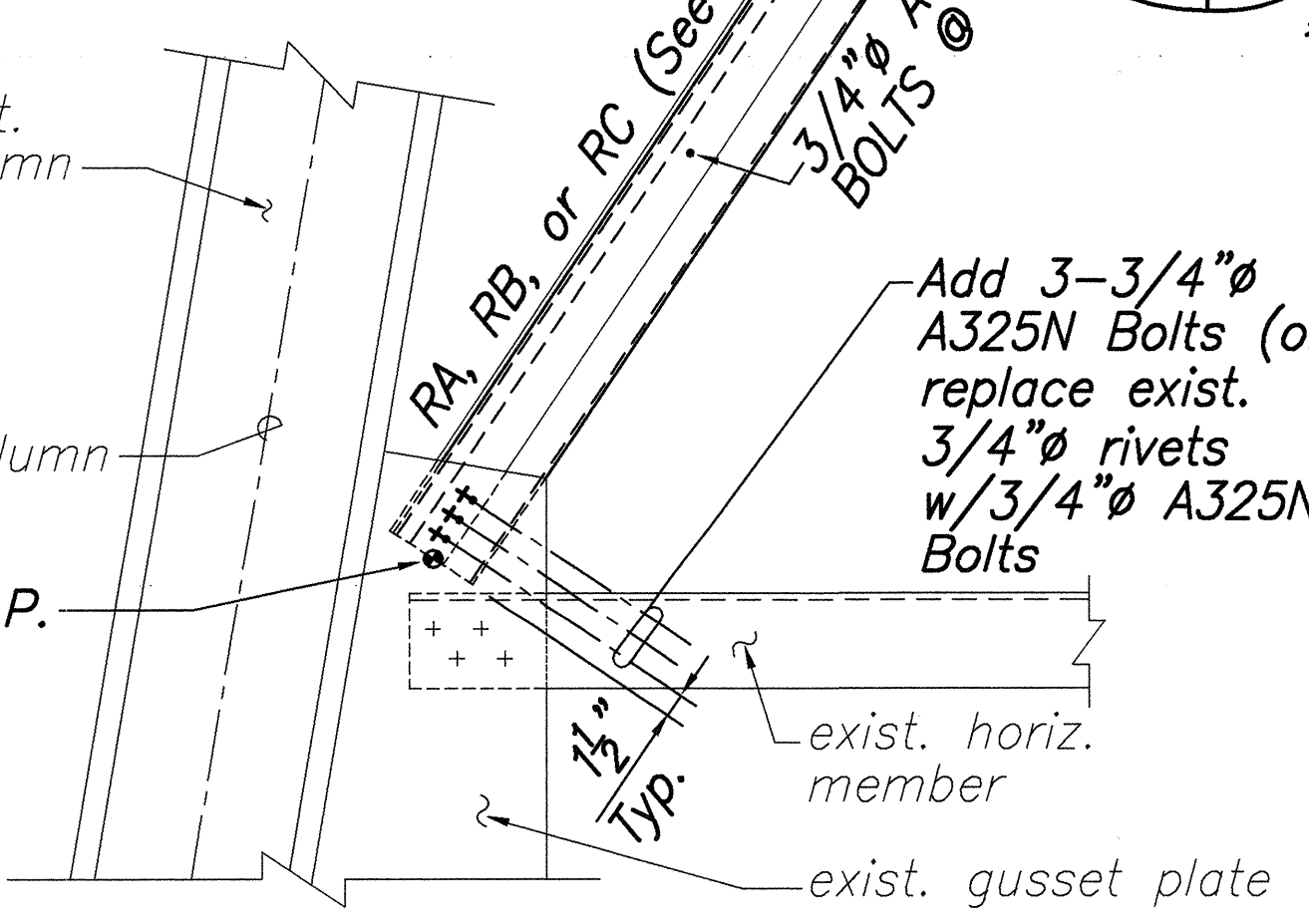
SECTION C
Scale: None
S-16 S-16



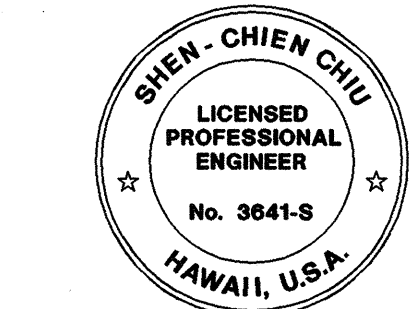
DETAIL 8
Scale: 1"=1'-0"
S-16 S-16
S-11, S-14



DETAIL 6
Scale: 1"=1'-0"
S-16 S-16
S-10, S-11, S-14



DETAIL 3
Scale: 1"=1'-0"
S-16 S-16
S-10, S-11, S-14



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Shen-Chien Chiu

DATE	REVISION
	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
	NANUE AND UMAUMA BRIDGES SUBSTRUCTURE RETROFIT SECTIONS & DETAILS
	SEISMIC RETROFIT OF VARIOUS BRIDGES EAST OF NINOLE, HAWAII F.A. PROJECT NO. BR-019-2(46)
Scale: As Noted	Date: AUG. 17, 1999
SHEET No. S-16 OF 23 SHEETS	

SURVEY PLOTTED BY: DATE: _____
 DRAWN BY: _____
 DESIGNED BY: _____
 CHECKED BY: _____
 No. _____
 NUS2-1.DWG 03/23/99 15:41 FINAL L:\DWG\6041-01\NEWSTRUCT\NANUE