Georgia Power Company
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Atlanta, Georgia 30308
Telephone 404 526-7020

Mailing Address:
Post Office Box 4545
Atlanta, Georgia 30302

Georgia Power
the southern electric system

April 20, 1982

J. T. Beckham, Jr.
Vice President and General Manager
Nuclear Generation


Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

NRC DOCKETS 50-321, 50-366
OPERATING LICENSES DPR-57, NPF-5
EDWIN I. HATCH NUCLEAR PLANT UNITS 1, 2
NRC I&E BULLETIN 80-11

Gentlemen:

Georgia Power Company hereby submits the enclosed information in response to the John F. Stolz (NRC) letter dated March 4, 1982, which requested additional information concerning our responses to NRC I&E Bulletin 80-11, "Masonry Wall Design."

If you have any questions in this regard, please contact this office.

J. T. Beckham, Jr. states that he is Vice President of Georgia Power Company and is authorized to execute this oath on behalf of Georgia Power Company, and that to the best of his knowledge and belief the facts set forth in this letter are true.

GEORGIA POWER COMPANY

By: J. T. Beckham, Jr.

Sworn to and subscribed before me this 20th day of April, 1982

Notary Public

Notary Public, Georgia, State at Large
My Commission Expires Sept. 20, 1983

JAE/mb

Enclosure

xc: H. C. Nix, Jr.
R. F. Rogers, III
J. P. O'Reilly (NRC-Region II)

A001
S/1

8204300218

# NRC I&E BULLETIN 80-11, "MASONRY WALL DESIGN"

## RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

## EDWIN I. HATCH NUCLEAR PLANT

## UNITS 1 AND 2

## DOCKET NOS. 50-321 AND 50-366

NRC Question 1

In Section 4.3 of Reference 2, the grout used to fill the masonry cells was given a minimum value of 4000 PSI for its compressive strength. Provide justification for the use of this value.

Response

As stated in Appendix C of Reference 2, the original erection specifications required that all grout used in concrete masonry wall construction meet the requirements of Specification Section 322-2 of the original plant specifications. This section requires, among other things, that the grout is to be tested to insure a minimum compressive strength of 4000 PSI. During construction, concrete and grout were mixed on site at the batch plant. Samples of all concrete and grout were routinely tested to ensure compliance with the specifications.

The specified minimum compressive strength of 4000 PSI was selected because an approved mix design already existed. Although the minimum compressive strength may be an optional value, depending on the specific project and use, the 4000 PSI strength was uniformly used at Plant Hatch.

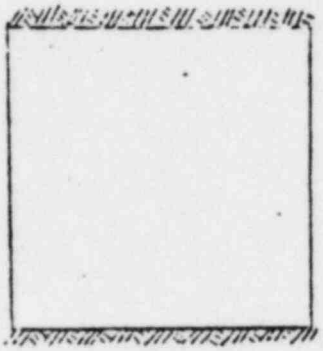
NRC Question 2

With respect to interstory drift effects, Section 3 of Appendix F [2] stated "examination of the test data indicates that the gross shear strain of a wall is a reliable indicator." Identify these test data sources. Also provide and discuss the acceptable level of strain for unconfined walls.

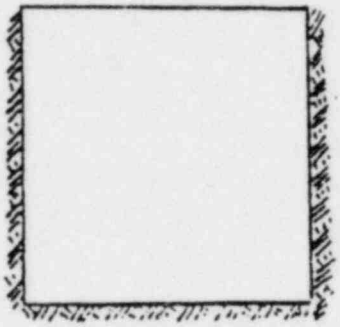
Response

A list of references from which the data on confined walls was taken was provided at the end of Appendix F (pages F-4 and F-5) in the 180-day response (Reference 2). Examples defining confined and unconfined walls are shown in attached figure 1. These definitions were utilized by the references listed above.

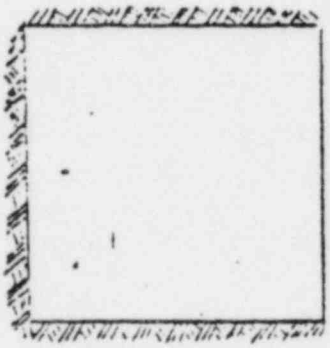
The works of Fishburn and those of Becica (see Appendix F page F-4) present an allowable shear strain for unconfined walls. However, since all masonry walls at Plant Hatch meet the criteria for confined walls, the question of shear strain allowables for unconfined walls was not addressed.



confined

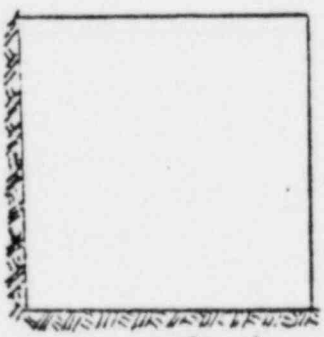


confined



confined

confined



unconfined

Figure 1 Examples Defining "Confined" and, "Unconfined" Walls

NRC Question 3

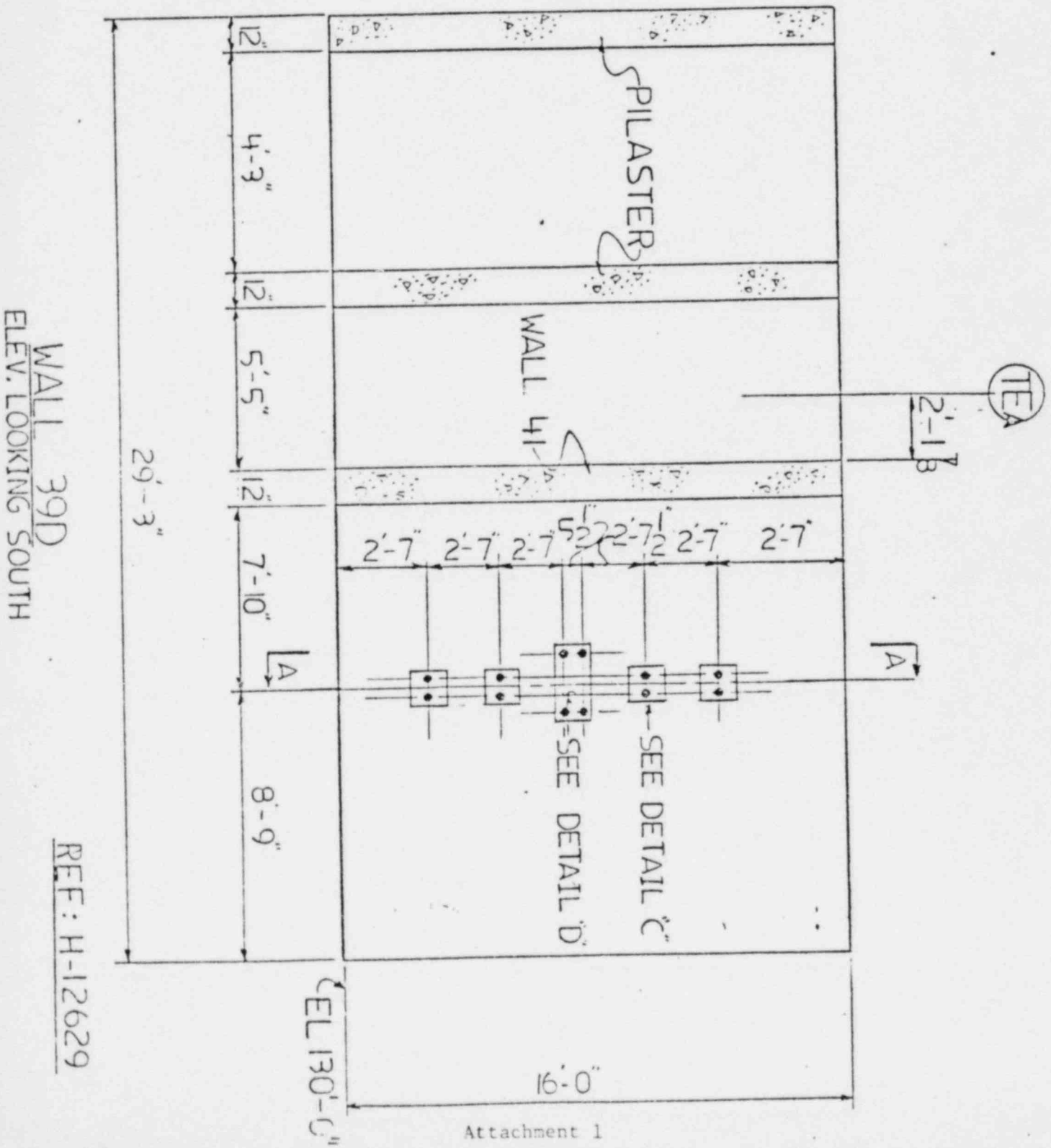
Provide details of modifications for all walls that do not satisfy the design allowables. Technical discussion should be provided detailing how these modifications will correct this deficiency. Also, provide the modification schedule.

Response

A number of walls were modeled for STRUDL-DYNAL and had a finite element analysis run of the as-built condition, taking into account all loads and load combinations. A total of ten (10) walls were identified where calculated stresses exceeded allowable stresses. The results of the analysis showed that the effective horizontal span length of the wall should be reduced. Therefore, a point somewhere within the middle one-third of the span of the wall was chosen considering obstructions and installation problems, and one or more structural steel columns were erected to provide additional support for the wall. The column(s) were designed to withstand the applied loads and were used to brace the wall as shown in the attached sketches. The wall was then re-modeled for STRUDL-DYNAL, including the steel column, and a finite element analysis was performed again for all postulated loads and load combinations. Resulting moments and shears for the masonry wall and support column were checked against allowables. In addition, bolts, plates, and welds for the support having an angle brace were checked for worst-case loads. Wall number C130-14A&B had an angle brace attached to the ceiling on each side of the wall to provide lateral shear support and reduce a local overstress condition to within allowables. Following the analysis using the modified models, each wall was determined to satisfy all stress allowables.

Detailed sketches of the modification for each wall are shown in attachments 1 through 8. The field modifications for each wall are complete except for wall C164-4A&B and wall C130-39A&B. Both of these walls will be removed in the near future to allow for relocation of the shift supervisors office and modifications in the health physics area. Therefore, no modifications have been scheduled for these walls.

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 11-21-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATIONS | [illegible] | [illegible] |
| C-130-39C & 39D (PSOC-80-005) | **Calculation Number** | **Sheet** 4 of 7 |

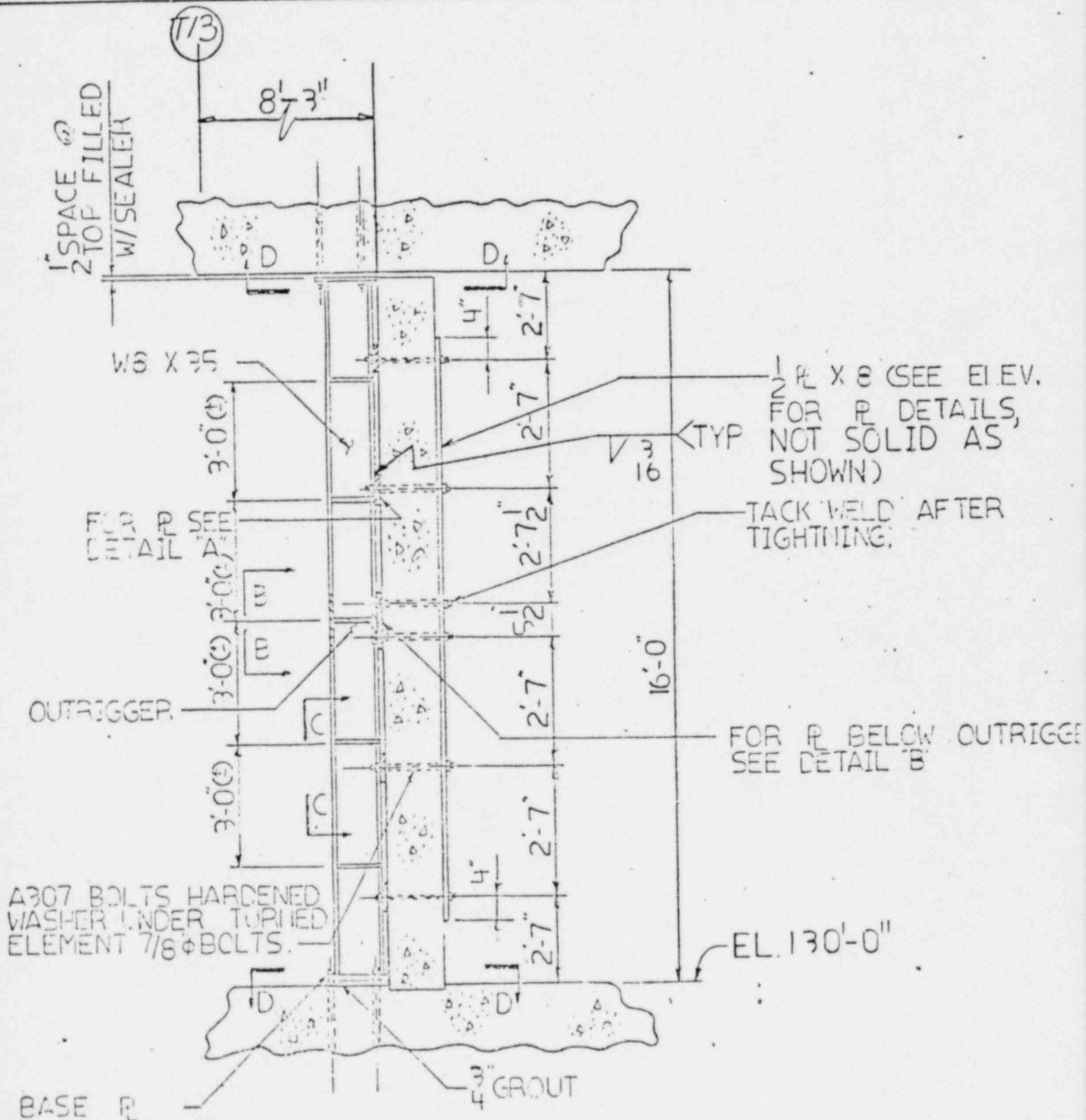



Attachment 1

Design Calculations

Southern Company Services

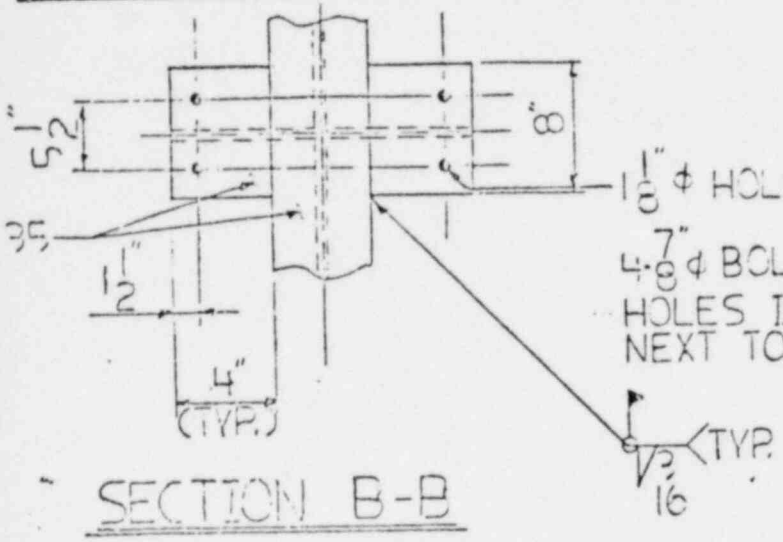
| | | |
|---|---|---|
| Project: HATCH-UNIT NO. 1&2 | Prepared By: TINA C. SALSER | Date: 11-21-80 |
| Subject/Title: WALL MODIFICATION | Reviewed By: [illegible] | Date: 11-24-80 |
| C-130-39C & 39D (PSOC-80-005) | Calculation Number | Sheet: 5 of 7 |



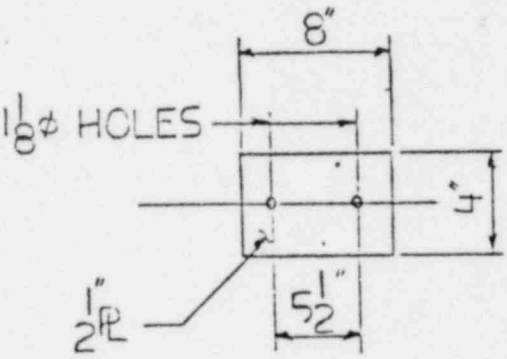

REF: H-12629

SECTION A-A

| Project | Prepared By | Date |
|---|---|---|
| HATCH- UNIT NO. 1 & 2 | TINA C. SAISER | 11-21-89 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATIONS | K. L. [illegible] | 1.24.90 |
| C-130-39C & 39D (PSOC-90-005) | **Calculation Number** | **Sheet** 6 of 7 |




SECTION B-B

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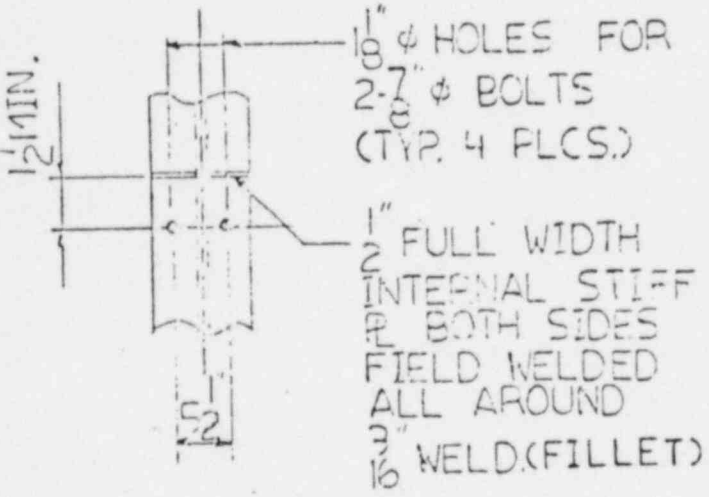


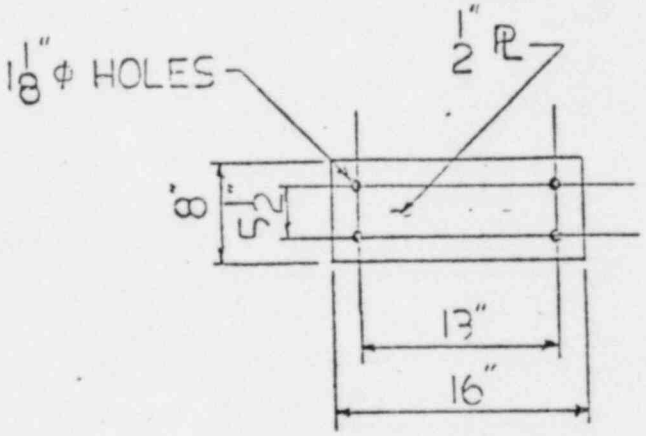


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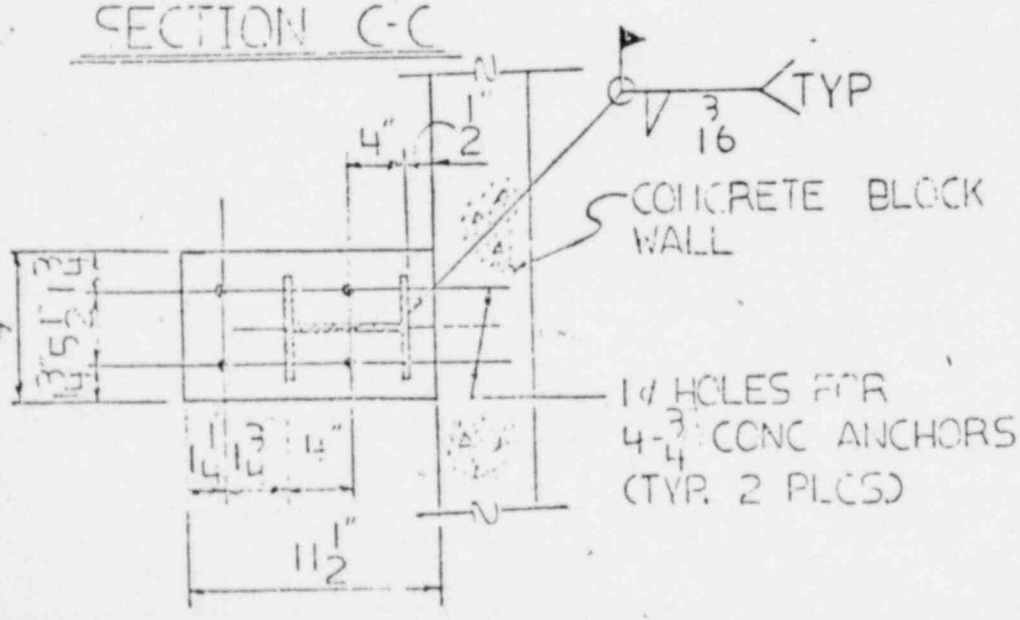
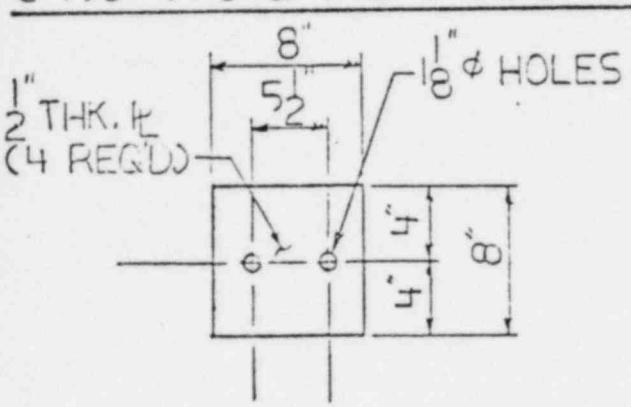
SECTION C-C




REF: H-12629

SECTION D-D

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1&2 | TINA C. SALSER | 11-21-80 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | | |
| C-130-39C & 39D (PSOC-80-005) | Calculation Number | Sheet 7 of 7 |

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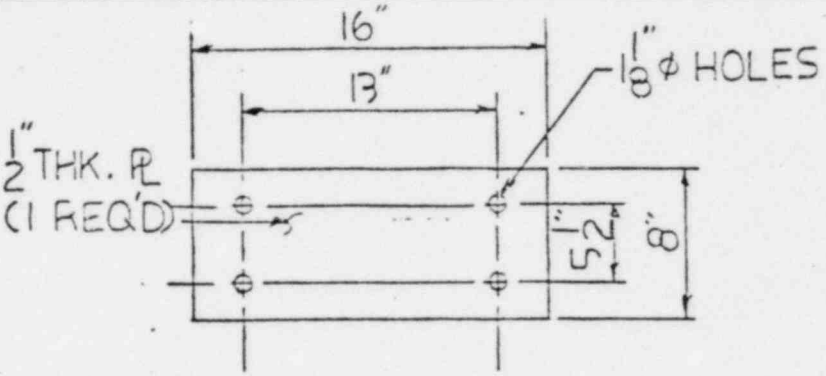



DETAIL "D"

| | |
|---|---|
| 1 - W8 X 35 | LENGTH 15'-9 3/4" |
| 4 - PLATES | 8" X 8" X 1/2" |
| 2 - PLATES | 8" X 16" X 1/2" |
| 4 - PLATES | 8" X 4" X 1/2" |
| 8 - STIFFNER PLATES | 1/2" X 3 7/8" X 7 1/8" |
| 2 - W8 X 35 | 8" LONG |
| 2 - PLATES | 9" X 11 1/2" X 1/2" |
| 12 - 7/8" ϕ BOLTS | 16" LONG (2 1/4" THREAD) |
| 8 - 3/4" ϕ CONC. ANC. | HILTI CATALOG #550108 OR EQ. |

NOTES:

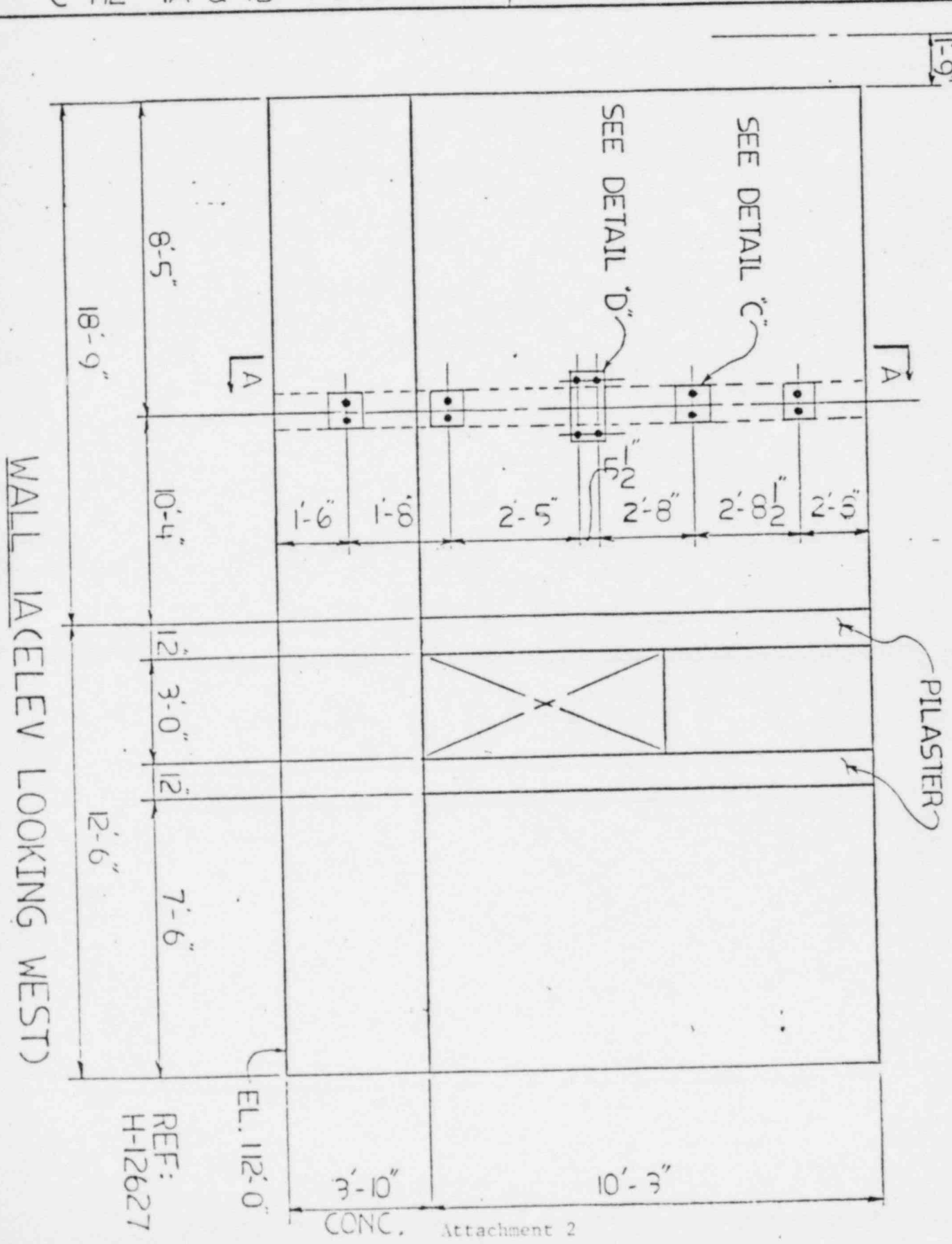
1. ALL STRUCTURAL STEEL SHALL BE ASTM A 36
2. ALL STRUCTURAL STEEL IS TO BE QUALITY CLASS "D"
3. ALL BOLTS ARE TO BE ASTM A 307

REF: H-12629

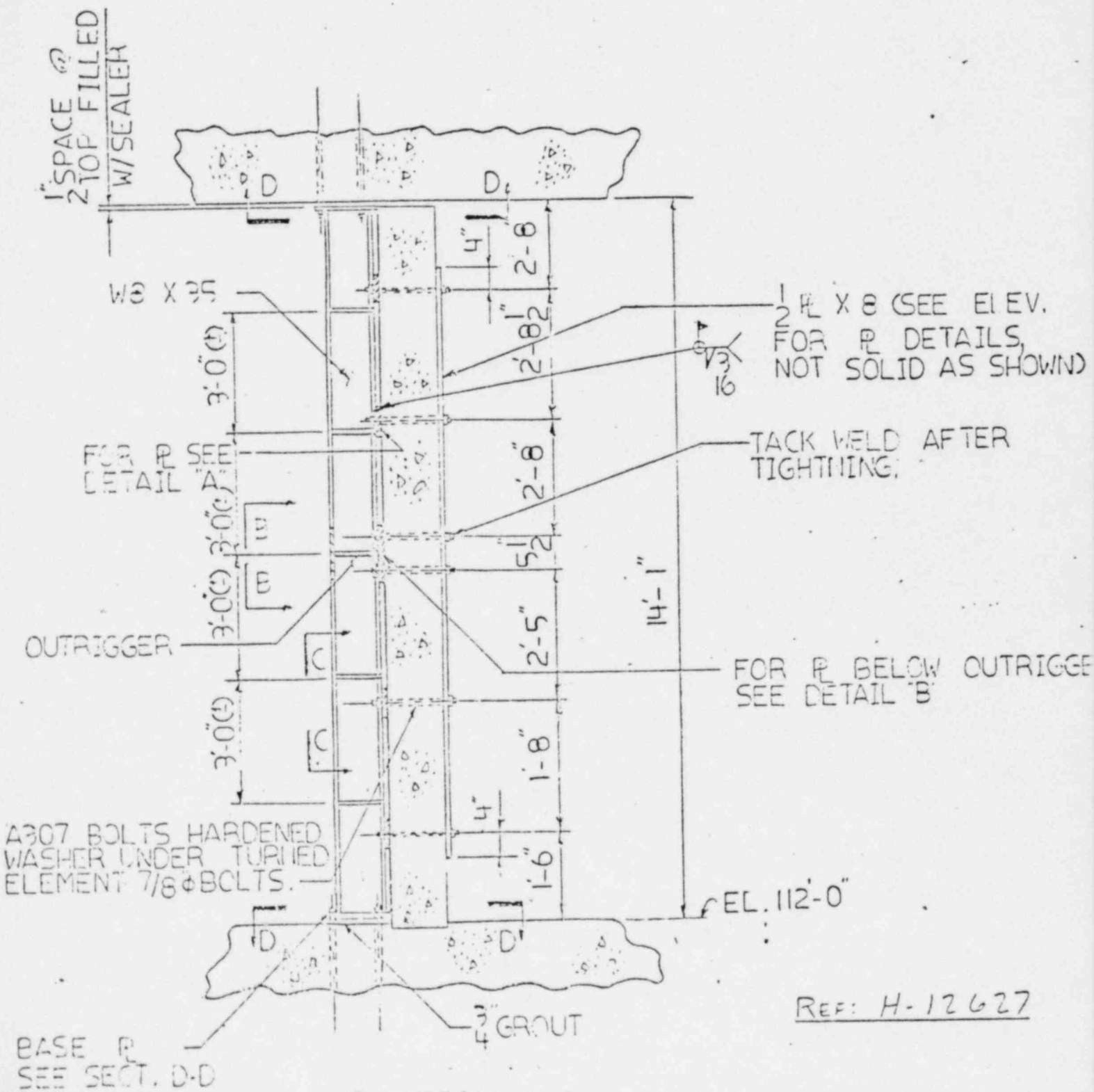
Design Calculations

Southern Company Services

| | | |
|---|---|---|
| Project: HATCH - UNIT NO. 1 & 2 | Prepared By: TINA C. SALSER | Date: 11-17-80 |
| Subject/Title: WALL MODIFICATION | Reviewed By: K. L. W[illegible] | Date: 11-19-80 |
| C-112-1A & 1B (PSOC-80-001) | Calculation Number | Sheet: 1 of 4 |



| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT 1 & 2 | TINA C. SALSER | 11-19-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. WHITAKER | 11-19-80 |
| C-112-1A & 1B (PSOC-80-001) | Calculation Number | Sheet 2 of 4 |



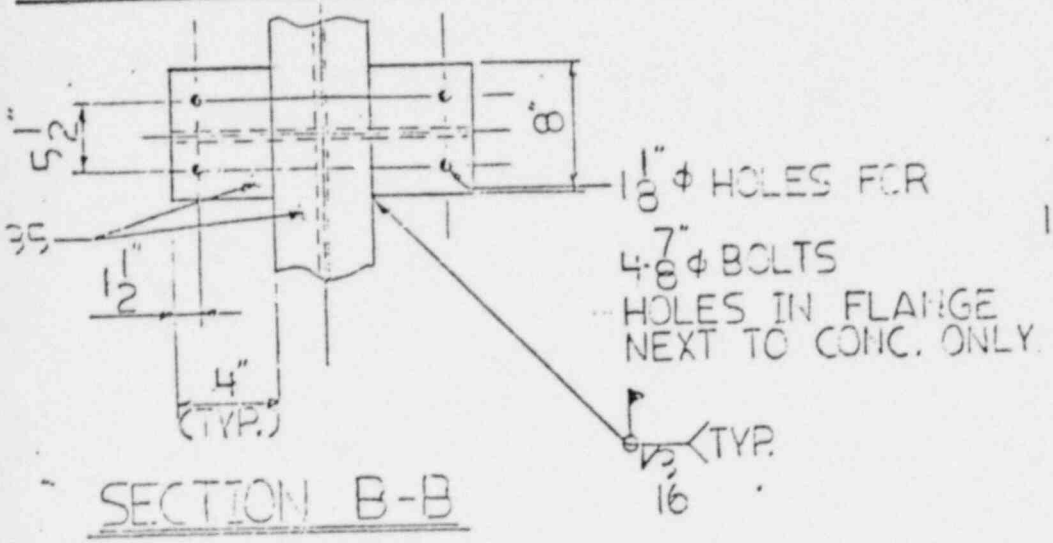

REF: H-12627

SECTION A-A

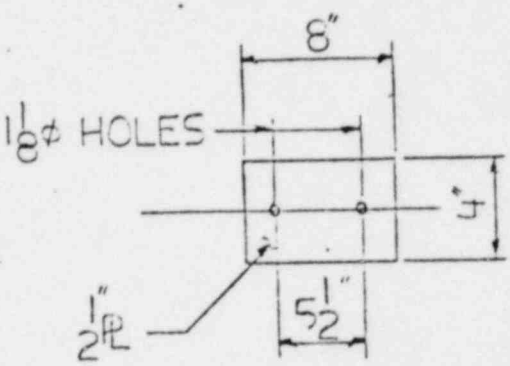
Design Calculations

Southern Company Services

| | | |
|---|---|---|
| Project: HATCH-UNIT NO. 1 & 2 | Prepared By: TINA C. SALTER | Date: 11-19-90 |
| Subject/Title: WALL MODIFICATIONS | Reviewed By: K. L. WHITMIRE | Date: 11-20-90 |
| C-112-1A & 1B (PSOC-80-001) | Calculation Number | Sheet: 3 of 4 |




SECTION B-B

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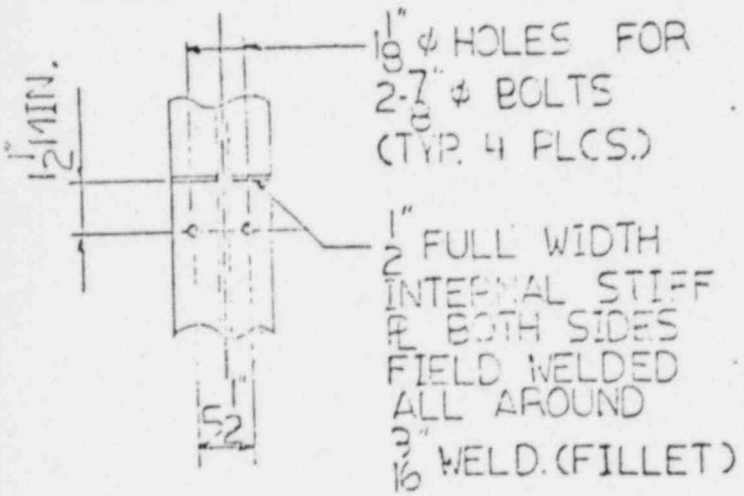


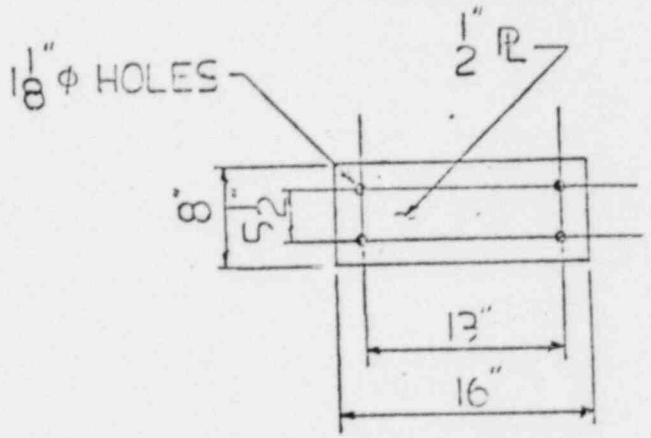


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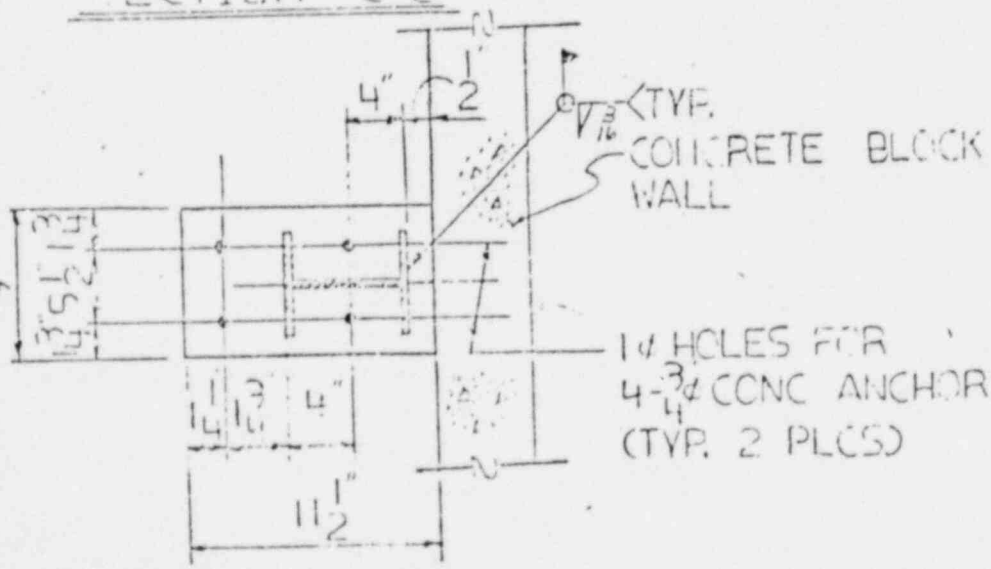
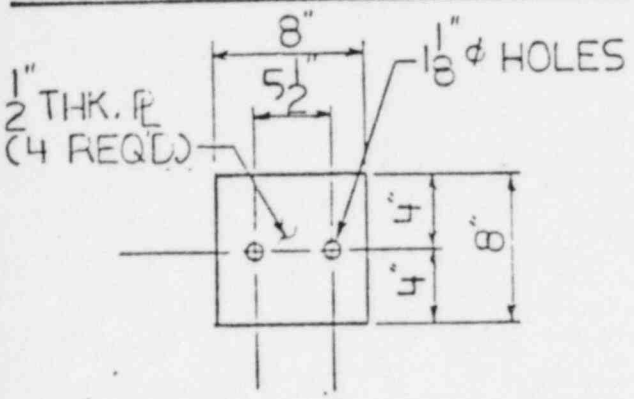
SECTION C-C




REF: H-12627

SECTION D-D

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 11-18-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. W[illegible] | 11-20-80 |
| C-112-1A & 1B (PSOC-80-001) | **Calculation Number** | **Sheet** 4 of 4 |

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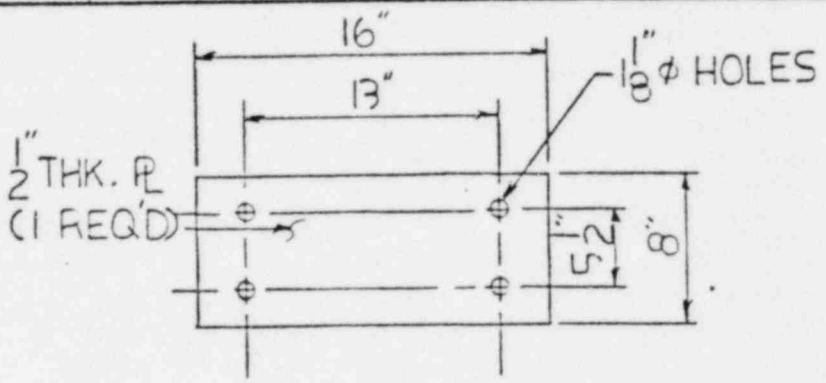



DETAIL "D"

| | |
|---|---|
| 1 - W8 X 35 | LENGTH = 13'-10 3/4" |
| 4 - PLATES | 8" X 8" X 1" |
| 2 - PLATES | 8" X 16" X 1" |
| 4 - PLATES | 8" X 4" X 1" |
| 2 - PLATES | 9" X 11 1/2" X 1" |
| 8 - STIFFNER PLATES | 3 7/8" X 7 1/8" X 1/2" |
| 2 - W8 X 35 | 8" LONG |
| 12 7/8" ϕ BOLTS | 16" LONG (2 1/4 THD) |
| 8 - 3/4" ϕ CONC. ANC. | HILTI CATALOG - #550108 OR EQ. |

NOTES

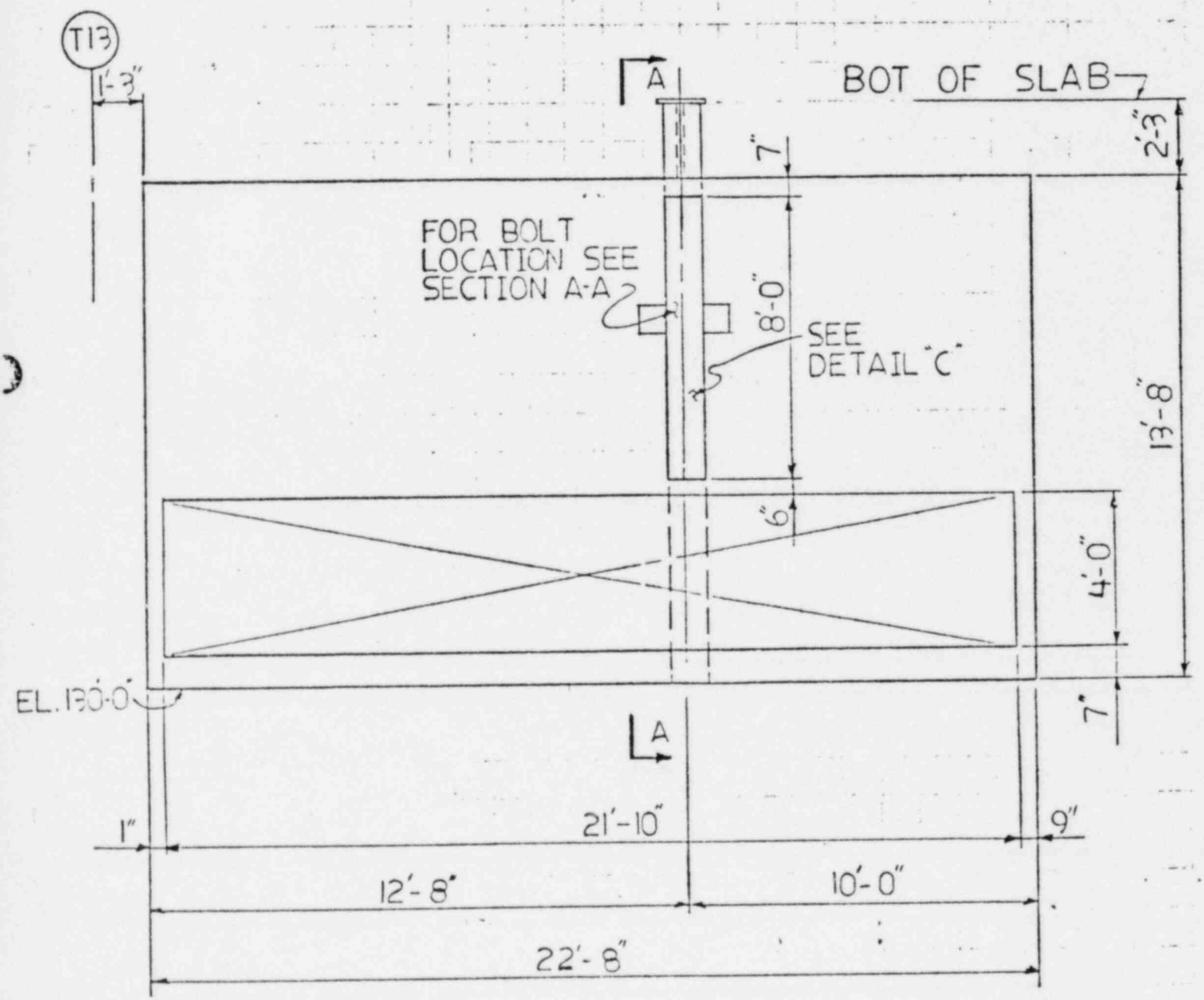
1) ALL STRUCTURAL STEEL SHALL BE ASTM A36.
2) ALL STRUCTURAL STEEL IS TO BE QUALITY CLASS "D".
3) ALL BOLTS ARE TO BE ASTM A307

H-12627

Design Calculations

Southern Company Services

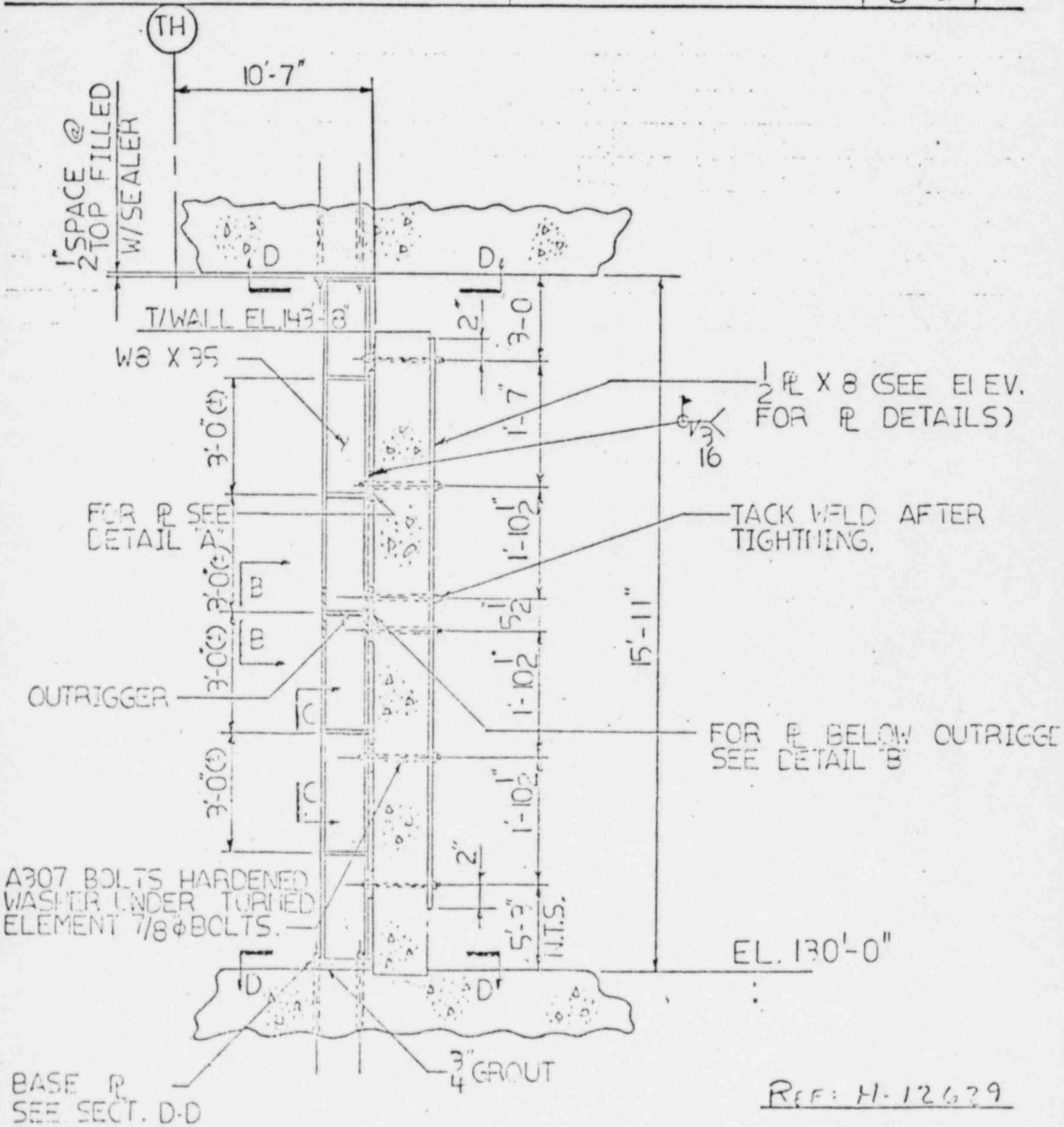
| | | |
|---|---|---|
| Project: HATCH-UNIT NO. 1 & 2 | Prepared By: TINA C. SALSER | Date: 11-19-80 |
| Subject/Title: WALL MODIFICATION | Reviewed By: K. L. WHITMORE | Date: 11-21-80 |
| C-130-2A & 2B (PSOC-80-002) | Calculation Number | Sheet: 4 of 7 |




WALL 2A
(ELEV LOOK WEST)

130 FLR.
REF. H-12027

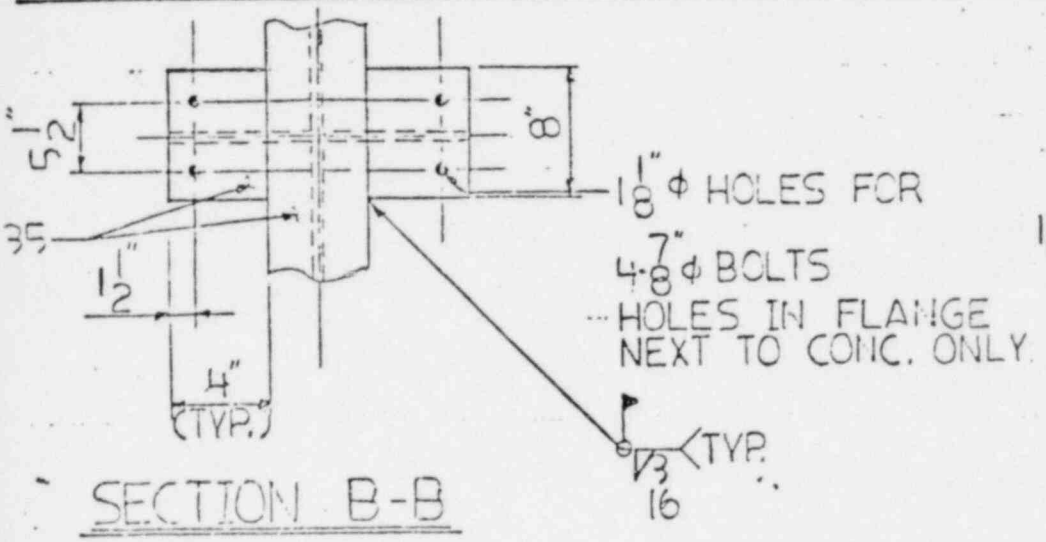
| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT 1&2 | TINA C. SALSER | 11-19-80 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | K. L. WHITMORE | 11-21-80 |
| C-130-2A & 2B (PSOC-80-002) | Calculation Number | Sheet 5 of 7 |



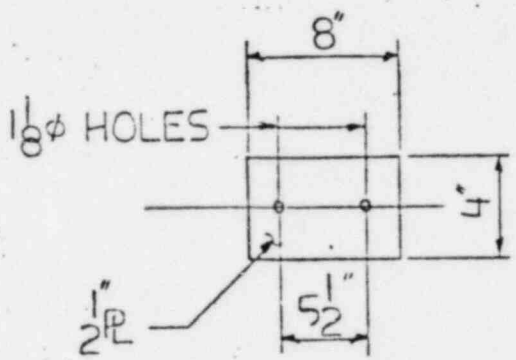

REF: H-12679

SECTION A-A

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SAISER | 11-19-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATIONS | K. L. WHITMORE | 11-21-80 |
| C-130-2A & 2B (PSOC-80-002) | **Calculation Number** | **Sheet** 6 of 7 |




SECTION B-B

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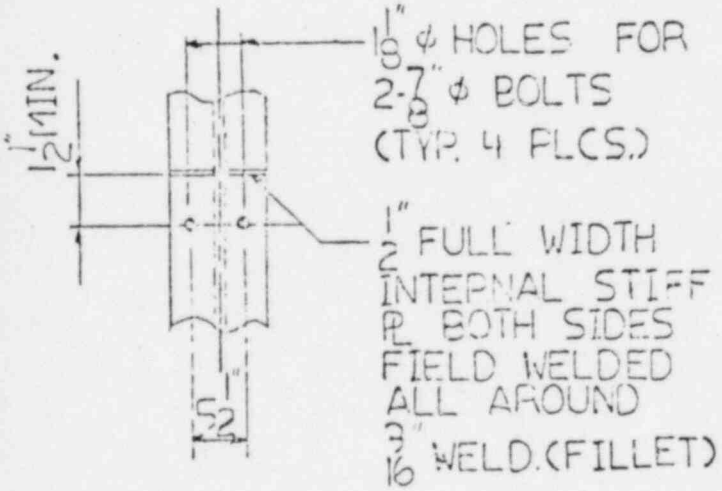


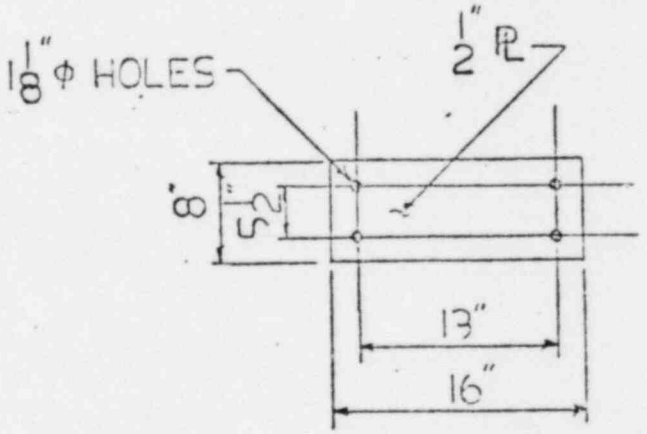


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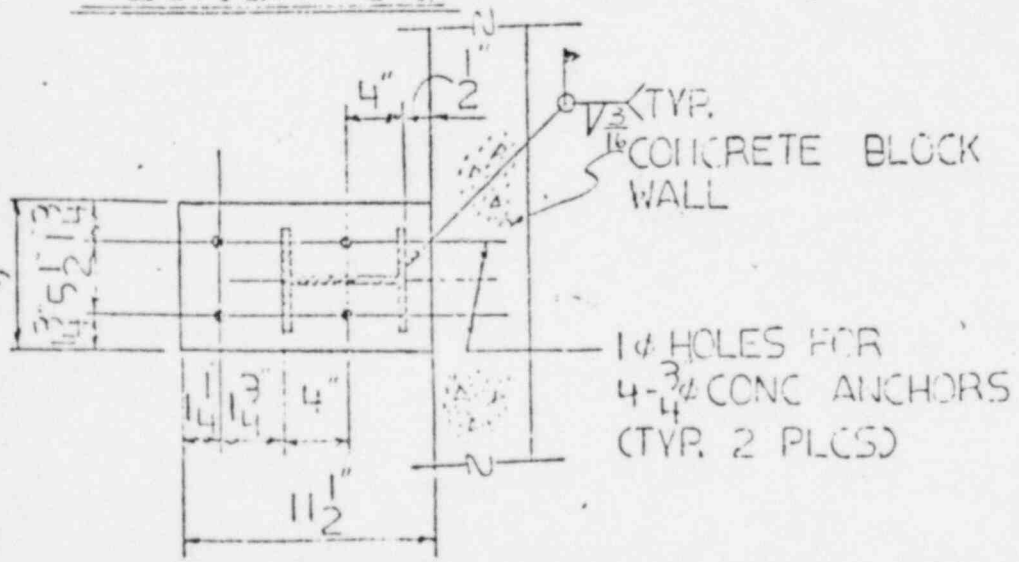
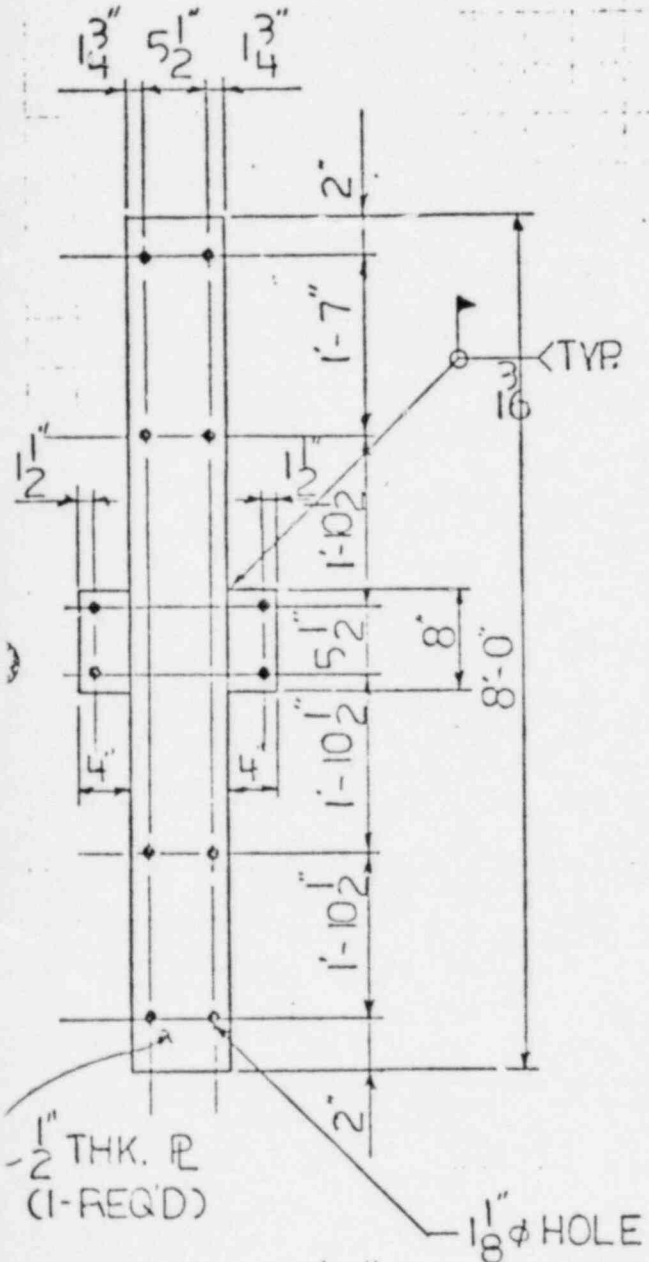
SECTION C-C




REF: H-12629

SECTION D-D

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SAISER | 11-12-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. WHITMORE | 11-21-80 |
| C-130-2A & 2B (PSOC-80-002) | **Calculation Number** | **Sheet** 7 of 7 |




DETAIL "C"

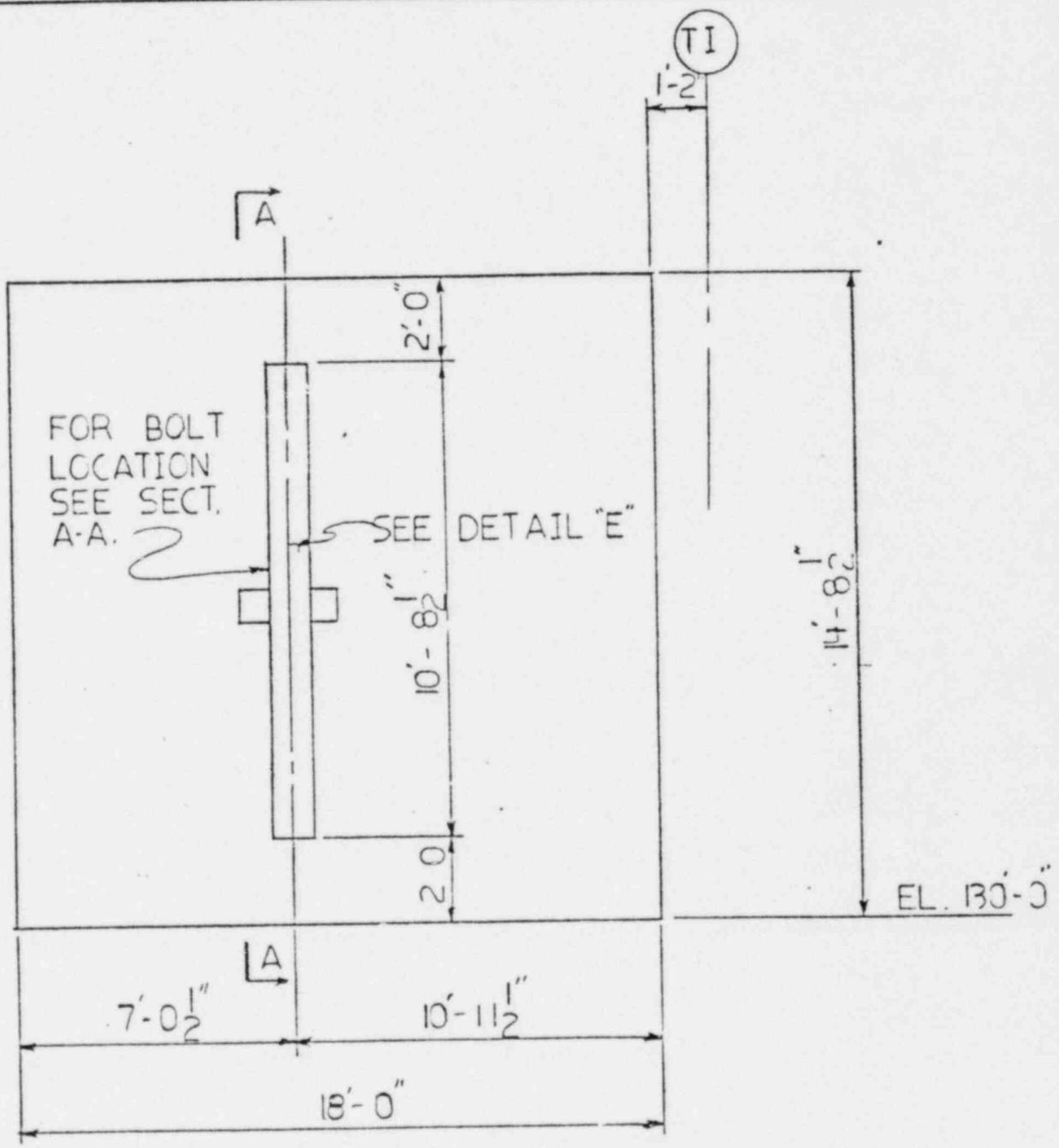
| | |
|---|---|
| 1 - W8 X 35 | LENGTH = 15'-8 3/4" |
| 1 - PLATE | 8" X 8'-0" X 1/2" |
| 2 - PLATES | 4" X 8" X 1/2" |
| 1 - PLATE | 8" X 16" X 1/2" |
| 4 - PLATES | 4" X 8" X 1/2" |
| 2 - PLATES | 9" X 11 1/2" X 1/2" |
| 8 - STIFFNER PLATES | 3 7/8" X 7 1/8" X 1/2" |
| 2 - W8 X 35 | 8" LONG |
| 12 - 7/8" ϕ BOLTS | 12" LONG (2 1/4" THD.) |
| 8 - 3/4" ϕ CONC. ANC. | HILTI CATALOG #5500108 OR EQ. |

NOTES

1) ALL STRUCTURAL STEEL SHALL BE ASTM A36.
2) ALL STRUCTURAL STEEL IS TO BE QUALITY CLASS "D".
3) ALL BOLTS ARE TO BE ASTM A307.

REF: H-12679

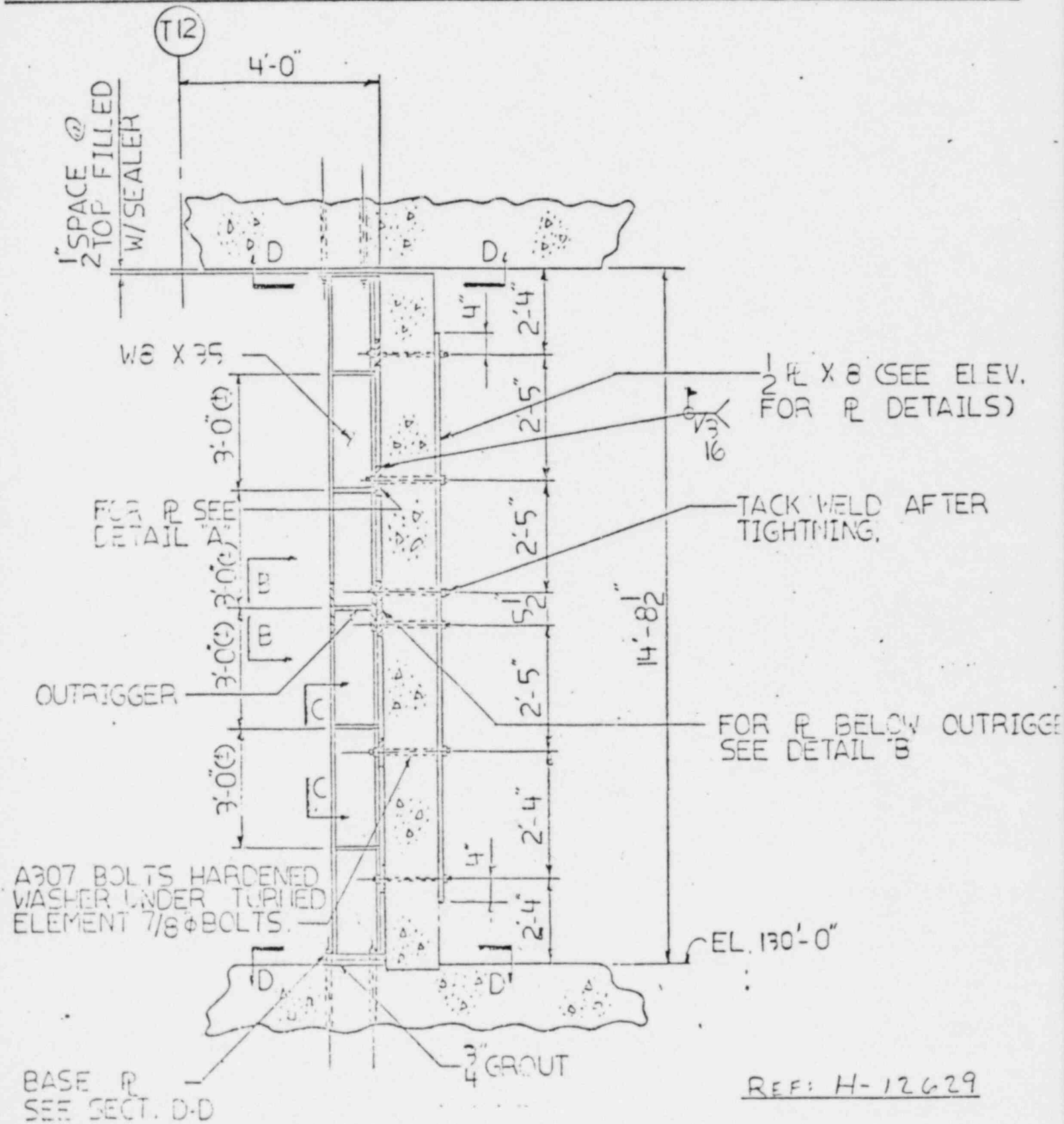
| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 11-19-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. [illegible] | 11-21-80 |
| C-130-3A & 3B (PSCC-80-003) | Calculation Number | Sheet 5 of 9 |




WALL 3B
(ELEV. LOCKING SOUTH)

130 FLR.
REF. H-12629

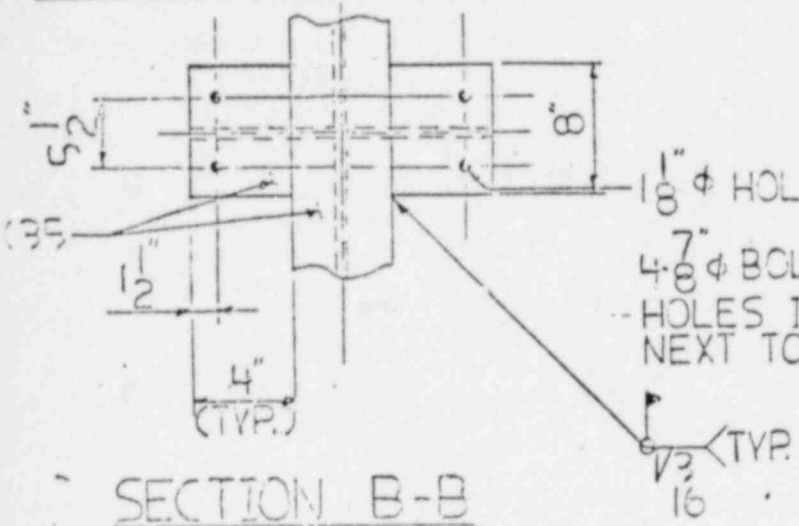
| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT NO. 1 & 2 | TINA C. SAISER | 11-19-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. W[illegible] | 11-21-80 |
| C-130-3A & 3B (PSOC-80-003) | Calculation Number | Sheet 6 of 9 |



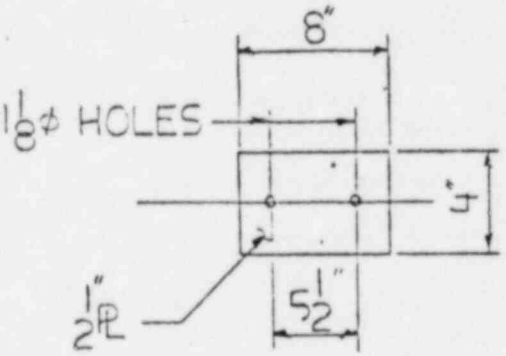

REF: H-12629

SECTION A-A

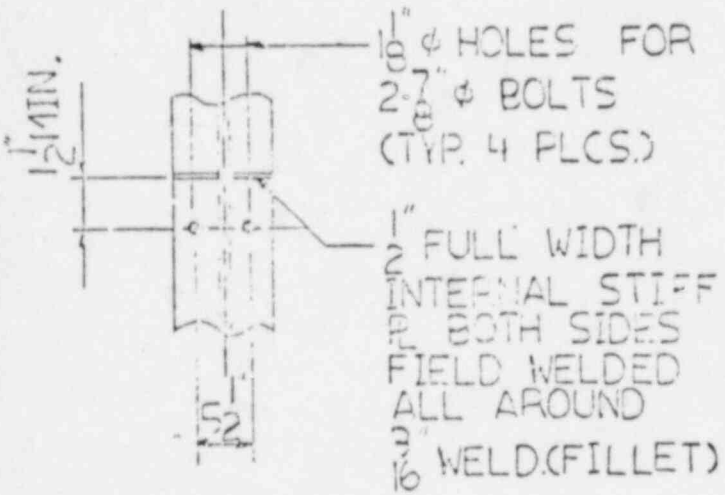
| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT NO. 1 & 2 | TINA C SALSER | 11-19-80 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATIONS | K. L. W[illegible] | 11-21-80 |
| C-130-3A & 3B (PSOC-80-003) | Calculation Number | Sheet 7 of 9 |

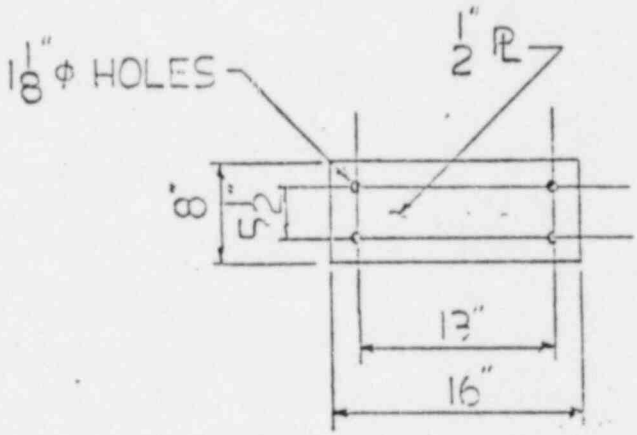



SECTION B-B



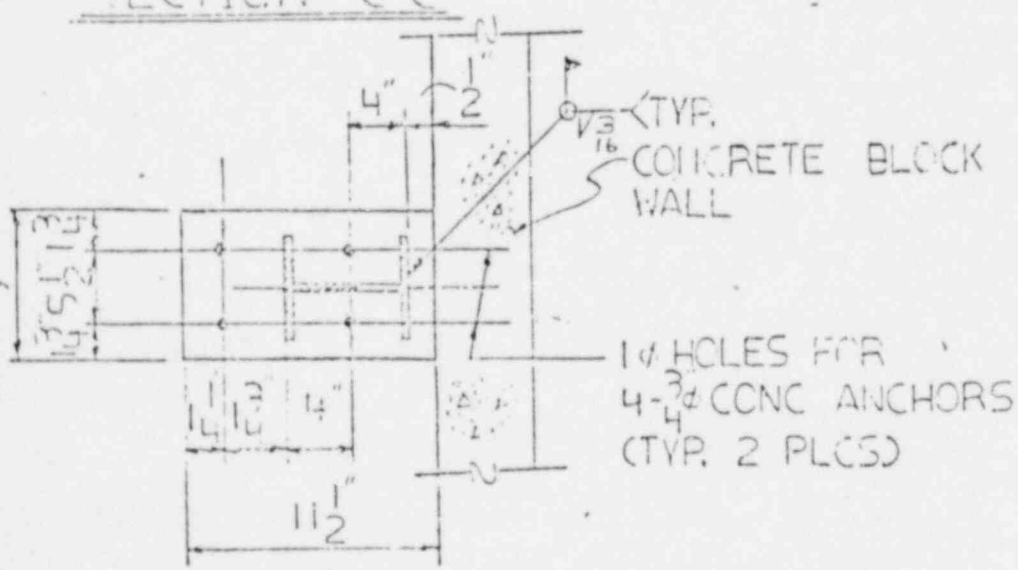

DETAIL "A"




DETAIL "B"

SECTION C-C



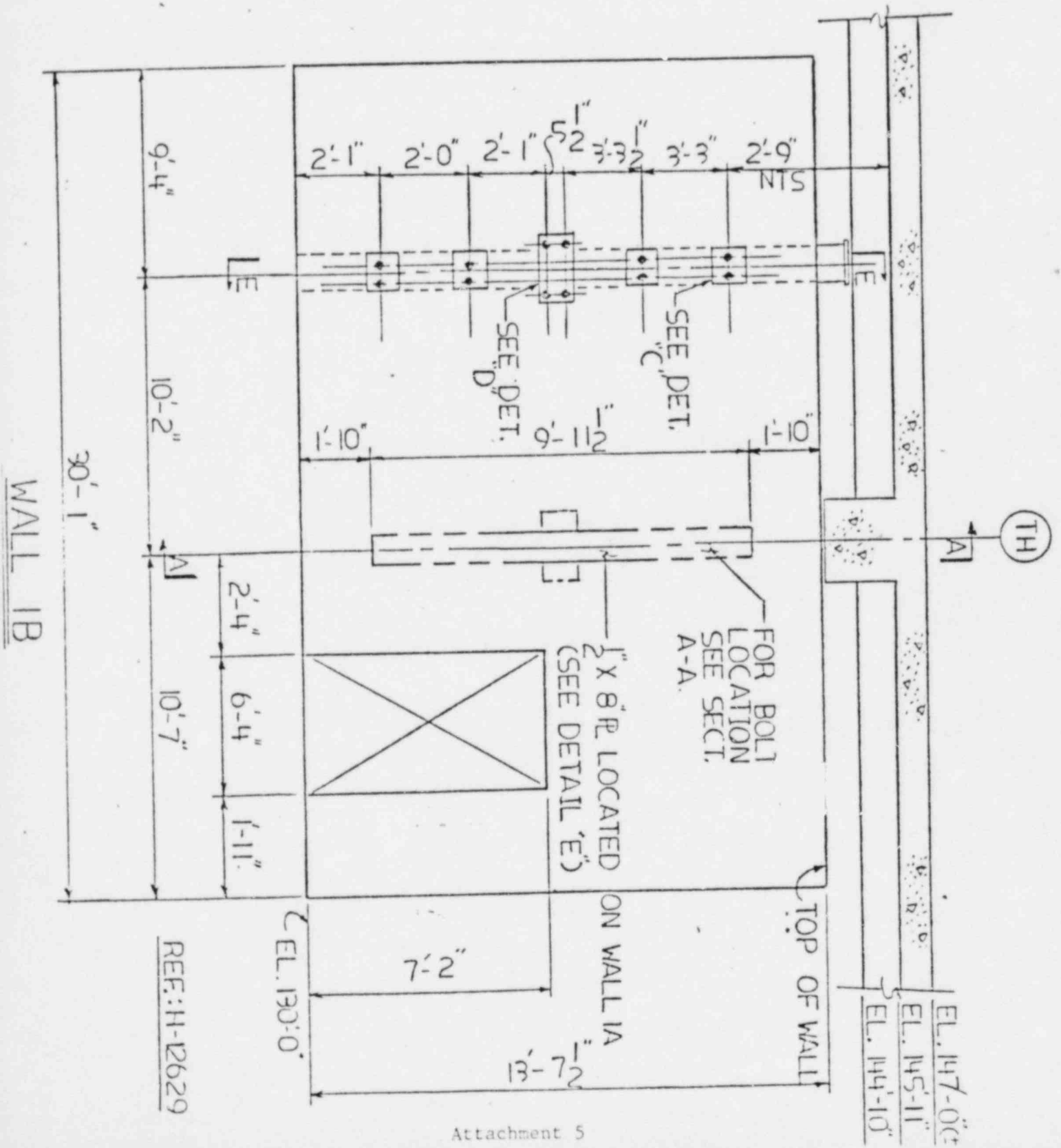

SECTION D-D

Ref: H-12629

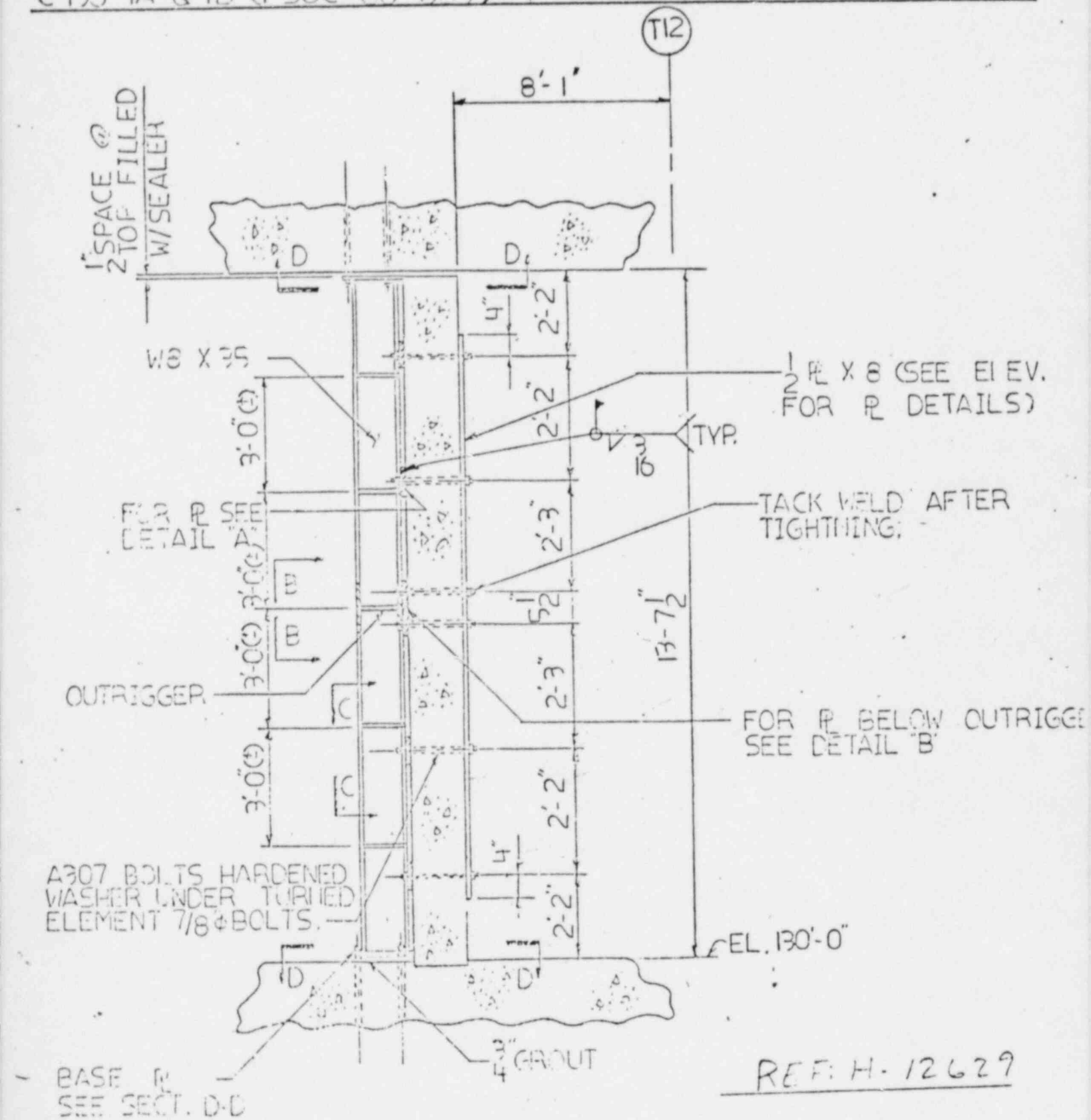
Design Calculations

Southern Company Services

| | | |
|---|---|---|
| Project: HATCH-UNIT NO. 1&2 | Prepared By: TINA C. SALSER | Date: 12-9-80 |
| Subject/Title: WALL MODIFICATION | Reviewed By: K. L. WHITMORE | Date: 12-10-80 |
| C-130-1A & 1B (PSOC-EO-009) | Calculation Number | Sheet: 1 of 6 |



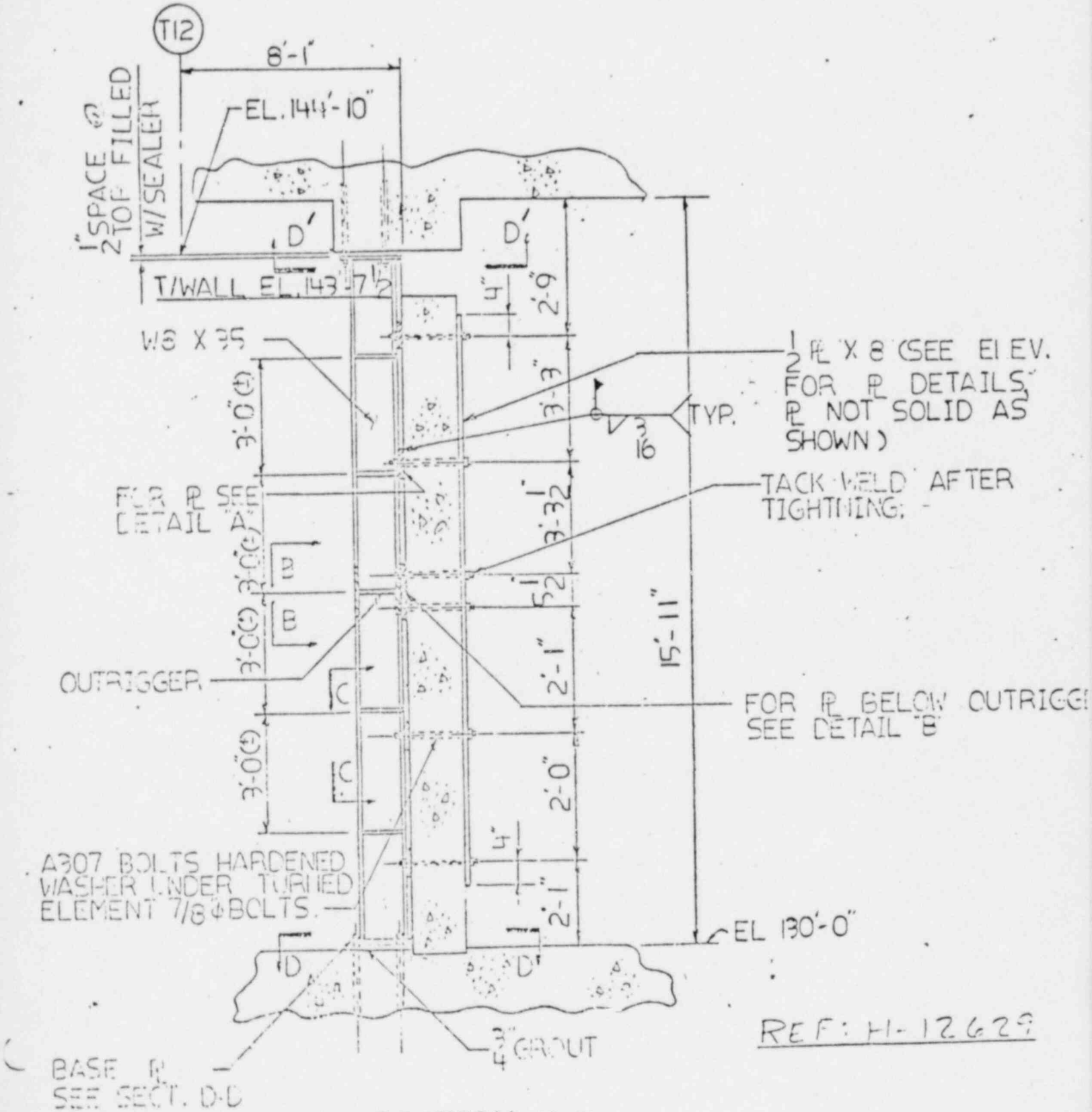
| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT NO. 1 & 2 | TINA C. SAISER | 12-9-80 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | K. L. W[illegible] | 12-10-80 |
| C-130-1A & 1B (PSOC-80-009) | Calculation Number | Sheet 2 of 6 |




REF: H-12629

SECTION A-A

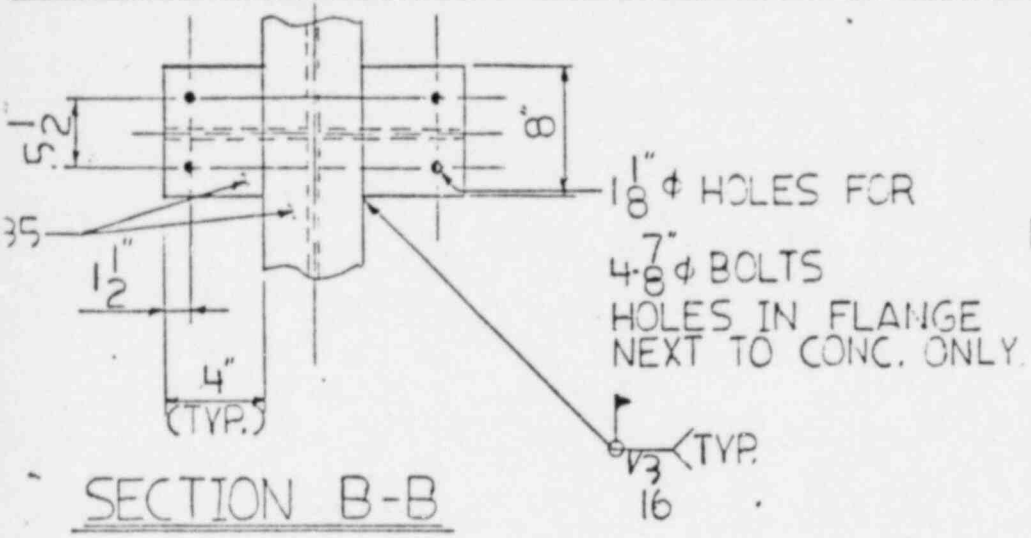
| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT NO. 1 & 2 | TINA C. SAISER | 12-9-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. WHITMORE | 12-10-80 |
| C-130-1A & 1B(PSOC-80-009) | Calculation Number | Sheet 3 of 6 |



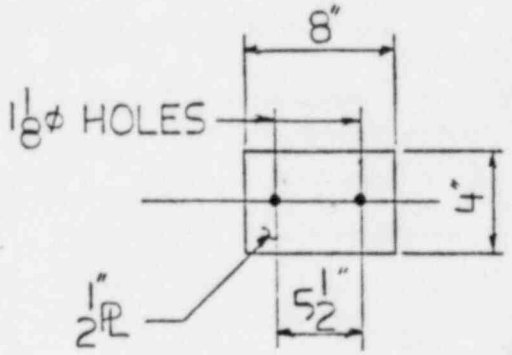

REF: HI-12629

SECTION E-E

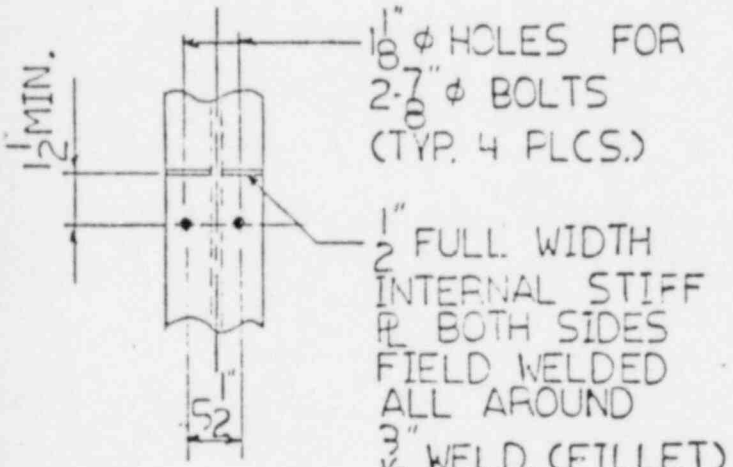
| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT. NO. 1 & 2 | TINA C. SAISER | 12-9-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATIONS | K. L. [illegible] | 12-10-80 |
| C-130-1A & 1B (PSOC-80-009) | **Calculation Number** | **Sheet** 4 of 6 |

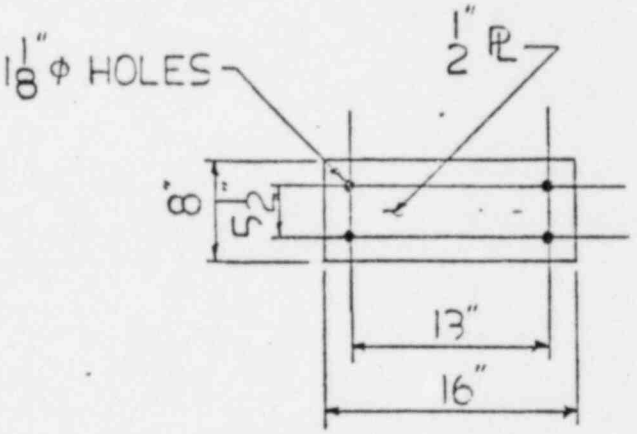



SECTION B-B



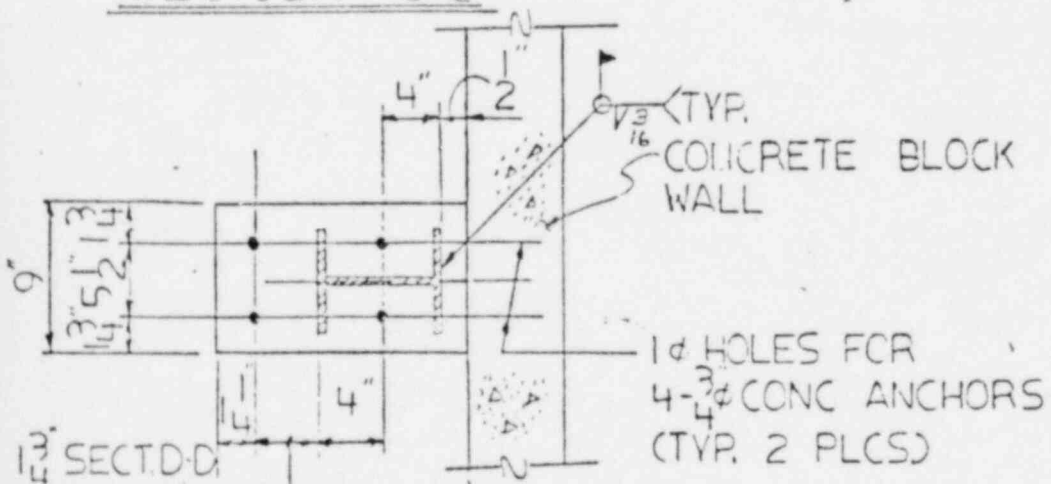

DETAIL "A"




DETAIL "B"

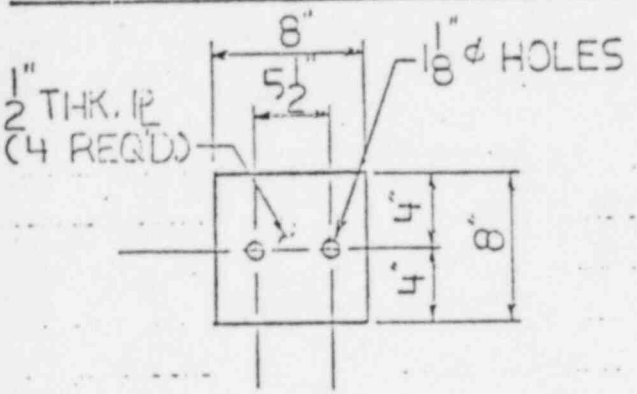
SECTION C-C



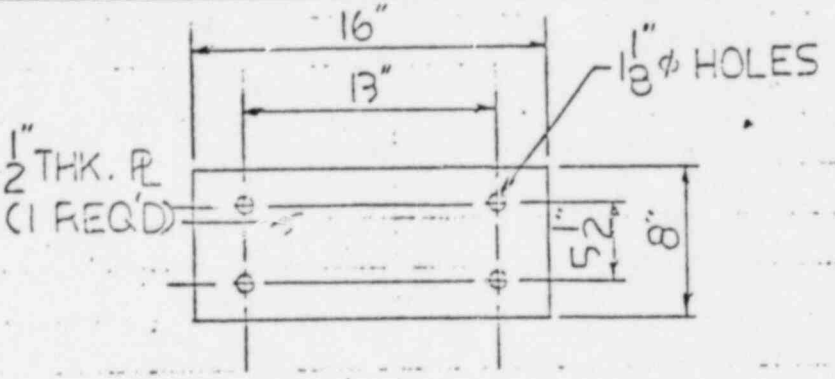

SECTION D-D

REF: H-12629

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 12-9-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. [illegible] | 12-10-80 |
| C-130-1A & 1B (PSOC-80-009) | **Calculation Number** | **Sheet** 5 of 6 |



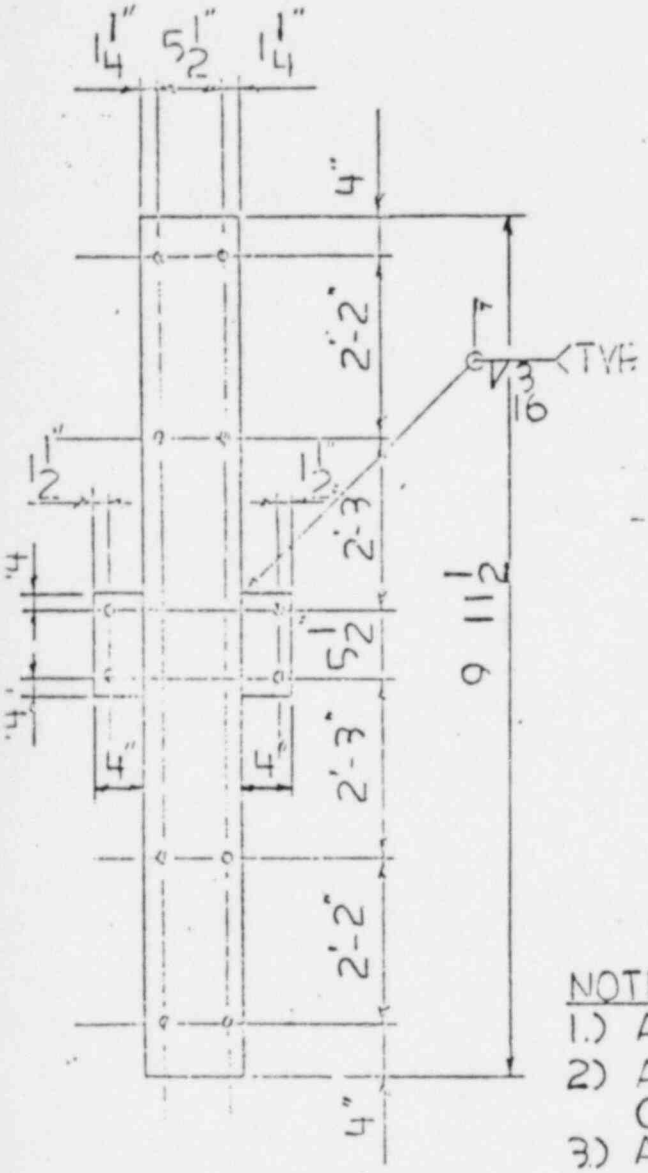

DETAIL "C"




DETAIL "D"

REF: H-12629

| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT NO. 1 & 2 | TINA C. SALSER | 12-9-80 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | K. L. [illegible] | 12-10-80 |
| C-130-1A & 1B (PSOC-80-009) | Calculation Number | Sheet 1 of 6 |




DETAIL "E"

| | |
|---|---|
| 1 - W8 X 35 | LENGTH 13'-5 1/4" |
| 4 - PLATES | 8" X 8" X 1/2" |
| 3 - PLATES | 8" X 16" X 1/2" |
| 1 - PLATE | 8" X 9'-11 1/2" X 1/2" |
| 10 - PLATES | 4" X 8" X 1/2" |
| 16 - STIFFNER PL'S | 3 7/8" X 7 1/8" X 1/2" |
| 4 - W8 X 35 | 8" LONG |
| 3 - PLATES | 9" X 11 1/2" X 1/2" |
| 24 - 7/8" ϕ BOLTS | 12" LONG |
| 16 - 3/4" ϕ CONC. ANC. | HILTI CATALOG #5500103 OR EQ. |
| 1 W8 X 35 | LENGTH 14'-7 3/4" |
| 1 PLATE | 9" X 10 3/4" X 1/2" |

NOTES:

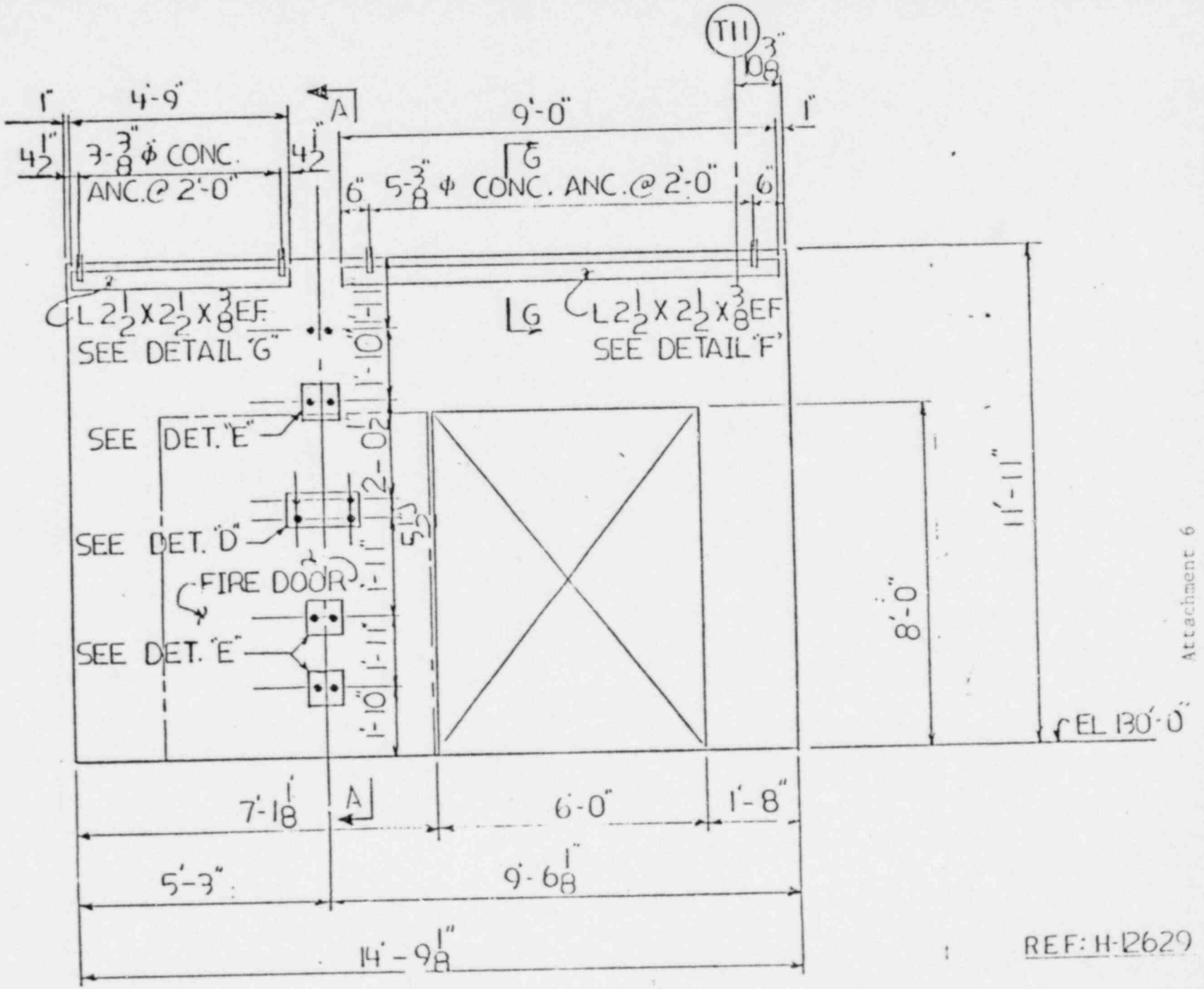
1.) ALL STRUCTURAL STEEL SHALL BE ASTM-A36
2) ALL STRUCTURAL STEEL IS TO BE QUALITY CLASS "D"
3) ALL BOLTS ARE TO BE ASTM-A307.

REF: H-12629

Southern Company Services

Design Calculations

| | | | |
|---|---|---|---|
| Project: HATCH - UNIT NO. 1 & 2 | Prepared By: TINA C. SALSER | Date: 12-1-80 | |
| Subject/Title: WALL MODIFICATION | Reviewed By: K. L. Williams | Date: 12-8-80 | |
| C-130-14A & 14B (PSOC-80-004) | Calculation Number | Sheet: 6 of 11 | |




WALL 14B

ELEV. LOOKING EAST

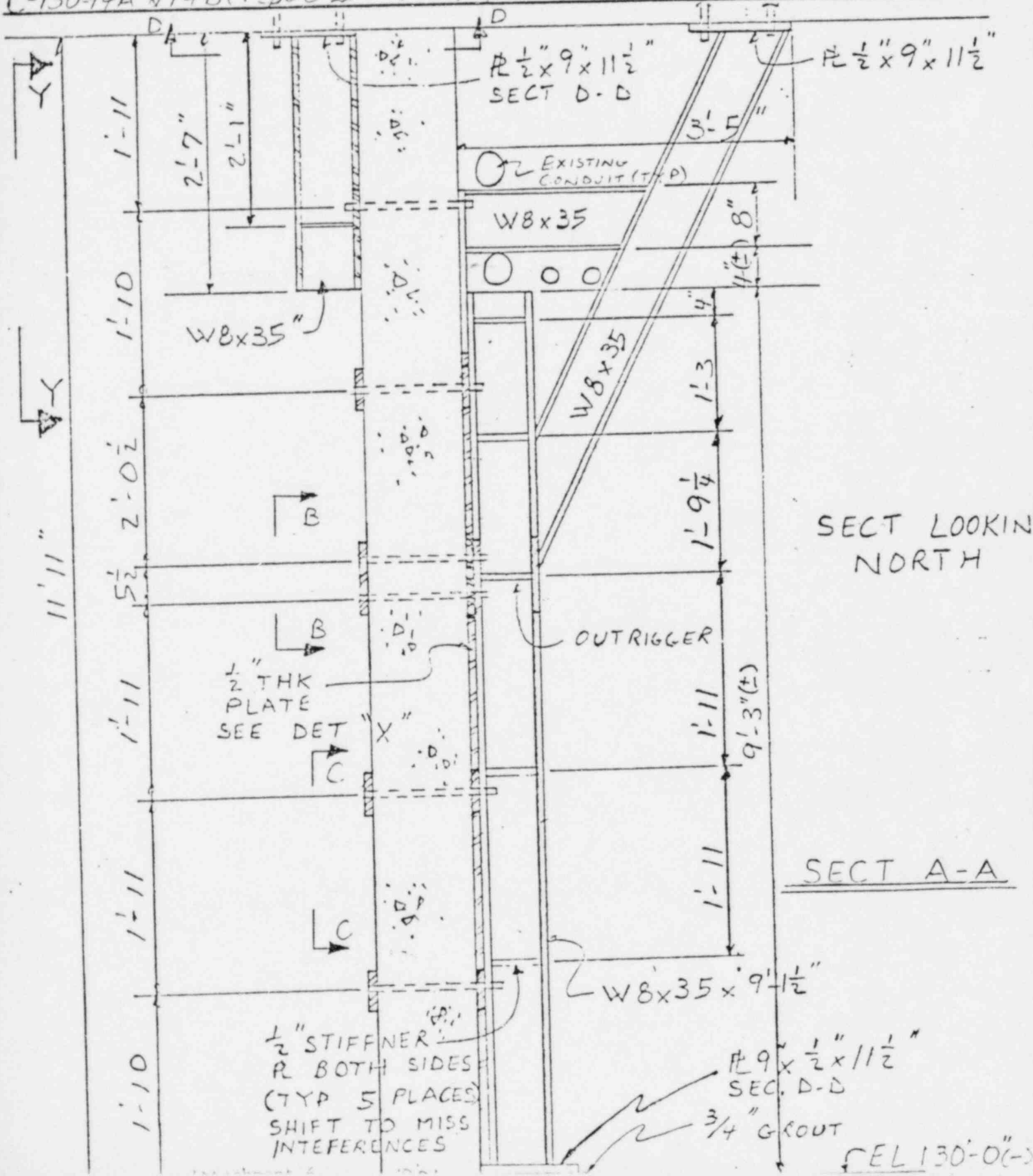
REF: H-2629

Attachment 6

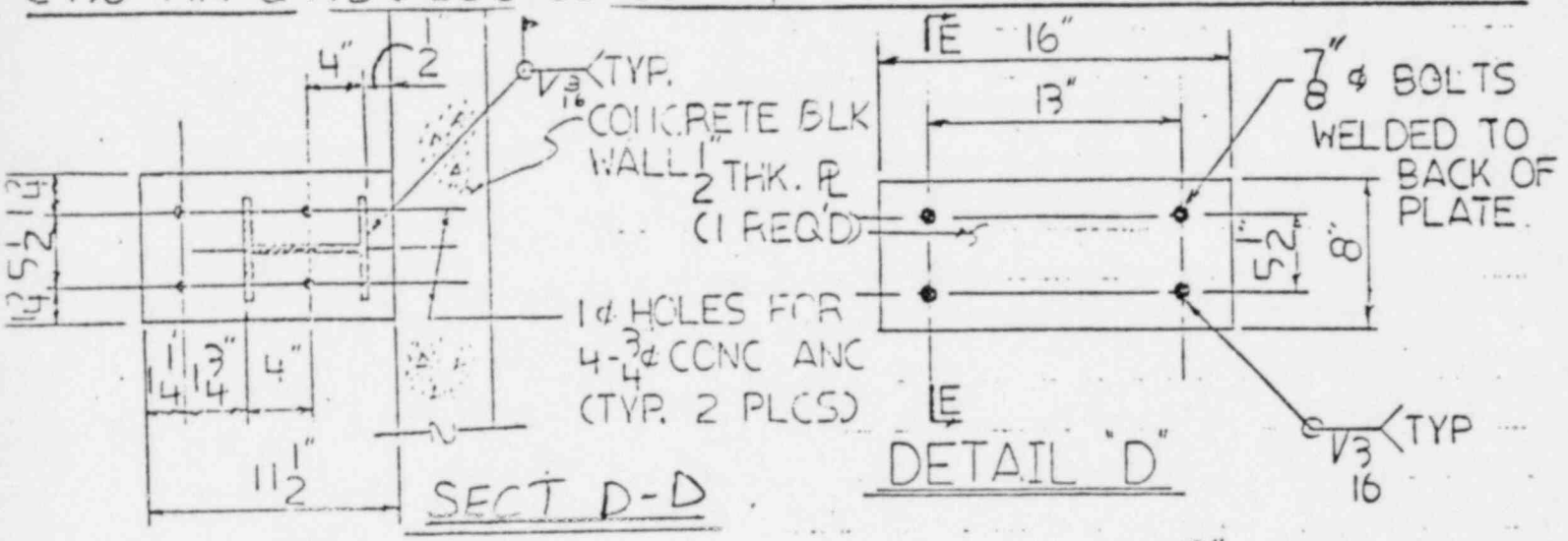
Design Calculations

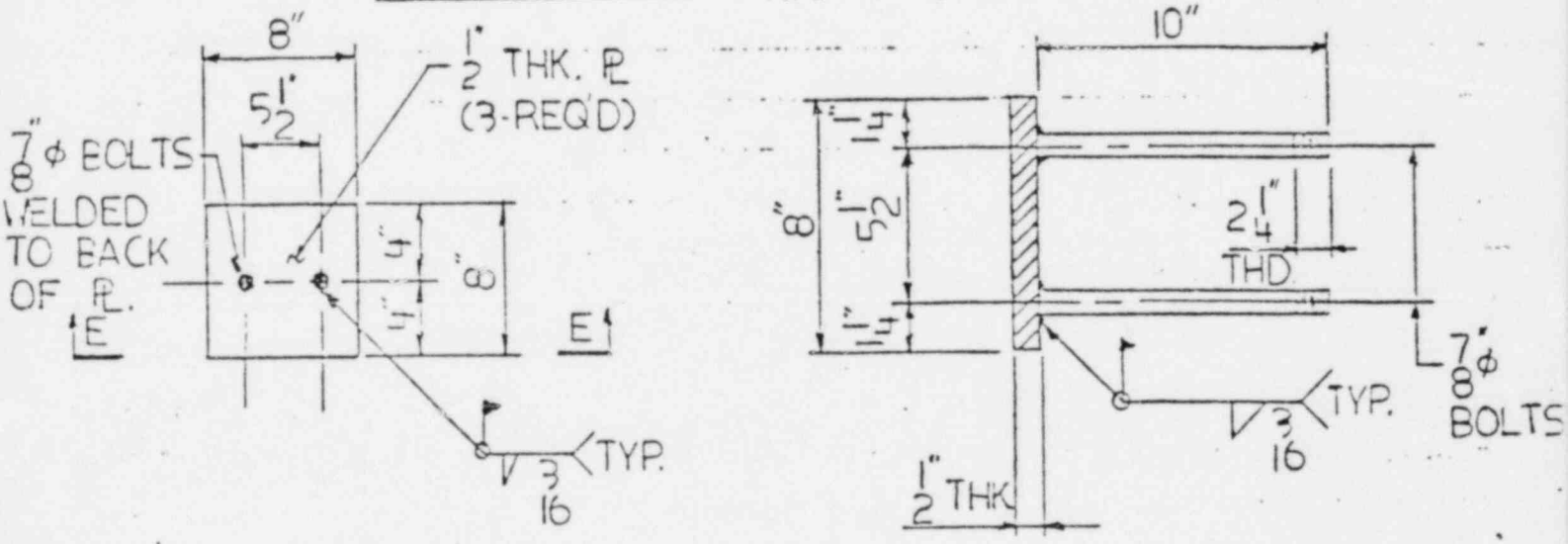
Southern Company Services

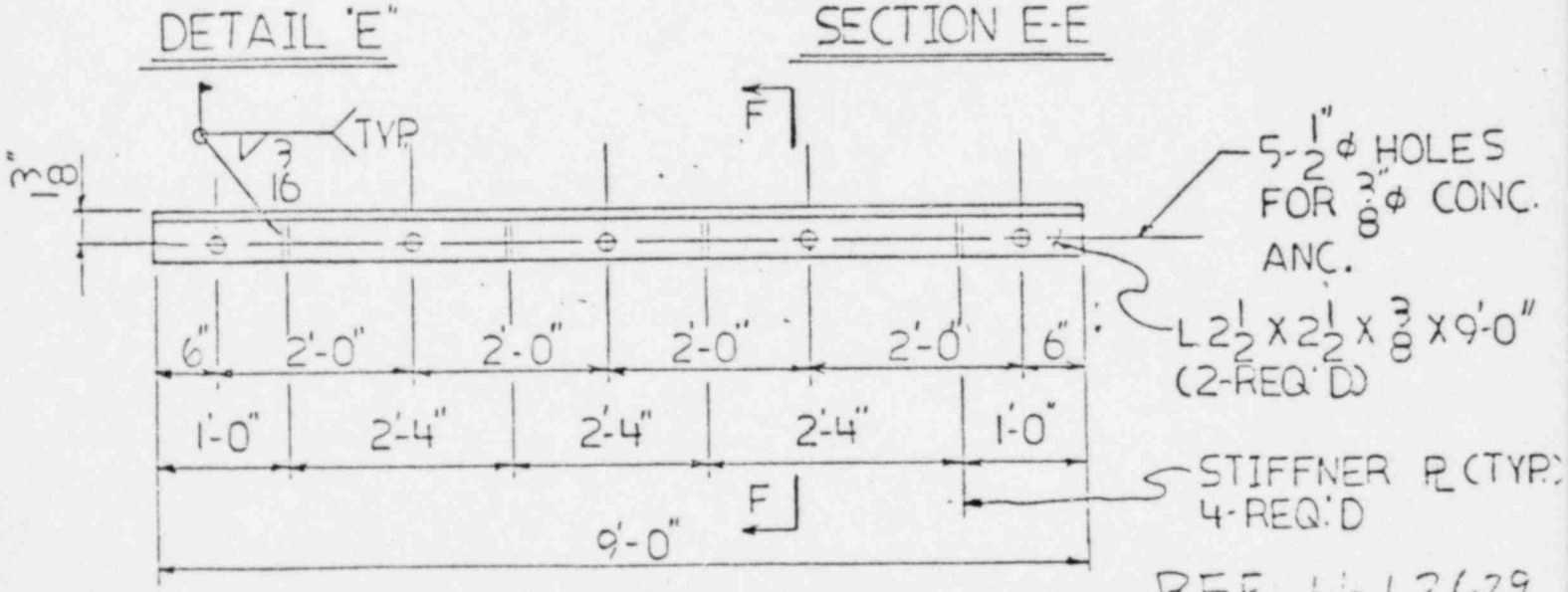
| | | |
|---|---|---|
| Project: HATCH - UNIT NO. 1 & 2 | Prepared By: CHURCH | Date: 12-28-81 |
| Subject/Title: WALL MODIFICATION | Reviewed By: K. L. WHITMORE | Date: 12-29-81 |
| C-130-14A & 14B (PSOC-80-004) | Calculation Number | Sheet: A of |



| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 12-1-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. WHITMIRE | 12-5-80 |
| C-130-14A & 14B (PSOC-80-004) | **Calculation Number** | **Sheet** 9 of 11 |

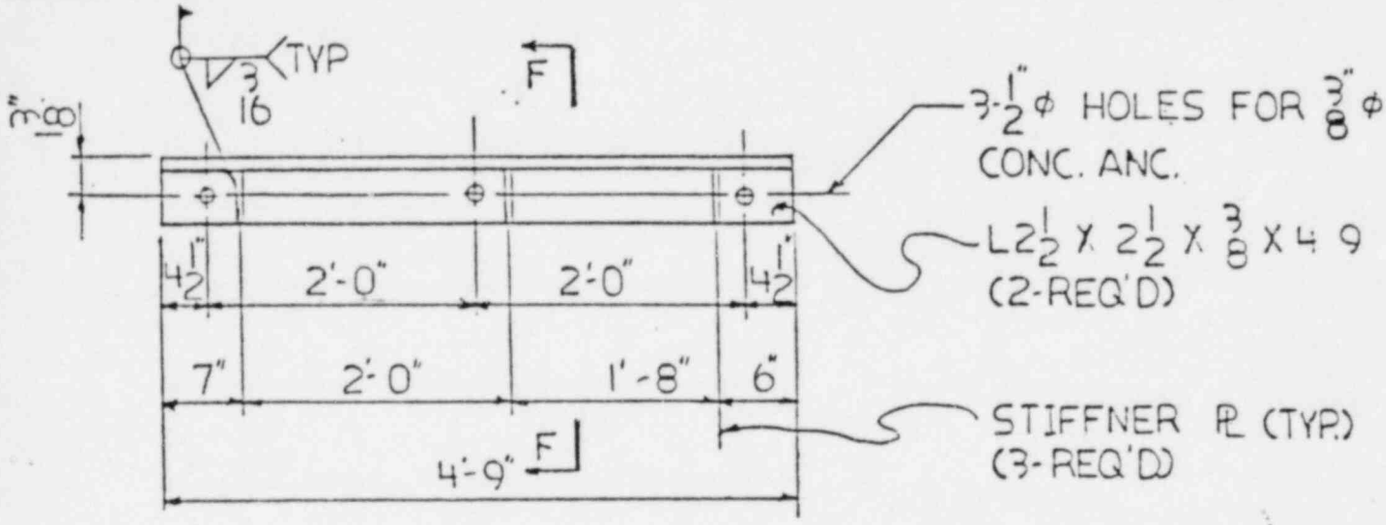


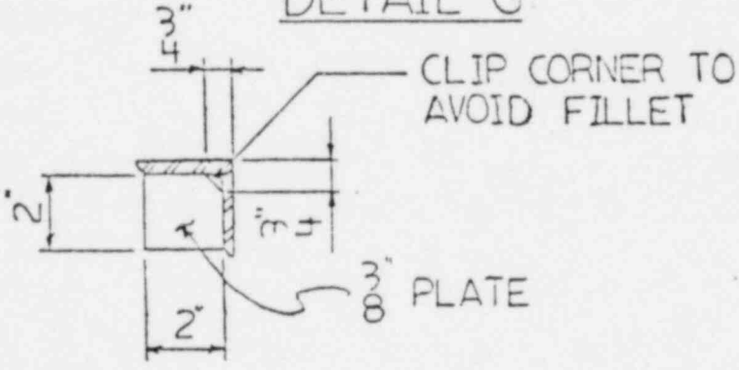




REF. H-12629

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 12-8-90 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | K. L. WHITAKER | 12-8-90 |
| C-130-14A & 14B (PSOC-80-0044) | Calculation Number | Sheet 11 of 11 |

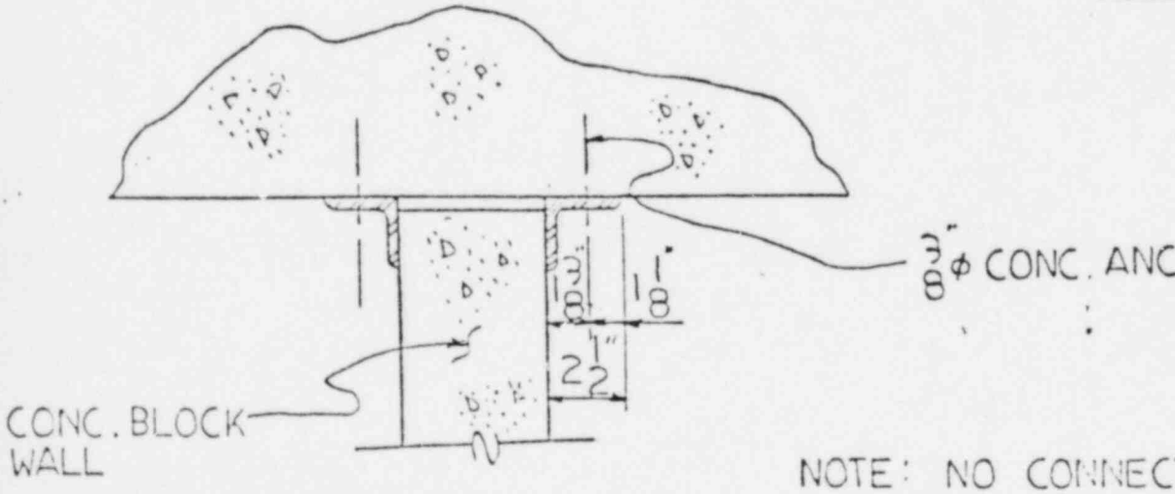



DETAIL "G"




SECTION F-F

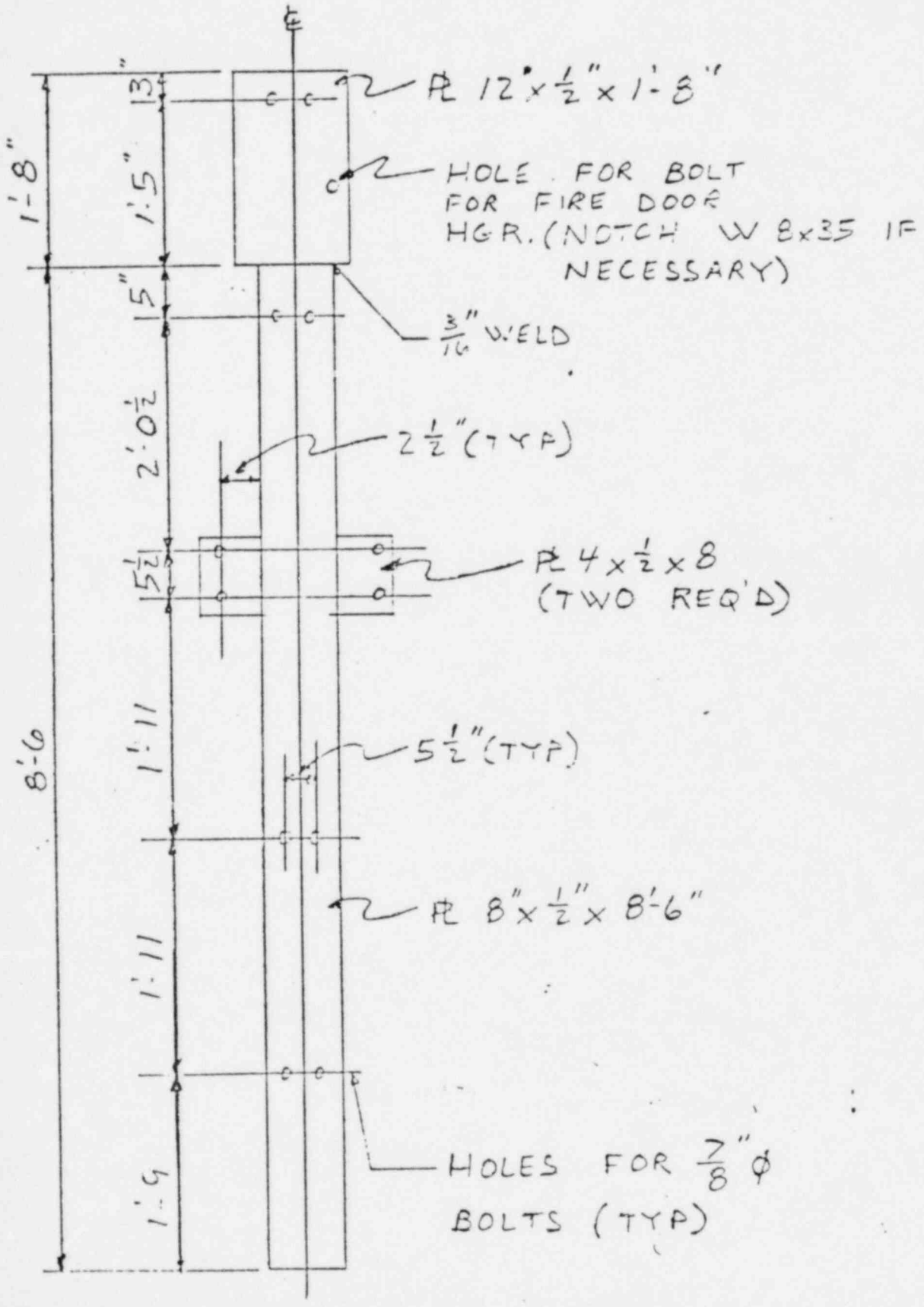
REF: H-12629




SECTION G-G

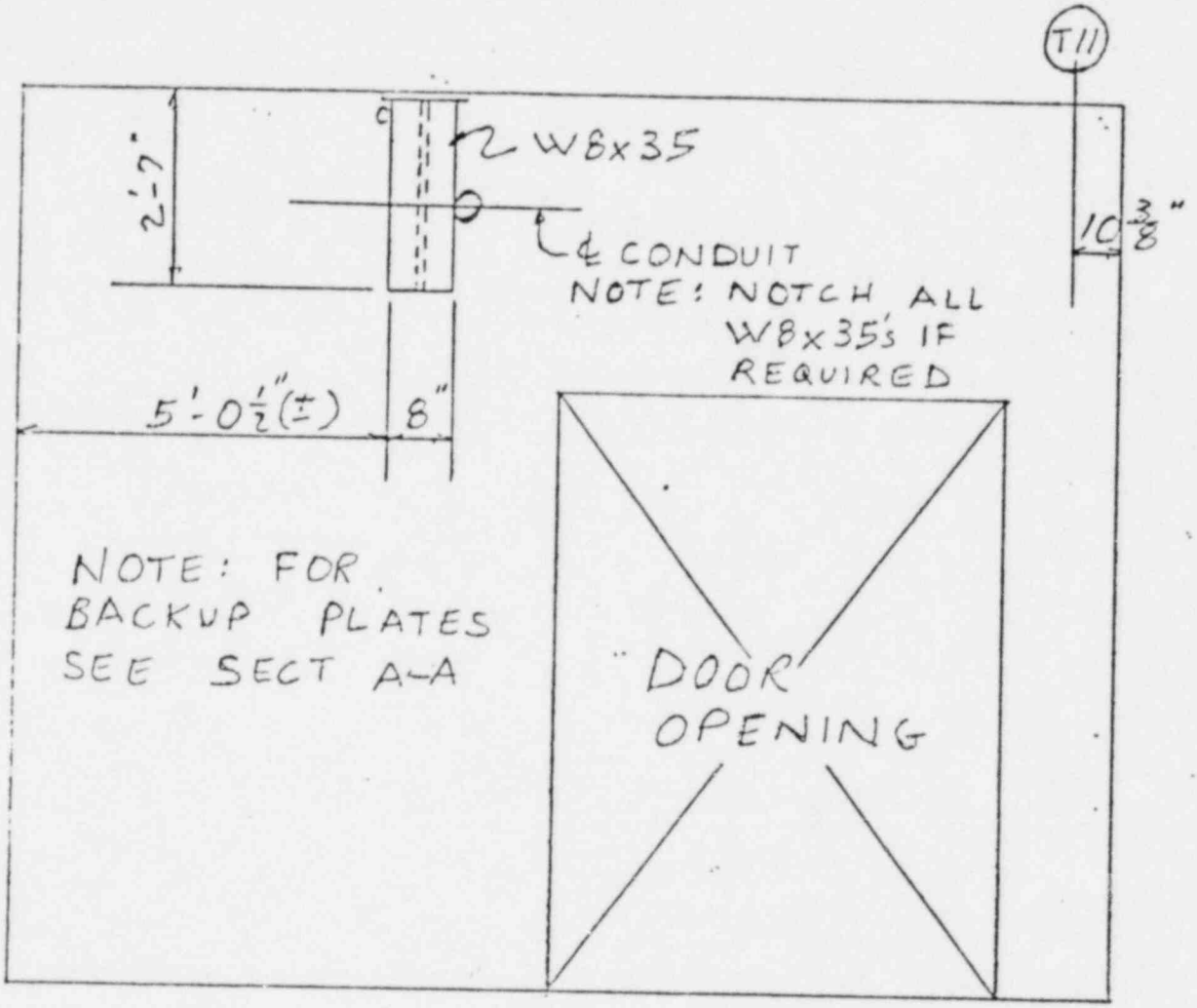
NOTE: NO CONNECTION BETWEEN ANGLE AND WALL.

| Project | Prepared By | Date |
|---|---|---|
| HATCH- UNIT NO 1 & 2 | R CHURCH | 12-28-81 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K L WHITMORE | 12-29-81 |
| C-130-14A & 14B (PSOC-80-004) | Calculation Number | Sheet 12 of |



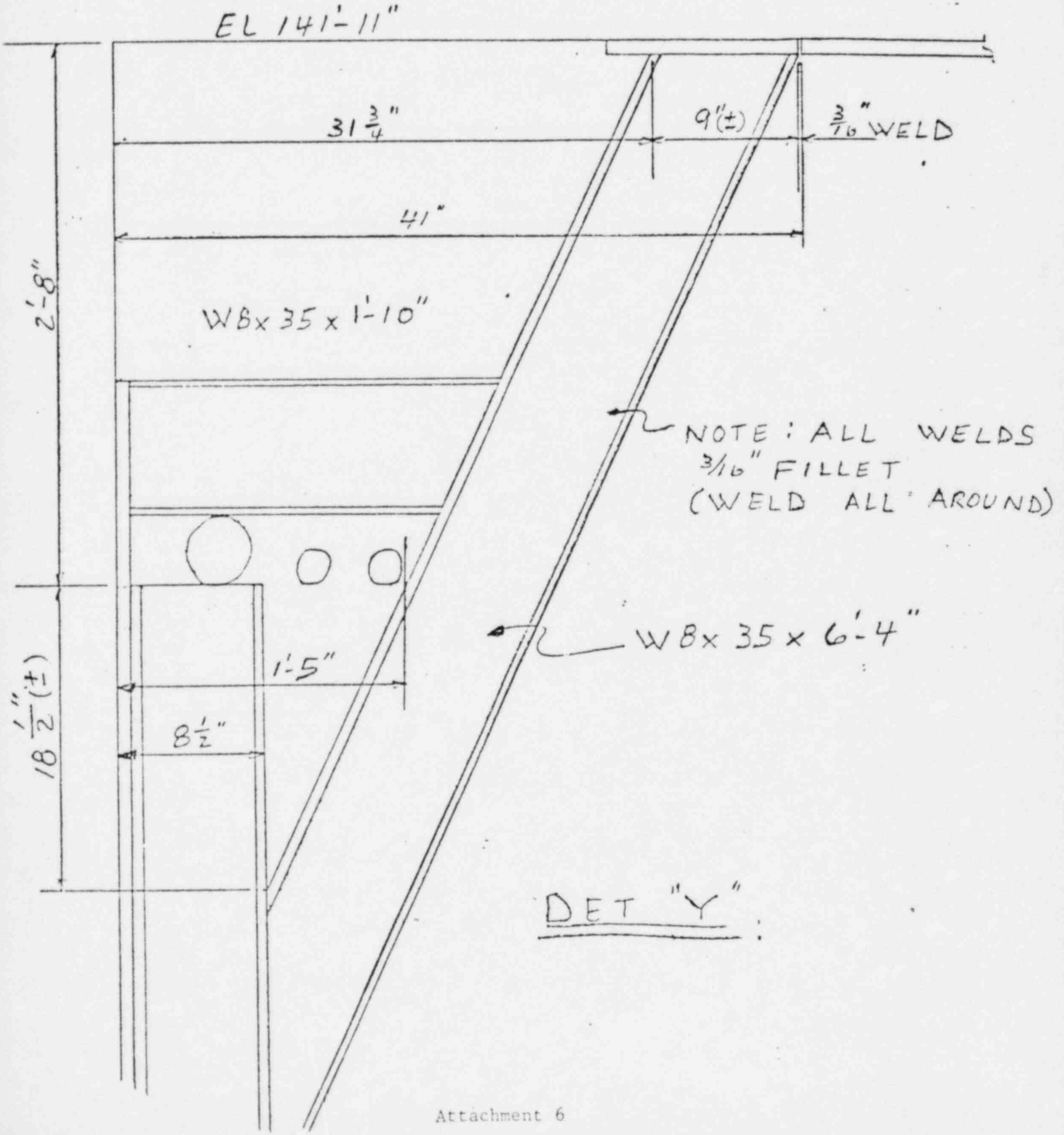

DFT V

| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT NO 1 & 2 | R. CHURCH | 12-28-81 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | K L WHITMORE | 12-29-81 |
| C-130-14A&14B (PSOC-80-004) | Calculation Number | Sheet 6 of |



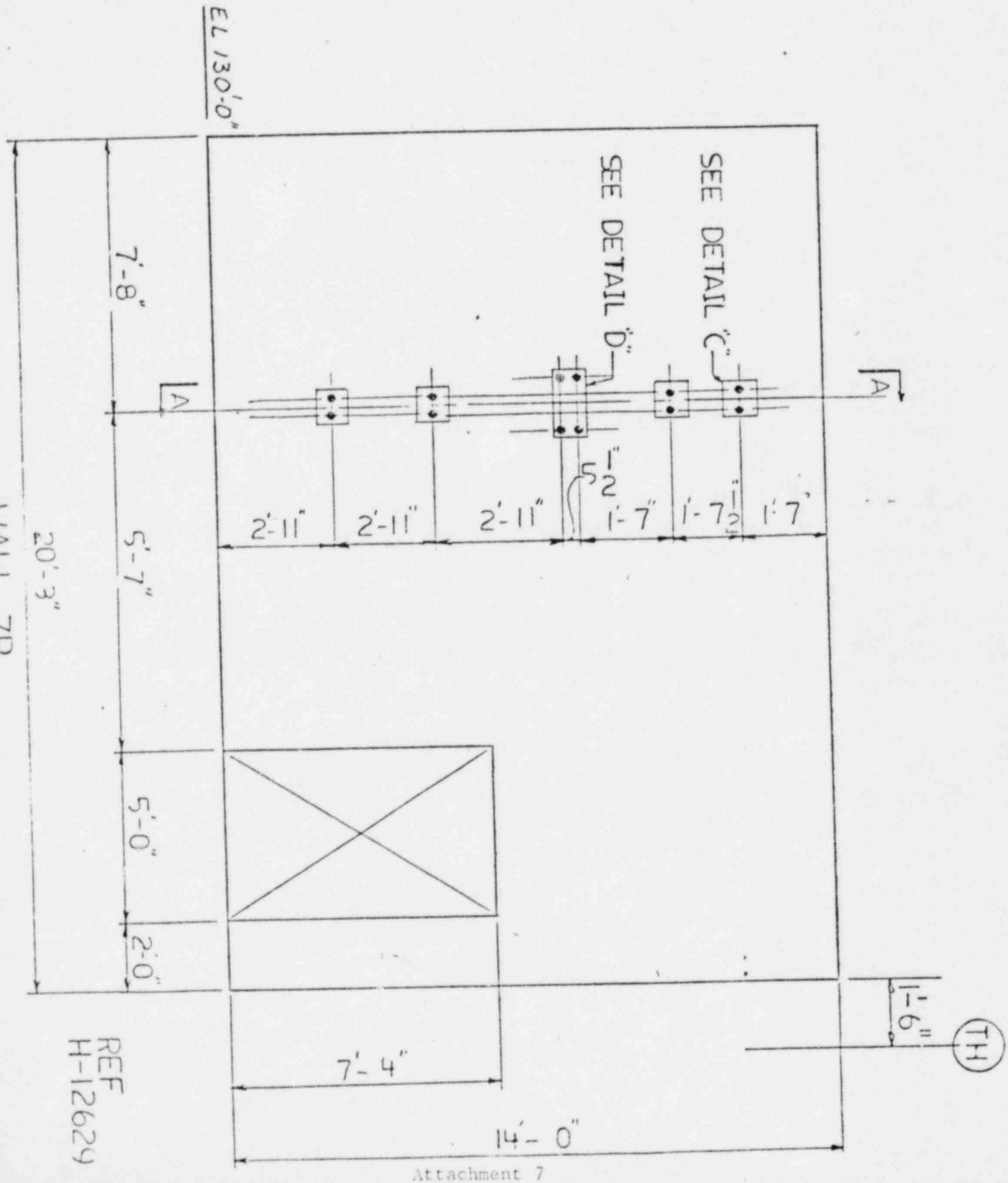

SECT Y-Y

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1&2 | E. CHURCH | 12-28-81 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. WHITMORE | 12-29-81 |
| C-130-14A&14B (PSOC-80-004) | **Calculation Number** | **Sheet** D of |

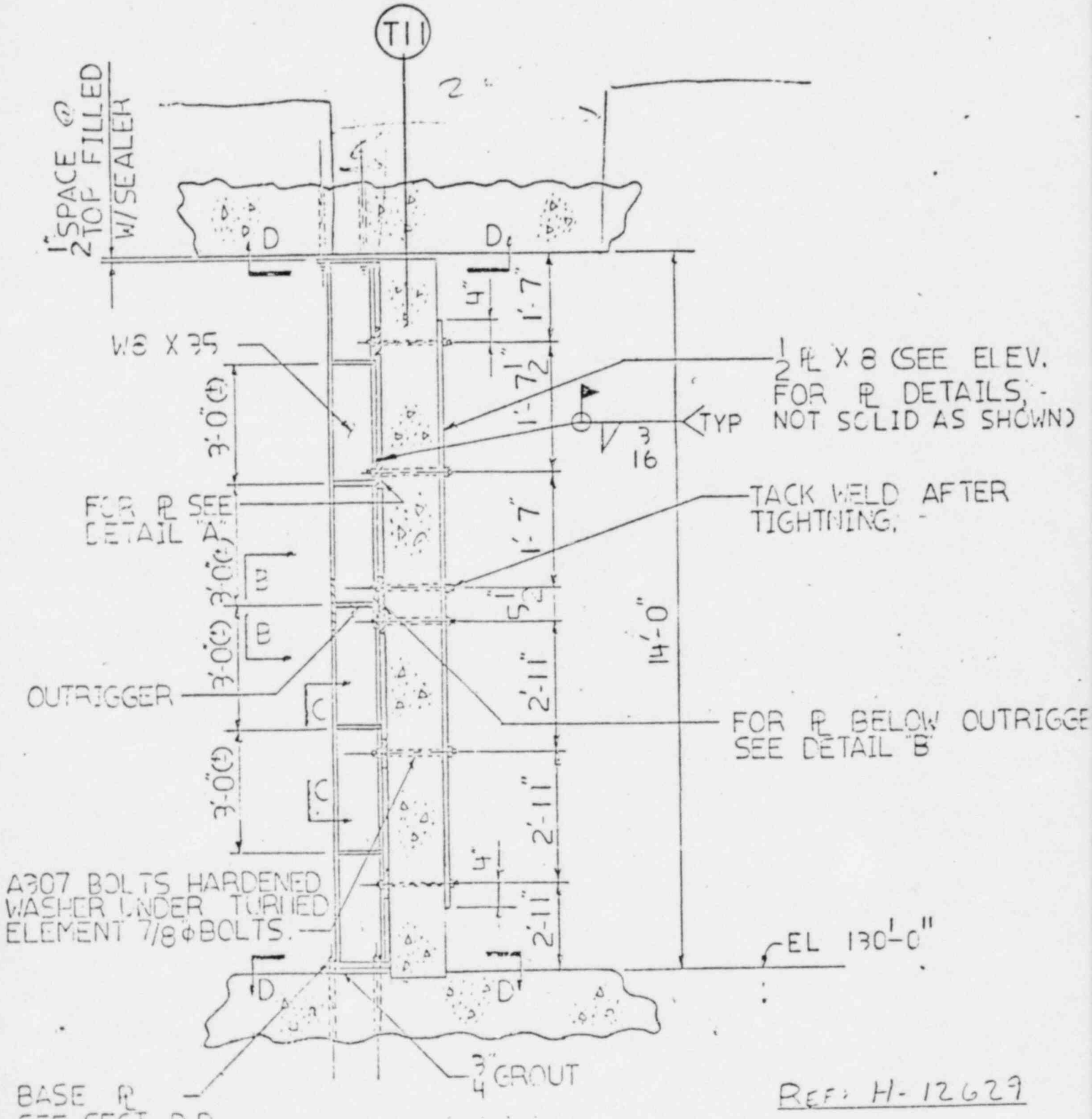



DET "Y"

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 11-21-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. WHITMORE | 11-25-80 |
| C-130-7A & 7B (PSOC-80-007) | Calculation Number | Sheet 3 of 8 |



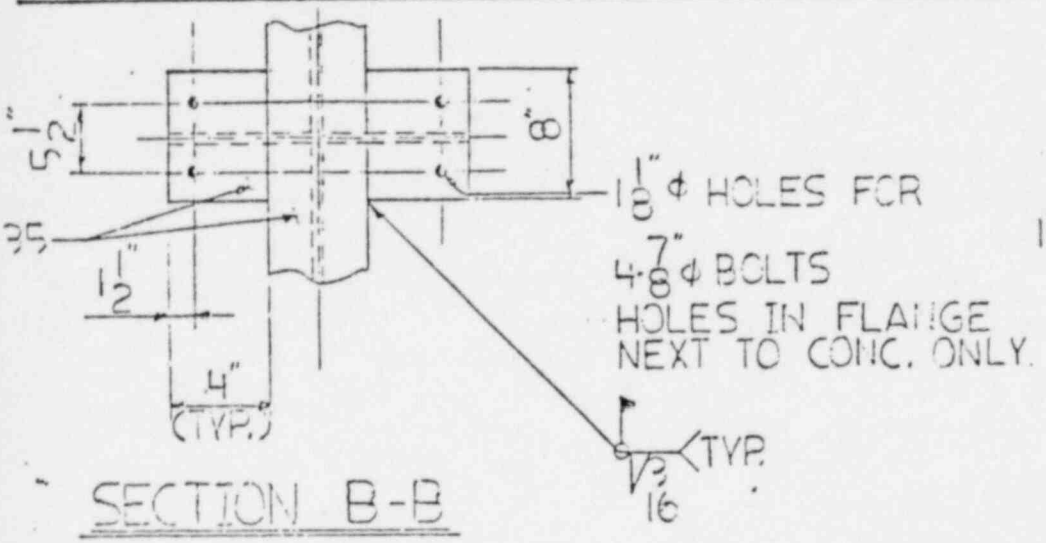
| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT 1D, 1&2 | TINA C. SALSER | 11-21-80 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | K.L. WHITMORE | 11-25-80 |
| C-130-7A & 7B (PSOC-80-007) | Calculation Number | Sheet 4 of 8 |



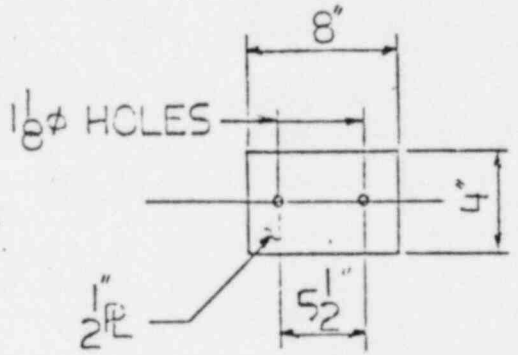

REF: H-12629

SECTION A-A

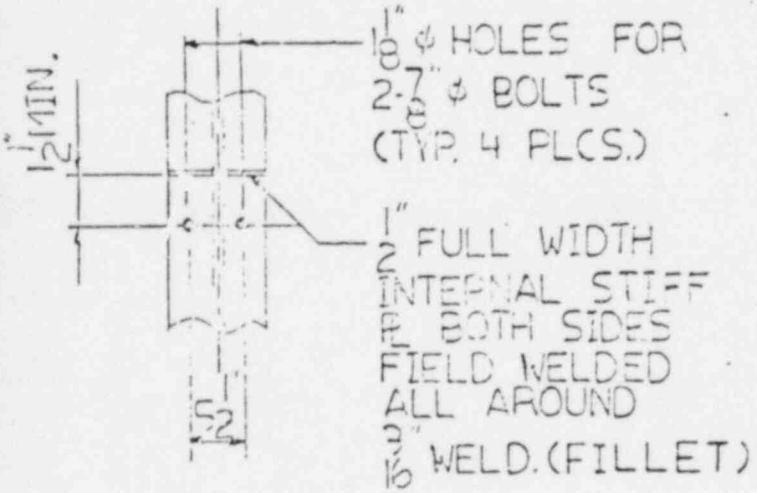
| Project | Prepared By | Date |
|---|---|---|
| HATCH- UNIT NO. 1 & 2 | TINA C. SALTER | 11-21-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATIONS | K. L. WHITMORE | 11-25-80 |
| C-130-7A & 7B (PSOC-80-007) | **Calculation Number** | **Sheet** 5 of 8 |

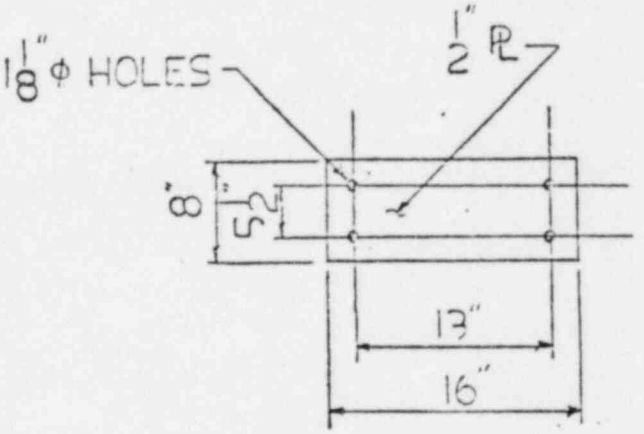



SECTION B-B



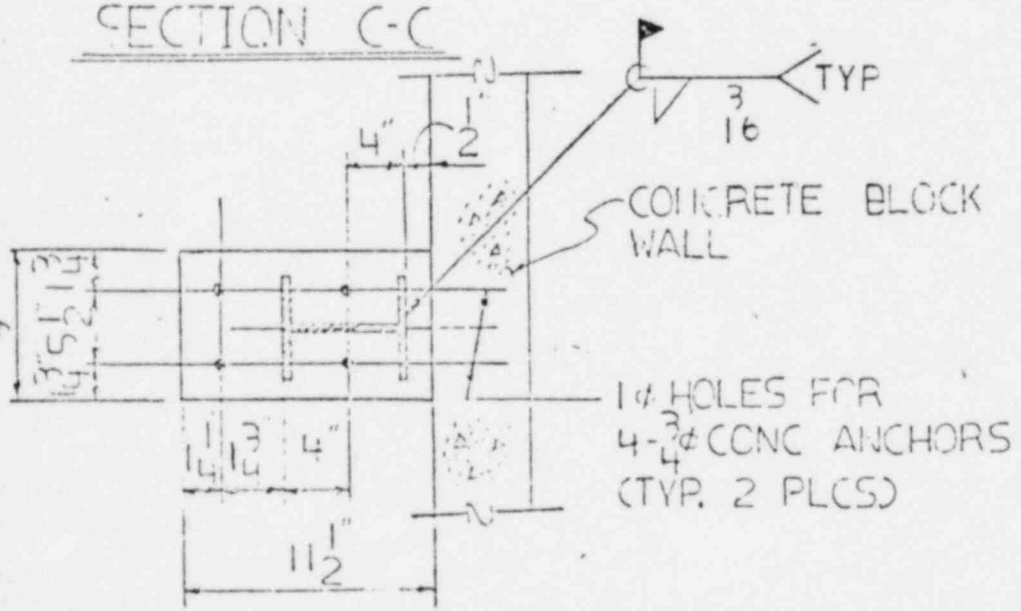

DETAIL "A"




DETAIL "B"

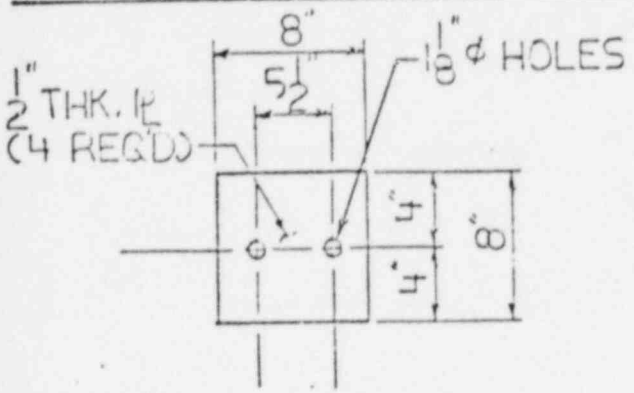
SECTION C-C



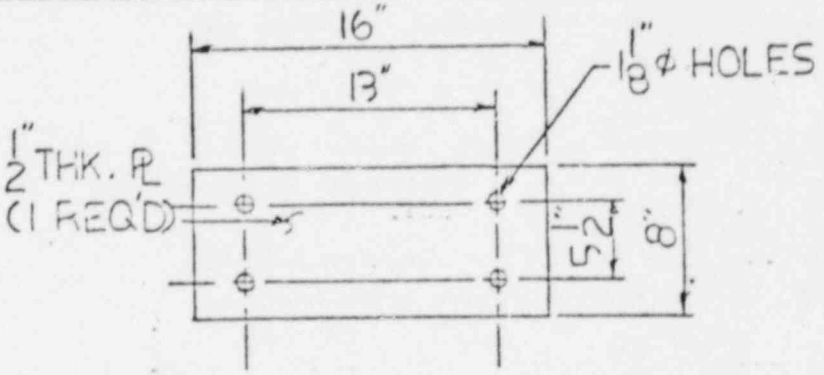

REF: H-12629

SECTION D-D

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 11-21-80 |
| Subject/Title | Reviewed By | Date |
| WALL MODIFICATION | K. L. WHITMORE | 11-25-80 |
| C-130-7A & 7B (FSOC-80-007) | Calculation Number | Sheet 6 of 8 |




DETAIL "C"




DETAIL "D"

| | |
|---|---|
| 1 - W8 X 35 | LENGTH = 13'-9 3/4" |
| 4 - PLATES | 8" X 8" X 1/2" |
| 2 - PLATES | 8" X 16" X 1/2" |
| 4 - PLATES | 8" X 4" X 1/2" |
| 8 - STIFFNER PLATES | 1/2" X 3 7/8" X 7 1/8" |
| 2 - W8 X 35 | 8" LONG |
| 2 - PLATES | 9" X 11 1/2" X 1/2" |
| 12 - 7/8" ϕ BOLTS | 12" LONG (2 1/4" THREAD) |
| 8 - 3/4" ϕ CONC. ANC. | HILTI CATALOG #550103 OR EQ. |

NOTES:

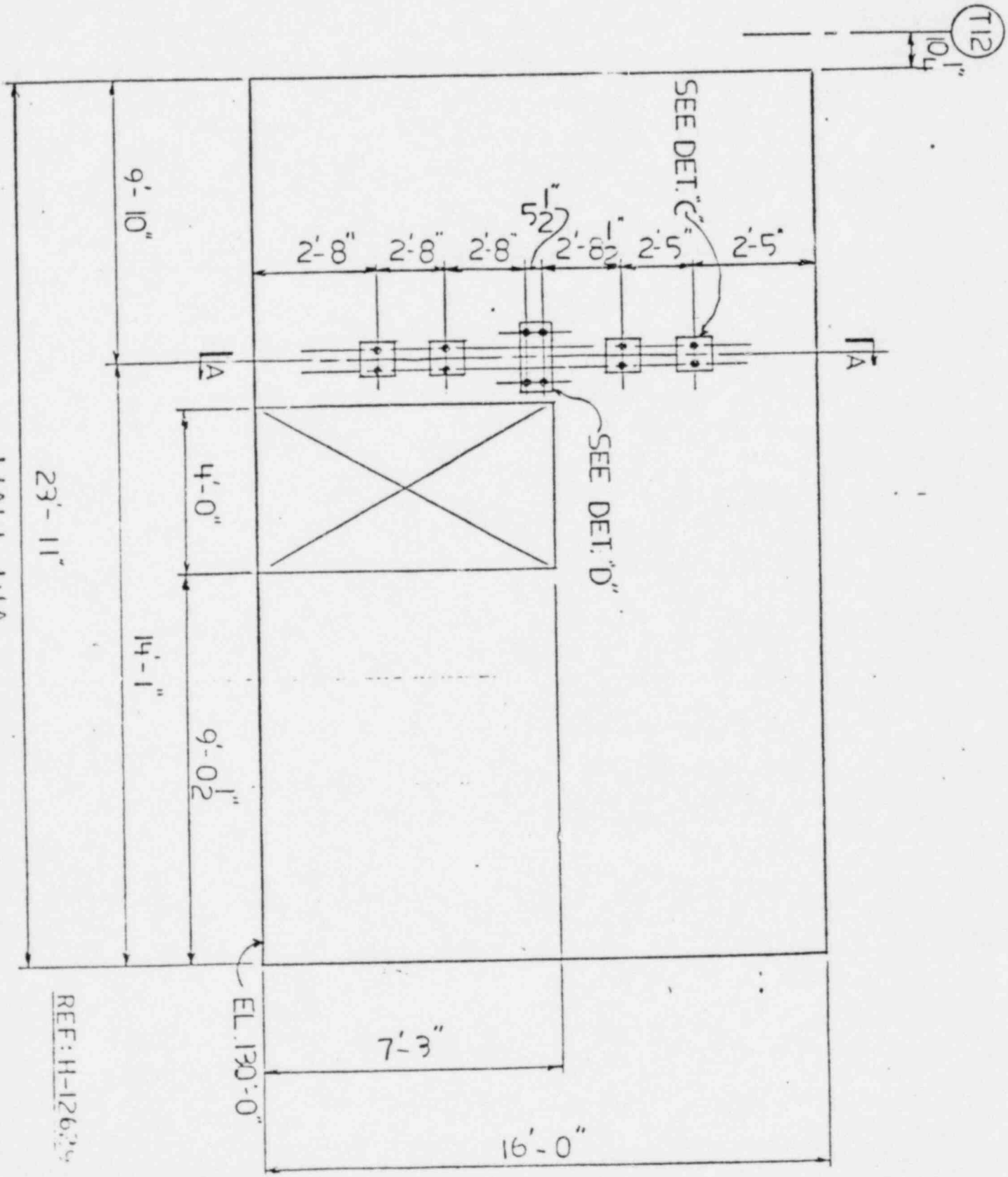
1) ALL STRUCTURAL STEEL SHALL BE ASTM A36.
2) ALL STRUCTURAL STEEL IS TO BE QUALITY CLASS "D"
3) ALL BOLTS ARE TO BE ASTM A307.

REF: H-12629

Design Calculations

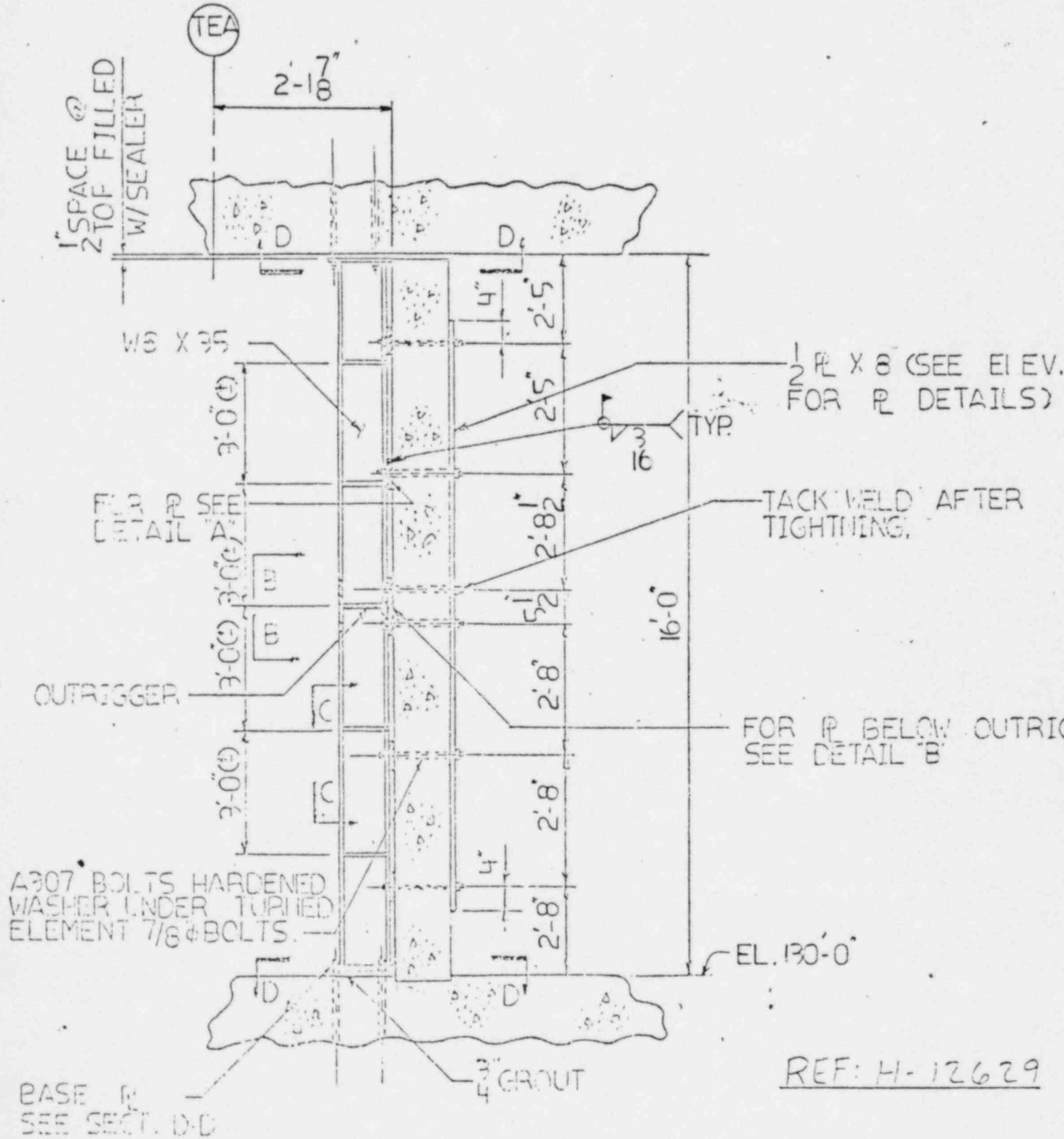
Southern Company Services

| | | |
|---|---|---|
| Project: HATCH UNIT NO. 1 & 2 | Prepared By: TINA C. SALSER | Date: 12-3-80 |
| Subject/Title: WALL MODIFICATION | Reviewed By: K. L. [illegible] | Date: 12-8-80 |
| C-130-41A & 41B (PSOC-80-008) | Calculation Number | Sheet: 1 of 5 |




REF: H-126[illegible]

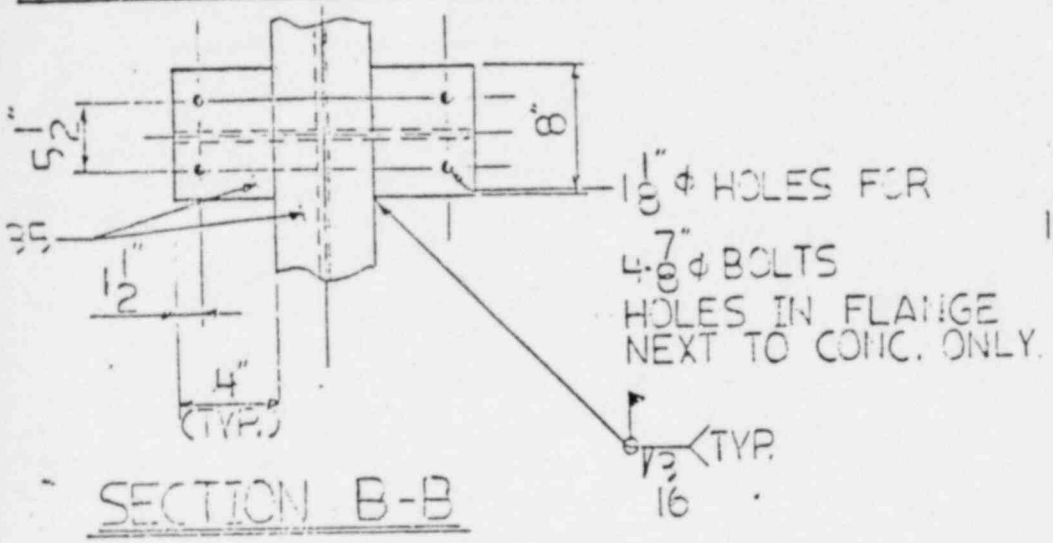
| Project | Prepared By | Date |
|---|---|---|
| HATCH-UNIT NO. 1 & 2 | TINA C. SALSER | 12-4-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| VIAL MODIFICATION | K. L. Wanning | 12-8-80 |
| C-130-41A & 41B (PSOC-80-008) | **Calculation Number** | **Sheet** 2 of 5 |



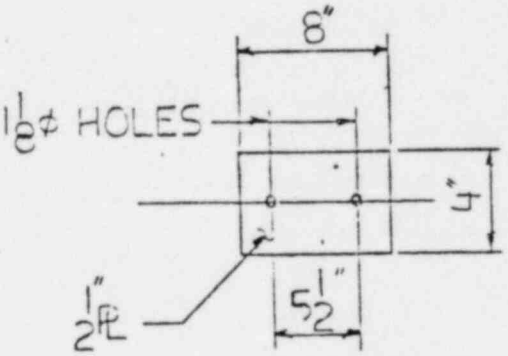

REF: H-12629

SECTION A-A

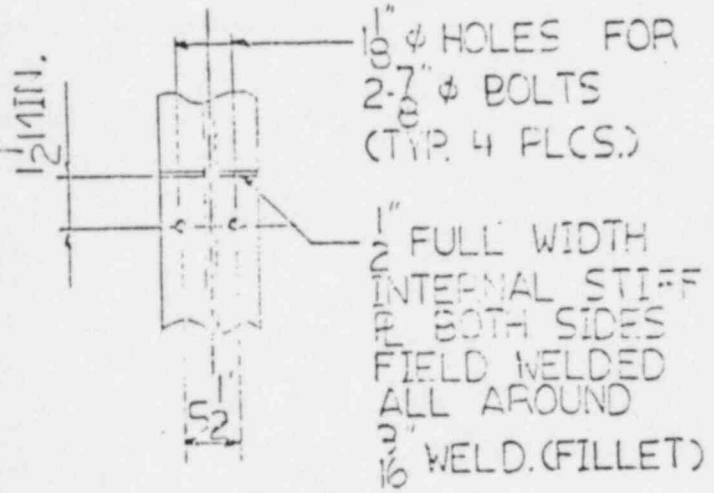
| Project | Prepared By | Date |
|---|---|---|
| HATCH UNIT NO. 1 | TINA C. SALSEH | 12-4-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATIONS | K. L. [illegible] | 12-8-80 |
| C-130-41A & 41B(PSOC-80-008) | Calculation Number | Sheet 3 of 5 |

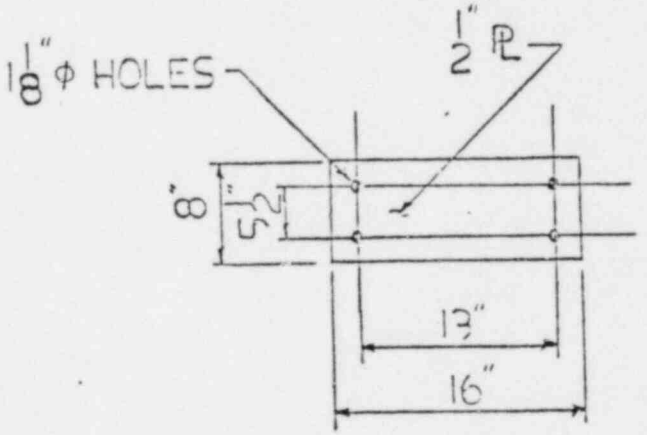



SECTION B-B



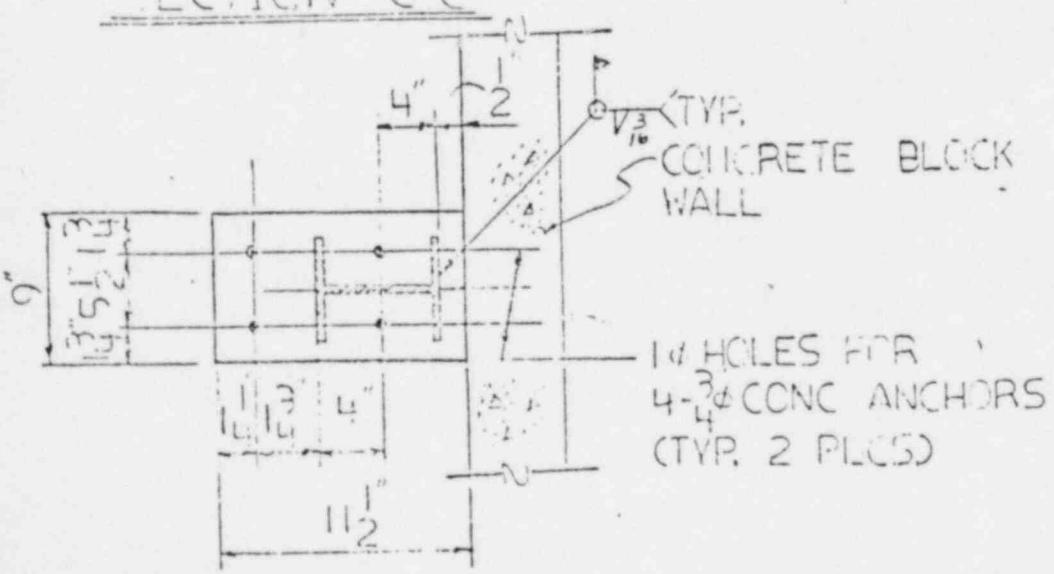

DETAIL "A"




DETAIL "B"

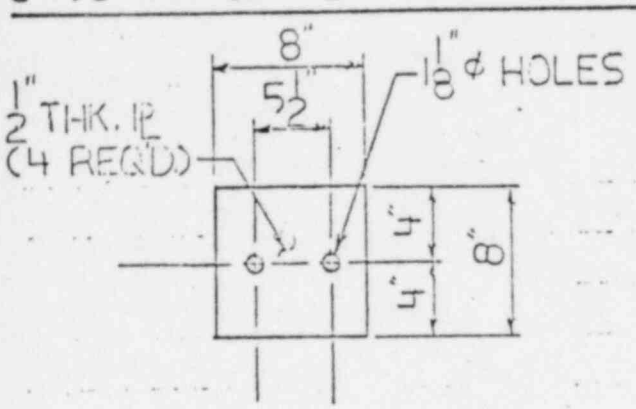
SECTION C-C



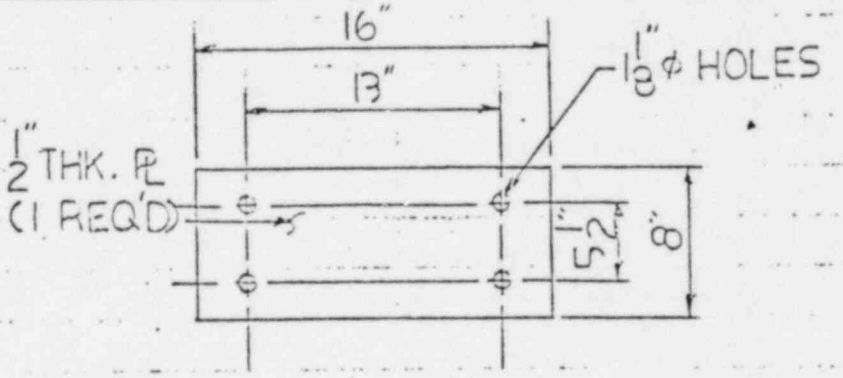

REF: H-12629

SECTION D-D

| Project | Prepared By | Date |
|---|---|---|
| HATCH - UNIT NO. 1 & 2 | TINA C. SALSER | 12-4-80 |
| **Subject/Title** | **Reviewed By** | **Date** |
| WALL MODIFICATION | K. L. W[illegible] | 12-8-80 |
| C-130-41A & 41B (PSOC-80-008) | **Calculation Number** | **Sheet** 4 of 5 |




DETAIL "C"




DETAIL "D"

| | |
|---|---|
| 1 - W8 X 35 | LENGTH = 15'-9 3/4" |
| 4 - PLATES | 8" X 8" X 1/2" |
| 2 - PLATES | 8" X 16" X 1/2" |
| 4 - PLATES | 4" X 8" X 1/2" |
| 8 - STIFFNER PLATES | 3 7/8" X 7 1/8" X 1/2" |
| 2 - W8 X 35 | 8" LONG |
| 2 - PLATES | 9" X 11 1/2" X 1/2" |
| 12 - 7/8" ϕ BOLTS | 16" LONG (2 1/4" THD) |
| 8 - 3/4" ϕ CONC. ANC. | HILTI CATALOG #5500108 OR EQ. |

NOTES:

1.) ALL STRUCTURAL STEEL SHALL BE ASTM-A36

2) ALL STRUCTURAL STEEL IS TO BE QUALITY CLASS "D".

3) ALL BOLTS ARE TO BE ASTM-A307

REF: H-12623

NRC Question 4

The data presented in Appendix D [2] is not legible. Supply a legible copy of this Appendix.

Response

A more legible copy of pages D-1 through D-3 of Appendix D is attached.

**Southeastern Brick Company**

BRICK, BLOCK
WATERPROOFING
INSULATION

METAL DOORS & FRAMES
MORTAR MIX & CEMENT
MASONRY REINFORCING MESH

Telephone (912) 283-8464
P. O. Drawer 2006

Waycross, Georgia 31501

May 23, 1978

Georgia Power Company
Plant Hatch
Baxley, Georgia 31513

Dear Sirs:

Enclosed you will find copies of our current test reports from Pittsburgh Testing Laboratories showing compressive strengths, moisture and linear shrinkage tests indicating that all the above comply with all ASTM specifications for concrete masonry units.

As indicated in these reports, all units being furnished to you for this project will comply with all current ASTM specifications and will be manufactured in the same manner as that being required to meet the two-hour fire rating of concrete masonry units. Our units have been designed to meet all physical requirements for this fire-rating.

Hoping the above meets with your approval, and will comply with your needs, we remain,

Yours very truly,

SOUTHEASTERN BRICK CO.

W. H. Gillis

W. H. Gillis
Vice President

WHG/mlo
encls.

# PITTSBURGH TESTING LABORATORY

ESTABLISHED 1901



Order No. JA-819
March 3, 1978
Report No. 9

Description: Test for Drying Shrinkage of Concrete Block

Specification: ASTM C-426-70

Reported to: Southeastern Brick Co.
P.O. Box 2006
Waycross, Ga. 31501

**********

Sampled by: Client
Block Type: Light Weight "
Block Size: 15 5/8" x 15 5/8 x 7 5/8"

Cells: 2
Wall Size: 1 1/4"

Results (% Shrinkage)

| Days | Block A | Block B | Block C |
|---|---|---|---|
| 5 | .014 | .021 | .018 |
| 7 | .020 | .029 | .023 |
| 9 | .024 | .031 | .026 |
| 11 | .030 | .035 | .031 |
| 13 | .033 | .036 | .033 |
| 15 | .035 | .037 | .034 |
| 17 | .037 | .038 | .034 |
| 19 | .039 | .039 | .036 |
| 21 | .040 | .040 | .036 |
| 23 | .041 | .040 | .037 |
| 25 | .042 | .040 | .037 |
| 27 | .042 | .040 | .037 |

Average time to shrinkage 25 days
Average linear shrinkage .0396%

PITTSBURGH TESTING LABORATORY

Robert L. [illegible]eries P. E.
Manager
Jacksonville District

10cc Client
3-14-78 er

# PITTSBURGH TESTING LABORATORY

2436 DENNIS STREET – JACKSONVILLE, FLORIDA



Order No.: JA-819
Lab. No.: 2967
Date: 1-23-78
Report No.: 7

**Description:** Compression, Absorption, Linear Drying Shrinkage and Relative Humidity Tests of Concrete Block

**Specifications:** ASTM C 140- , ASTM C 426- and ASTM C 427-

**Reported To:** Southeastern Brick Company
P.O. Box 2005
Waycross, Georgia 31501

---

Size of Block: 7 5/8 x 7 5/8 x 15 5/8"
Number of Cells: 2
Wall Thickness: 1 1/2"

Method of Curing: Steam
Date of Manufacture: 1-4-78

## COMPRESSION TESTS

| Mark | Weight, Lbs. | Area, Sq. In. | Total Load, Lbs. | Unit Load, Lbs./Sq. In. | Age, Days |
|---|---|---|---|---|---|
| 1 | 25.00 | 119.1 | 142,000 | 1192 | 16 |
| 2 | 25.44 | " | 144,000 | 1209 | 16 |
| 3 | 25.63 | " | 153,000 | 1285 | 16 |

## MOISTURE TESTS

| Mark | Wt. of Concrete, Lbs./Cu. Ft. | Absorption, Lbs./Cu. Ft. | Absorption, Percent | % Moisture as Compared to Total Abs. |
|---|---|---|---|---|
| 4 | 84.0 | 15.3 | 18.2 | 63.6 |
| 5 | 84.9 | 15.0 | 17.7 | 70.7 |
| 6 | 84.3 | 15.7 | 18.6 | 64.7 |

## LINEAR DRYING SHRINKAGE

| Mark: | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|
| Percent: | | | | | |

## RELATIVE HUMIDITY

| Mark: | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|
| Percent: | | | | | |

Note: The Average Relative Humidity for Jacksonville, Florida, for the Month of _____ is _____, based on U. S. Weather Bureau Records.

10cc Client
1-23-78 cr

PITTSBURGH TESTING LABORATORY
By: Robert L. Morries P. E.
Manager, Jacksonville District

NRC Question 5

With regard to the allowable stresses for factored loads, a factor of 1.67 was used for tension, shear, and bond of masonry. The SEB criteria [4] allows factors of 1.3 for shear carried by masonry, 1.5 for masonry tension parallel to the bed joint, and 1.3 for masonry tension normal to the bed joint. Justify the use of a factor of 1.67.

Response

An extensive test program was performed at the University of California, Berkeley [7] to determine the reliability of allowable shear stresses for reinforced masonry from the UBC, NCMA, and ACI codes. These tests enhance the test performed by Schneider which was used as the basis for developing the various design codes.

For shear tests performed using reinforced masonry, the tested value exceeded the unfactored code allowable value by at least a factor of 2.22. Allowing an increase of 1.67 still results in a safety factor of at least 1.33 when compared with the worst case test results.

Tests conducted by the NCMA and others are reported by the NCMA [8] indicate that the code allowables have a safety factor of 2.60 to 3.87, depending on the type mortar, for tension perpendicular to the bed joint. These tests were for hollow masonry walls.

For solid masonry units, tests performed at the NMCA laboratories indicate that code allowables have a factor of safety of at least 2.8 for tension perpendicular to the bed joint.

Additional tests reported by the NCMA [8] dealt with tension parallel to the bed joint. These tests results indicated factors of safety ranging between 3.59 and 8.45. One series of tests reported by reference [8] resulted in factors of safety averaging only 2.02; however, the tests were conducted after only 15 days and the results are at a variance with other test data.

Results of the tests mentioned above indicate that an increase of 1.67 would yield an acceptable factor of safety for factored loads.

NRC Question 6

With respect to modes of vibration, Section 5.2.2 of Reference 2 indicated that the first mode of vibration accounts for over 99% of the total moment and displacement of the walls. Provide sample calculations (with different boundary conditions) to justify this position.

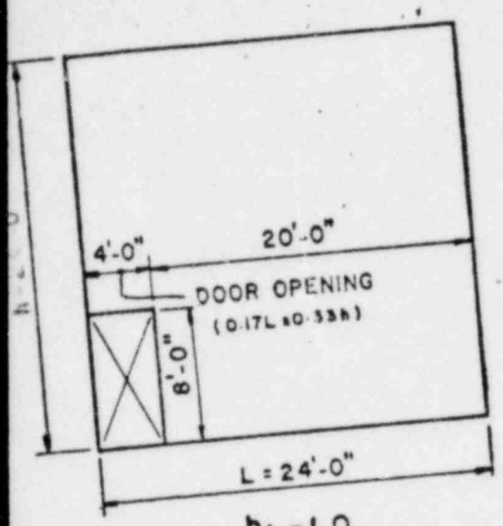
Response

A committee was formed on August 5, 1980 by a number of utilities and Engineering firms to investigate concrete masonry analysis techniques. The committee was charged with the responsibility of investigating a number of factors affecting the analysis of concrete masonry walls including the effects of the participation of higher modes than the first on moments, shears, and displacements.

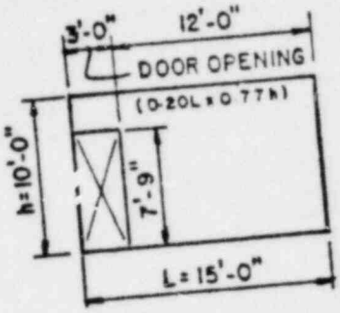
The Committee conducted a parametric study to determine the effect of the participation of higher modes. For each of the three boundary conditions referenced in Exhibit A, and for a cantilevered wall with an aspect ratio equal to 1.0, the modal displacements for the first eight modes were compared to the SRSS displacement for wall panels with the full $E_mI$ (D) and a reduced $E_mI$ (D) within the third segment of the panels. The results are tabulated in Exhibit B.1 and indicate that 99% of the displacement is contributed by the first mode. In addition to considering displacement, the committee reviewed the effect of modal participation on moments for the wall panels indicated in Exhibit B.2. It was again demonstrated that the first mode moment calibrated more than 99% of the SRSS moment for an eight mode analysis. For both the displacement and the moment study, an acceleration of $1.0_g$ applied over the entire frequency range was used as the input spectra.

The finite element program used did not provide shear values within the elements nor at the supports. It is the Committee's opinion, however, that the first mode would likewise contribute at least 99% of the shear in wall and at the supports since the wall moment (99% contribution from the first mode) is derived from the shear diagram.

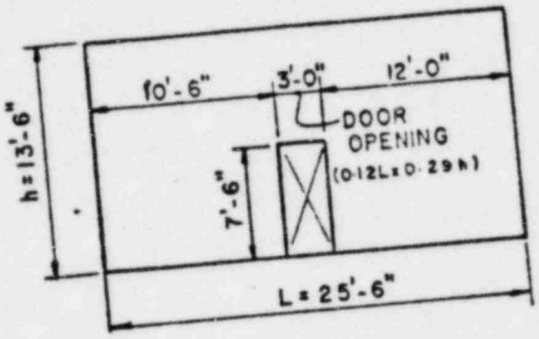
## A. FINITE ELEMENT MODELS




$h/L = 1.0$



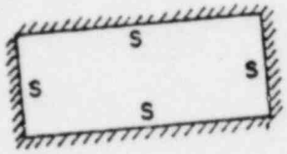

$h/L = 0.67$

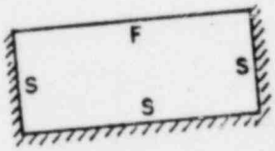


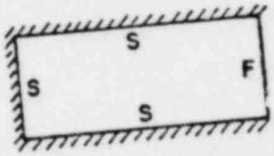

$h/L = 0.53$

## B. DESIGN PARAMETERS USED

### 1. Support Conditions




S = SIMPLE SUPPORT
F = FREE EDGE

### 2. Material Properties

a. Poisson's Ratio = 0.2
b. Type M mortar, $F'_m$ = 1350 psi; $E_m = 1.350 \times 10^6$ psi
c. 12" Solid Block Wall; $\gamma$ = 145 lbs/ft$^3$
d. Section Properties based on actual dimensions
e. Section Properties for Hollow Wall assumed same in each direction (error of $\pm$5% on moment of inertia)

### 3. Stiffness Variation

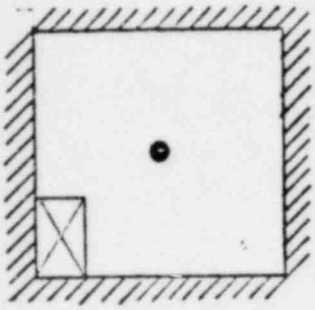
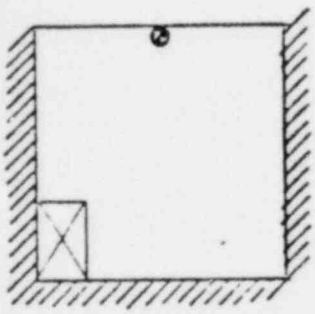
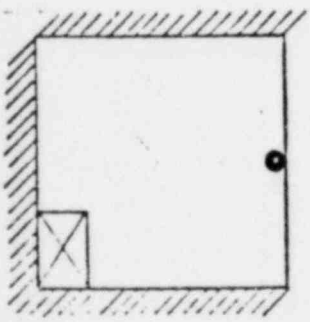
Stiffness values used for each support condition for each wall panel

a. Full value of EI for the entire wall panel
b. Reduced stiffness value of EI/3 for middle third portion of wall panel in each direction, remaining portion of wall with full EI value
c. Same as in 3(b) except reduced stiffness value of EI/5 is used

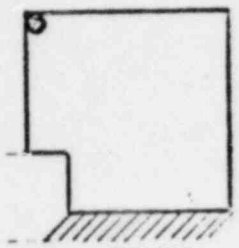
### 4. Frequencies of 12" Hollow Block Wall ($\gamma$ = 125 lbs/ft$^3$)

Multiply the frequencies of 12" solid wall by a constant:

1.2802 for hollow wall spanning horizontally
1.3425 for hollow wall spanning vertically

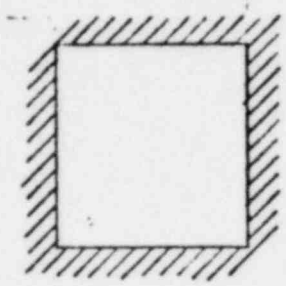
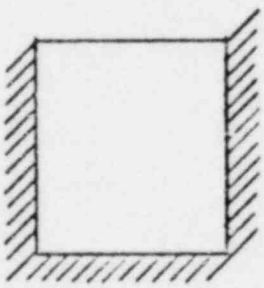
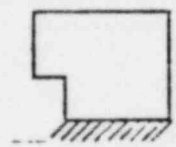
| Support Case | Type | Displacement (Inches) | |
|---|---|---|---|
| | | Full $E_m I$ | 1/5 $E_m I$ |
|  | Mode 1 | 0.15970 | 0.23554 |
| | Mode 2 | 0.00012 | 0.00014 |
| | Mode 3 | 0.00000 | 0.00000 |
| | Mode 4 | 0.00001 | 0.00014 |
| | Mode 5 | 0.00298 | 0.00653 |
| | Mode 6 | 0.00050 | 0.00002 |
| | Mode 7 | 0.00008 | 0.00011 |
| | Mode 8 | 0.00000 | 0.00000 |
| | SRSS | 0.15973 | 0.23563 |
|  | Mode 1 | 0.48266 | 0.53906 |
| | Mode 2 | 0.03577 | 0.03387 |
| | Mode 3 | 0.00008 | 0.00007 |
| | Mode 4 | 0.00028 | 0.00295 |
| | Mode 5 | 0.00365 | 0.00235 |
| | Mode 6 | 0.00195 | 0.00228 |
| | Mode 7 | 0.00043 | 0.00047 |
| | Mode 8 | 0.00039 | 0.00007 |
| | SRSS | 0.48400 | 0.54014 |
|  | Mode 1 | 0.47807 | 0.53441 |
| | Mode 2 | 0.03597 | 0.03393 |
| | Mode 3 | 0.00004 | 0.00004 |
| | Mode 4 | 0.00071 | 0.00369 |
| | Mode 5 | 0.00300 | 0.00143 |
| | Mode 6 | 0.00191 | 0.00229 |
| | Mode 7 | 0.00057 | 0.00062 |
| | Mode 8 | 0.00050 | 0.00001 |
| | SRSS | 0.47944 | 0.53551 |

MODAL DISPLACEMENTS FOR ASPECT RATIO 1.0

| Support Case | Type | Displacement (inches) | |
|---|---|---|---|
| | | Full $E_m I$ | 1/5 $E_m I$ |
|  FIXED | Mode 1 | 5.7866 | 6.4289 |
| | 2 | 0.0464 | 0.0635 |
| | 3 | 0.0565 | 0.0796 |
| | 4 | 0.0199 | 0.0121 |
| | 5 | 0.0069 | 0.0068 |
| | 6 | 0.0000 | 0.0000 |
| | 7 | 0.0000 | 0.0002 |
| | 8 | 0.0053 | 0.0046 |
| | SRSS | 5.7871 | 6.4297 |

R1

Exhibit B.2

| Support Case | h/L | Modes | Contribution from First Mode Moment for SRSS of All Mode Moments |
|---|---|---|---|
|  | 1.0 | 1 thru 8 | 99.30% |
| | .67 | | |
| | .54 | 1 thru 8 | 99.86% |
|  | 1.0 | 1 thru 5 | 99.82% |
| | 0.67 | 1 thru 5 | 99.78% |
| | 0.50 | 1 thru 5 | 99.70% |
|  FIXED | 1.0 | 1 thru 8 | 99.75% |

R1

COMPARISON OF FIRST MODE MOMENT TO SRSS MOMENT

NRC Question 7

Identify the test sources used for evaluating the shear strength of concrete block walls (Section 4 of Appendix F [2]).

Response

Test sources used are as follows:


1. Mayes and Clough, "Literature Survey - Compressive, Tensile, Bond and Shear Strength of Masonry," Earthquake Engineering Research Center, University of California, 1975.

2. ACI Standard, "Building Code Requirements for Concrete Masonry Structures," (ACI-531-79).

3. Commentary on "Building Code Requirements for Concrete Masonry Structures," (ACI 531-79).

4. Specification for the Design and Construction of Load-Bearing Concrete Masonry" - NCMA -1979.

5. Research Data and Discussion Relating to "Specification for the Design and Construction of Load Bearing Concrete Masonry" - NCMA - 1970.

6. Uniform Building Code, Chapter 25 "Masonry" - 1979.

7. Whittemore, Stang, and Parsons "Structural Properties of Six Masonry Wall Constructions," Building Materials and Structures Report No. 5., NBS - 1938.

8. Whittemore, Stang, and Parsons "Structural Properties of Two Buch-Concrete Block Constructions and a Concrete Block Wall Construction Sponsored by the National Concrete Masonry Association," Building Materials and Structures Report.

9. Whittemore, Stang, and Parsons, "Structural Properties of Concrete Block Cavity Wall Construction" Building Materials and Structures Report 21, NBS 1939.

10. Fishburn, "Effect of Mortar Strength and Strength of Unit on the Strength of Concrete Masonry Walls," Monograph 36, NBS, 1961.

11. ASTM Standard Specification for Brick and Applicable Standard Testing Methods for Units and Masonry Assemblages - May 1975.

12. Schneider, "Shear in Concrete Masonry Piers," California State Polytechnic College, Pomona, California.

13. Yokel and Fattal "Failure Hypothesis for Masonry Shear Walls" - Journal of the Structural Division, March 1976.

14. "A State of the Art Review - Masonry Design Criteria" - Computech - 1980.

15. "Tentative Provisions for the Development of Seismic Regulations for Buildings" - Applied Technology Council Chapter 12 A - ATC 3-06-1978.

16. The Masonry Society Standard Building Code Requirements for Masonry Construction, First Draft.

17. Copeland and Saxer, "Tests of Structural Bond of Masonry Mortars to Concrete Block" - Journal of the Structural Division - November 1964.

18. Hamid, Drysdale, and Heiderbrecht, "Shear Strength of Concrete Masonry Joints," Journal of the Structural Division - July 1979.

NRC Question 8

Indicate how seismic loads in different directions were accounted for in the analysis.

Response

Consistent with the original design of the plant and with the FSAR, horizontal earthquake loads were applied in only one direction at a time.

For a horizontal earthquake acting perpendicular to a given wall, the wall was checked for all stresses due to the inertial load of the wall itself, inertial loads due to attached equipment (see the response to Question 12), and static moments from attached equipment. These loads were all combined by the direct sum method.

For a horizontal earthquake acting parallel to the wall, in-plane drift effects and equipment inertial loads were considered for the over-all evaluation of the wall.

For a vertical earthquake, the inertial load moments (see the response to Question 12) due to attached equipment were applied to the wall. None of the walls are loading bearing, so the only other load considered was the inertial load of the wall itself due to a horizontal earthquake acting perpendicular to the wall.

For each of the conditions listed above the wall was checked to insure local load transfer from all attachments to the wall (see response to Question 10.

NRC Question 9

Indicate whether the out-of-plane drift effect was included in the analysis.

Response

The out-of-plane drift effect was included in the analysis. The internal wall moments due to deflections caused by out-of-plane interstory drift were determined for each wall height, location, and orientation and compared to the ultimate allowable moment for each wall. In all cases, calculated moments were found to be less than allowables.

NRC Question 10

Indicate whether the potential for block pullout was considered in the analysis.

Response

As stated in Section 5 (Reference 2), there were four postulated modes of failure.

1. A failure of the masonry mortar resulting in a single block pullout,

2. A shear failure of the masonry around the bolt backing plate,

3. A shear cone failure around an individual bolt, and

4. Local crushing of the masonry under the bolt due to action of the shear loads on the bolt.

Each of these failure modes was investigated to insure that local stresses did not exceed allowable stresses for any of these failure modes.

For every attachment to a concrete masonry wall, conservative assumptions were used to determine the maximum load the piece of equipment would place on the wall (see the response to Question 12). Each attachment was then checked to see if local load transfer could be accomplished without exceeding the allowable stresses for any of the four failure modes mentioned above.

NRC Question 11

Justify the formula given in Section 4.1.2 of Appendix E [2] for allowable tension stress in cell grout.

Response

The tensile value recommended for the grout core tensile stress is taken from ACI 318 for concrete, with a factor of safety of three. An increase of 1.67 is deemed reasonable for factored loads.

NRC Question 12

Indicate how equipment weights were accounted for in the seismic analysis.

Response

Attachments to concrete masonry walls were identified during the plant walkdowns. The weight of each component attached to a wall was determined and proportioned to its supports on the wall. All pipes and conduits were assumed full for purposes of the analysis. Conservative weights were supplied for all pieces of equipment to insure that future minor changes in equipment would not increase the load on the walls and to provide an additional safety factor for the analysis.

No major piping systems were found to be attached to any concrete masonry walls and all systems which were attached were sufficiently rigid to insure that the attachments would all experience the same acceleration as the wall. Therefore, the load due to each attachment multiplied by the acceleration of the wall was assumed to equal the inertial loads from that attachment.

The attachment inertial loads were combined directly with the wall inertial loads using the absolute sum method. In addition, moments obtained by multiplying the inertial load of each piece of equipment by the distance from the center of gravity of the reinforcing to the center of gravity of the equipment were also applied to the wall. Because most major loads on the walls came from individual pieces of equipment such as panelboards and pull boxes rather than from piping or conduit systems, the method used to account for equipment weights is conservative in the design of the wall.

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8. Research Data and Discussion Relating to "Specification for the Design and Construction of Load Bearing Concrete Masonry" - NCMA-1970.