UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of TEXAS UTILITIES GENERATING COMPANY, et al. (Comanche Peak Steam Electric Station Station, Units 1 and 2)	Docket Nos. 50-445-1 and 50-446-1

CASE'S ANSWER TO APPLICANTS' STATEMENT OF MATERIAL FACTS AS TO WHICH THERE IS NO GENUINE ISSUE REGARDING THE EFFECTS OF GAPS ON STRUCTURAL BEHAVIOR UNDER SEISMIC LOADING CONDITIONS

in the form of

AFFIDAVIT OF CASE WITNESS MARK WALSH

1. Applicants state:

"All bolts in multiple bolt, bearing-type connections will react imposed shear loads within at most the distance of the bolt hole tolerances. (Iotti, Finneran Affidavit at 8 /1/.)"

I disagree with this statement (and with some of the statements in the Affidavit). At the point all bolts begin to react the shear loads (that is, when the last bolt will have received a 1 lb. shear load), the first bolt that has reacted the shear load may have the shear load of 1,000 lbs., and this may have exceeded the allowable shear capacity of the bolt. This is assuming that the first bolt that reacted the shear load has not failed when the last bolt begins to resist the shear load.

/1/ I believe that the actual citation should be at 4-5.

One of Applicants' primary arguments which is contained in the back-up Iotti/Finneran Affidavit is regarding the definition of "oversized" bolt holes. This is addressed in detail in answer 2. following.

One example of statements with which I disagree which is made in the Affidavit of Dr. Iotti and Mr. Finneran is found on page 5 of the Affidavit (last paragraph, continuing on page 6), wherein they cite "Structural Design Guide to AISC Specifications for Buildings," by Paul F. Rice and Edward S. Hoffman (Attachment B to Affidavit).

Although the one page (268) from that document which Applicants have attached appears to be accurate /2/, their discussion and the portion cited (which is out of context) are very misleading. (See Attachment A, pages 264 through 271 of the Rice/Hoffman text.) In the portion attached by Applicants, Messrs. Rice and Hoffman are only talking about connections that receive static loads (i.e., loads that do not change direction) because the yielding stress criteria is not applicable in friction-type connections, as will be discussed later. The connections referenced by Messrs. Rice and Hoffman specifically exclude the supports that have dynamic loads (as will be shown below) such as most of those supports at CPSES. In addition, the inelastic deformation in bearing-type connections is recognized by the AISC Code at 1.5.2.2, where the allowable bearing stress is 1.35 Fy.

Therefore, the Applicants' statements are lacking reference to the

/2/ It should be noted that I have not reviewed the entire text of the other reference cited by Applicants, "Plastic Design of Steel Frames," and cannot state whether or not it is taken out of context.

specific amount of inelastic deformation allowed by the AISC Code for a non-dynamically loaded structure.

On pages 265-266 of the Rice/Hoffman text, following a discussion of AISC and ASTM specifications, it is stated (the numbers Messrs. Rice and Hoffman have placed in parentheses refer to sections from AISC or ASTM):

> "The use of ordinary (A307) bolts is limited by a number of Specification requirements. The allowable stresses are low: tension Ft = 20 ksi on the threaded area; and shear Fv - 10 ksi (1.5.2.1). The slip before full bearing is achieved on a group of ordinary bolts effectively rules out the sharing of stress in a mixed connection. Holes are to be taken as 1/16 in. larger than the nominal diameter (1.23.4), and the ordinary bolt does not expand to fill out the hole like a driven rivet nor can it be used for dependable friction. Stress sharing may not be assumed between ordinary bolts and rivets or welds (1.15.10; 1.15.11). In addition, low-strength bolts are not permitted in important field connections including . . . connections subject to vibration, impact, or stress reversal (1.15.12) . . . " (Emphases added.)

As discussed above, according to Messrs. Rice and Hoffman (Applicants' own chosen authority), A307 bolts are not permitted in connections subject to vibration, such as those at Comanche Peak.

Applicants have admitted that the connections at Comanche Peak are subject to vibration. Applicants' witness Finneran stated, in regard to the support which Jack Doyle and I noticed that had failed during hydrotesting (Tr. 4793/15-4794/4):

> "Q: (By Mr. Reynolds) Would you render an opinion on why the paint that Mr. Doyle talked about may have flaked during the flow of fluid through the pipe?
>
> "BY WITNESS FINNERAN:
> "A. I would say that possibly vibration may have been a cause for paint coming off of the deformed area during flow of fluid during the pipe; one possible cause.
>
> "Q. Yes. So what you are saying is that it could have been that when the deformation was caused during construction, the paint cracked but remained on, and then when vibration occurred due to hydrostatic flow, the paint chipped off?

"BY WITNESS FINNERAN:
"A. It's a possibility. I couldn't say if that's exactly what happened." (Emphases added.)

And at Tr. 5002/24-5003/9, Mr. Finneran further testified:

"Q: (By Mr. Walsh) Is vibration a common occurrence at Comanche Peak?

"BY WITNESS FINNERAN:
"A. I think all piping systems that have fluids in them or flowing to them are possibly subject to some vibration.

"Q: How about other pipes, main steam? Will they have vibrating effects?

"BY WITNESS FINNERAN:
"A. Quite possibly there will be vibration in the main steam piping." (Emphases added.)

The ASME Code requires the Applicants to minimize vibration where it states:

"**NF-3112.2 Design Mechanical Loads.** . . . The requirements of (a), (b), and (c) below shall apply.

". . . (c) Component supports shall be designed to minimize vibration."

In addition, according to Messrs. Rice and Hoffman (Applicants' own chosen authority), Applicants are also barred from using A307 bolts because of stress reversal.

As indicated above, Messrs. Rice and Hoffman cited the AISC code (to which the Applicants are committed through Specification MS-46A), Section 1.15.12, which states, in part:

"**Field Connections**

"Rivets, high strength bolts or welds shall be used for the following connections:

. . . Connections for supports of running machinery, or of other live loads which produce impact or reversal of stress.

"In all other cases field connections may be made with A307 bolts." (Emphases added.)

CASE requested, through discovery on the issue of Applicants' Motion for Summary Disposition regarding generic stiffnesses, the drawings which the Applicants used in their Motion. Of the 60 supports which the Applicants provided (I count 59, but this is immaterial to this point), 52 had reversible loads which is a reversal of stress on the supporting connection. (*See* Attachment B, the referenced 59 drawings.) On the drawings, the reversal of loads is shown in the block listing the loads and the direction of the load is indicated as + or - . Of the 7 supports which do not contain reversible loads (CT-1-013-006-S22S, CT-1-013-004-S32S, MS-1-001-002-C72S, MS-1-01-001-C72S, CT-1-013-002-C42S, CC-2-011-719-A53R, CT-1-013-011-S22R), 5 are spring cans and 2 are rigid-type supports. Based on this random sample, 88% of these supports require high strength bolts due to the requirement of a reversal of stress (load) /3/, according to the AISC Code (to which the Applicants are committed in design specification MS-46A).

It is also obvious from the preceding discussions that Applicants are in violation of ANSI N45.2.11, 3. DESIGN INPUT REQUIREMENTS, 3.2 Requirements, which states, in part:

> "The design input requirements should include the following where applicable:
>
> > "(9) Mechanical requirements such as vibration, stress, shock and reaction forces." (Emphases added.)

/3/ Stress is equal to the load divided by the cross-sectional area of the item under consideration.

2. Applicants state:

"Applicants' specifications for bolt hole tolerances are 1/16" for up to 1" diameter bolts and 1/8" for 1" and greater diameter bolts. (Iotti, Finneran Affidavit at 7.)"

I agree that this appears to be Applicants' current practice (although Applicants have not provided copies of the specifications themselves with their Motion for Summary Disposition). However, I do not agree with the implication, which is obviously that Applicants' specifications are acceptable. I maintain that Applicants' practice (or specifications) is contrary to applicable codes and NRC regulations.

One of Applicants' primary arguments which is contained in the back-up Iotti/Finneran Affidavit is regarding the definition of "oversized" bolt holes. This is a crucial argument for Applicants, because according to their own statement (bottom of page 6, Iotti/Finneran Affidavit):

> "The 8th Edition of the AISC Manual of Steel Construction is quite instructive on this point. At page 5-58 of the Manual, Paragraph 1.23.4.3 (Attachment C) states 'Oversized holes may be used in any or all plies of friction-type connections, but they shall not be used in bearing-type connections.'" (Emphasis added.)

Applicants claim (Affidavit, page 7) that they use more stringent tolerances than defined by the AISC Code (to which Applicants are committed, according to their Design Specification MS-46A). A claim the Applicants make in the Iotti/Finneran Affidavit (page 7) is:

> "AISC defines 'oversized' as d + 3/16" for bolts up to and including 7/8" diameter, d + 1/4" for 1" bolts, and d + 5/16" for bolts greater than or equal to 1 1-1/8" (sic) diameter."

I do not agree with Applicants' representation as to AISC's definition of "oversized." A point which the Applicants fail to make is as shown in Attachment C to their Affidavit, AISC Table 1.23.4, "Maximum Sizes of Fastener Holes, Inches" (emphasis added) -- that is, that these are the maximum size of holes. For a 1" diameter bolt, the maximum size hole for a standard hole is 1-1/16". If the hole is greater than 1-1/16" up to and including 1-1/4" for a 1" diameter bolt, the hole is considered oversized.

It is apparent that the Applicants do utilize an oversized hole for the 1" and greater bolts. As stated previously, paragraph 1.23.4.3 of Attachment C of the Applicants' affidavit (from 8th Edition, AISC Manual of Steel Construction, page 5-58), states:

> "Oversized holes may be used in any or all plies of friction type connections, but they shall not be used in bearing type connections." (Emphasis added.)

It can be seen from what is shown above that bearing type connections can only be used with standard size holes. If the hole is greater than a standard size hole, bearing connections are not allowed. Therefore, the Applicants are not in compliance with the AISC Code to which they are committed (according to their design specification MS46-A).

On page 7 of Applicants' affidavit, they state:

> "Thus, Applicants' specifications for bolt hole tolerances can definitely not be called 'oversized,' as that term is generally used in the construction industry."

Although the Applicants have not sized their bolt holes to the maximum allowed for an oversized condition, the bolt hole is still an oversized hole (as discussed above). And, as the term is generally used in the construction industry, holes are considered to be oversized if they are over a standard sized hole, up to and including the maximum oversized hole allowed. Contrary to what Applicants state (Affidavit, page 7), they are not in compliance with standard industry practice.

There are several aspects of this matter of which the Board should be aware. One of the most important is whether or not Applicants even attempt to determine the size of bolt holes and, if so, how? During the 6/6/84 telephone conference call between Applicants/NRC Staff/and me, I requested documentation (original and all revisions of procedures or whatever other documentation exists) showing that QC inspectors inspect the whole tube steel base plates prior to inserting the bolt (which is the only way QC could be certain when inspecting that there were no oversize holes). (See 6/6/84 conference call Tr. 74-76.)

In Applicants' 7/15/84 letter to CASE President Juanita Ellis (received by CASE 7/16/84), Applicants' counsel stated (page 2, second full paragraph):

> "Second were materials concerning Applicants' practice regarding the inspection of bolt holes in base plates, which relates to the motion concerning the effect of gaps. This information is attached. Copies of an example of the Material Identification Log, and the associated hanger drawing, for support H-BR-2-5B-001-009-3 are provided. This log is filled out by the QC inspector prior to release of materials, including base plates, from the fabrication shop. Although not separately called out on the log, one of the attributes of base plates the QC inspector examines is bolt hole size." (First emphasis in the original; second emphasis added.)

I agree with the statement of Applicants' counsel that the inspection of base plates for bolt hole size is not separately called out on the Material Identification Log, and in reviewing these documents (see Attachment C), I see no reference to the QC inspectors' verifying the hole size.

There is additional information which indicates that QC inspectors do not inspect for oversize bolt holes. In the sworn affidavit of Howard J. "Robbie" Robinson (sent to the Board and parties with CASE's 11/28/83 Answer to Board's 10/25/83 Memorandum (Procedure Concerning Quality Assurance)), Mr. Robinson stated (page 7):

> "My duties as general foreman over the fab shop consisted of fabricating items such as pipe hangers, cable tray hangers, and Q miscellaneous steel assemblies for subsequent installation in the field. . . I did, over a period of about three years, engage in an ongoing argument with one of the foremen within the steel hanger department whose duty was to install hangers in the field where he challenged the practice in the fab shop of drilling 1" holes in base plates to the code allowable of 1-1/16" diameter for a 1" bolt. His stand had been that we were allowed to overdrill the hole to a 1-1/8" diameter. . . he . . . made the statement to me that he had been drilling them oversize all along and intended to continue to. If he in fact did drill these holes oversize, and I believe that he did, one must assume that any subsequent QC inspection failed to identify this." (Emphases added.)

(See also discussion under answer 2. preceding.)

Further confirmation of what I believe to be the truth of this matter is to be found in a document concerning an investigation conducted by Applicants into allegations which had been made. (See Attachment D, 3/9/84 TUGCO Office Memorandum to Distribution from Jerry C. Walker, Subject: Resolution of QAI-0001, and the attached 2/22/84 TUGCO Office Memorandum from Boyce Grier to Antonio Vega, Subject: Investigation of Allegations QAI #0001.) Item 3, page 2, of the

2/22/84 Memorandum discusses allegations of an alleger that an oversize hole (1-1/2") had been drilled for a 1-1/4" Hilti bolt in a hanger base plate (i.e., a hole 1/4" larger in diameter than the bolt). Mr. Grier states that he subsequently identified the support in question as CC-2-070-002-A33R (copy of the as-built drawing for the support is Attachment F to his report). He further states:

> "There is nothing in the documentation package for this pipe support to indicate a requirement for or the approval of an oversize hole. I reviewed the reports of the QC inspections for the Hilti installation for this support. These are contained in the following:
>
> "IRMH-19682, dated 7/1/81
> "IRMH-53200, dated 2/15/83
> "IRMH-53257, dated 2/22/83
>
> "These reports do not indicate any nonconforming or unsatisfactory conditions. (Blacked-out) stated during his interview that he had no knowledge of oversize holes ever being drilled for Hilti bolts.
>
> "I made inquiry of pipe support engineering (Jay Ryan) as to whether an oversize hole for a Hilti bolt in the support in question would be of concern. I was told that it would not be a problem.
>
> "The allegation that an oversize hole had been drilled for a Hilti bolt could neither be confirmed or dismissed. It appears that physical inspection of the holes for the support in question would be the only way to resolve this matter. In view of the response from Engineering regarding the significance of this matter, it does not appear necessary to pursue the matter further." (Emphases added.)

Thus, the investigator reviewed the documentation packages and saw no indication of an oversize hole or of a requirement for or the approval of an oversize hole. He reviewed the reports of the QC inspections, which did not include the Material Identification Log which Applicants' counsel referenced as being the documentation I requested regarding Applicants' practice for the inspection of bolt holes in base plates. When he checked with pipe support engineering (Jay Ryan), he was told that the 1/4" oversize bolt hole would be no problem, although no basis is given in the report for Jay Ryan's disposition of the problem. Based on Jay Ryan's position, the investigator ceased his investigation -- even though he admitted that he could neither confirm or dismiss the allegation.

Therefore, as demonstrated above, Applicants' statement that they have no oversize holes (including those greater than the 1/8" criteria Applicants claim to use) is without substance.

3. Applicants state:

"Test data indicate that bolts of the kind Applicants use have margins of safety for shear displacements equal to the maximum bolt hole tolerances ranging from 5.6 (1 1/4" super kwick Hilti) to 3.2 (1 1/4" Richmond Inserts). (Iotti, Finneran Affidavit at 8-9.)"

I agree with this statement, but I do not see where it is material to the Board. This statement discusses displacements only. For the Applicants to be in compliance with IE Bulletin 79-02 the factor of safety must be based on ultimate load, not displacement.

Using the test data shown in Attachment A to Applicants' testimony in September 1982 (Applicants' Exhibit 142D, admitted at Tr. 4794, Attachment B), for a 3/4" diameter Hilti bolt loaded in shear, the load at 1/8" displacement is 10,000 lbs. The allowable load as listed in the PSE Manual (see Attachment E, PSE Manual, Section V, Hilti Concrete Anchor Bolts, Rev. 0, 1/8/82, page 8 of 10, Figure 6) is 3,693 lbs. for a 3/4" diameter Hilti with 9-1/4" embedment. Therefore at 1/8" displacement, the Hilti bolt has exceeded its allowable by 10,000/3,693 = 2.71.

The same philosophy can be used for the Richmond insert. Referring to Applicants' Exhibit 142D, Attachment C, sheet labeled 5, at a displacement of .125" (1/8"), the shear load is approximately (14 + 16) /2 = 15 kips. The capacity for a 1" diameter A307 bolt is 7.85 kips. Therefore, the load in the bolt has exceeded the established allowable by 15/7.85 = 1.91.

In addition, in the design of pipe supports at CPSES, the designer assumes the support is rigid at the bolted connections and does not move, and determines the stiffness of the support or determines the deflection for the support based on this assumption (that is, that the bolted connections don't move). Now the Applicants are stating that the bolted connections by themselves will move 1/8". It would appear that the Applicants are not utilizing appropriate design assumptions. Only if the Applicants were utilizing friction type connections, would their assumptions be proper.

At this time it would be appropriate to bring to the Board's attention what I believe Applicants are up to. The Applicants, in this Motion for Summary Disposition, are addressing the consequences of gaps in bearing type connections. The Applicants have claimed to this Board on the record (for example, Tr. 5154/18-5154/15, 5161/7-25, and 5208/1-17) that they utilize bearing type connections in the design of base plates utilizing Hilti bolts. But in response to one of Cygna's questions in regards to Hilti bolts, the Applicants informed Cygna that they are designed as friction type connections and will not move because they are pretorqued. See Attachment F (copy of the 4/19/84 letter, with relevant attachments, from L. M. Popplewell, Project Engineering Manager, TUGCO, to Ms. Nancy Williams, Project Manager, Cygna Energy Services), wherein Applicants state (bottom of page 9):

> "Using our design approach, the Hilti joints, since they are pre-torqued, would perform as a friction joint within their working loads." (Emphasis added.)

This is a complete reversal of philosophy by the Applicants, not presented to the Licensing Board before. At Tr. 5208/1-7, Dr. Chang states that the loads due to pretorquing are to set the wedges and the pretorque value used is too small to be considered sufficient as a friction-type connection.

It is apparent that the Applicants are singing a different song in their response to Cygna. There is no indication within the Phase 3 Cygna Report that Cygna investigated whether or not the Hilti bolts are torqued sufficiently to be considered as a friction-type connection.

One must consider whether or not the statement made to Cygna is true (i.e., the pretorque provided to the Hilti bolts is sufficient to consider them as friction connections). The allowable shear force assuming a safety factor of 2 can be calculated by the following formula modified from the Applicants' Motion for Summary Disposition on cinched-up U-bolts, page 14 of Affidavit, modified to accommodate the shear force requirement:

V = (T/K x D)(.4)/FS

where V = the allowable shear capacity

.4 = the coefficient of friction between concrete and steel

K = torque coefficient = .3

D = diameter of bolt (say, a 3/4" diameter)

T = the applied torque

FS = factor of safety = 2

The Brown & Root procedures shown in CASE Exhibit 669B (Attachment to Deposition/Testimony of CASE Witness Jack Doyle), sheet 10P, for a 3/4" diameter bolt has a required torque of 150 foot-lbs.

The allowable shear value is thus

1/2 ((150)(12) / (.3)(.75)) (.4) = 1,600 lbs.

The allowable listed in the PSE Manual for a 3/4" diameter Hilti bolt is 3,693 lbs. or a (3693/1600)(100) = 231% difference.

The above analysis does not include creep effects on the concrete; these effects will decrease the pretorqued value. The coefficient of friction between the nut and the Hilti bolt was assumed to be .3. Therefore, my analysis is on the very liberal side, and the Applicants' statement to Cygna that the Hilti bolt connection is a friction connection is lacking proper consideration.

In addition, when Brown & Root tested the Hilti bolts for compliance to IE Bulletin 79-02 and compared pretorque to ultimate load, they neglected to consider an important factor. This factor is that Brown & Root did not measure the load induced into the bolt due to pretorquing, but rather the ultimate load due to pretorquing in a tension test. To have measured the pretorqued value would have required Brown & Root to measure the displacement of the bolt due to an applied load. When the bolt first begins to displace is when the pretorqued value is determined.

4. Applicants state:

"Consideration of all bolts in multiple bolt, bearing connections, with bolt hole tolerances equivalent to those used by Applicants, to react shear loads equally is accepted industry practice and is premised on the fact that the inelastic localized deformations that could result from self-limiting stresses do not unacceptably reduce the ultimate bolt capacity. (Iotti, Finneran Affidavit at 5-7.)"

I disagree with this statement. As already discussed above, accepted industry practice does not allow bearing-type connections when the bolt hole is greater than the maximum standard sized hole. The inelastic localized deformations that the Applicants are relying on have limitations that the Applicants failed to address, as shown above; i.e., allowable bearing stresses and when bearing connections can and cannot be used. Therefore, the conclusion that the Applicants have attempted to make is not complete and violates established code allowables and industry practice.

5. Applicants state:

"The report CASE relied on (CASE Exhibit 1001) to support its contention that at most two bolts may be considered to react shear loads in multiple bolt, bearing connections addressed connections in which bolt hole tolerances from 1.33 times bolt diameter, up to 1/2" for 1" bolts, may be present.

"These conditions could result in a safety factor for shear displacement of only 1.1. (Iotti, Finneran Affidavit at 9-10)."

I disagree with the first sentence. As stated above, the inelastic deformations that occur with the Applicants' position will exceed established code allowables (i.e. allowables based on load, not displacement) with these oversized holes the Applicants use. What Dr. Fisher (referenced in the Iotti/Finneran Affidavit) was addressing was a warning to engineers and designers of the new Code provisions; i.e., an allowance for excessively oversize holes in column base plates where tensile forces are not commonly seen, and the shear force is accommodated by the compressive load of the column. With the old Code (i.e., the 7th Edition), no oversize hole was allowed with A307 bolts to resist a shear load. But the new Code not only allows the oversize hole but the hole can be larger because, as Dr. Fisher states, columns are generally not experiencing tensile loads. Therefore, Dr. Fisher provides methods to accommodate connections for columns that do not contain sufficient compressive loads.

I partially agree with the second sentence, to the extent that it is correct when one considers displacement <u>only</u>, and not allowable stress, for a nuclear power plant.

6. Applicants state:

"In a seismic event, only the first quarter cycle loading could cause preferentially loaded bolts to deflect in shear.

"For the remainder of the cycles the bolts will equally react the loading (Iotti, Finneran Affidavit at 13.)"

I agree with the first and second sentences; however, they are not reflective of the true extent of the problem, as discussed in the following.

The Applicants' example and position is demonstrated in Figure 1 below. At the end of the first quarter cycle loading on a two-bolt base plate, the bolt that reacts first may deform at the peak of the cycle, as shown in Figure 1b below, as the Applicants state. And as shown in Figure 1c, the bolt is permanently deformed. In addition to this, Applicants have another flaw in their presentation. They assume that the bolt is behaving in a ductile manner, under a shear load. This assumption is not consistent with the following statement from NRC Regulatory Guide 1.124 ("Service Limits and Loading Combinations for Class 1 Linear-Type Component Supports," admitted at Tr. 5901, page 1.124-2, B.1.b.):

> "The increase permitted by NF-3231.1 and F-1370(a) of Section III for shear stresses or shear stress range should not be more than 1.5 times the level A service limits because of the potential for <u>non-ductile behavior</u>." (Emphasis added.)

Nowhere in ASME NF are the level A service limits or the AISC Code for shear stress allowed to exceed the yield strength of the material. Therefore, the Applicants are in violation of the ASME code, as well as the AISC Code, when they allow the bolts to exceed the yield strength in shear and deform.

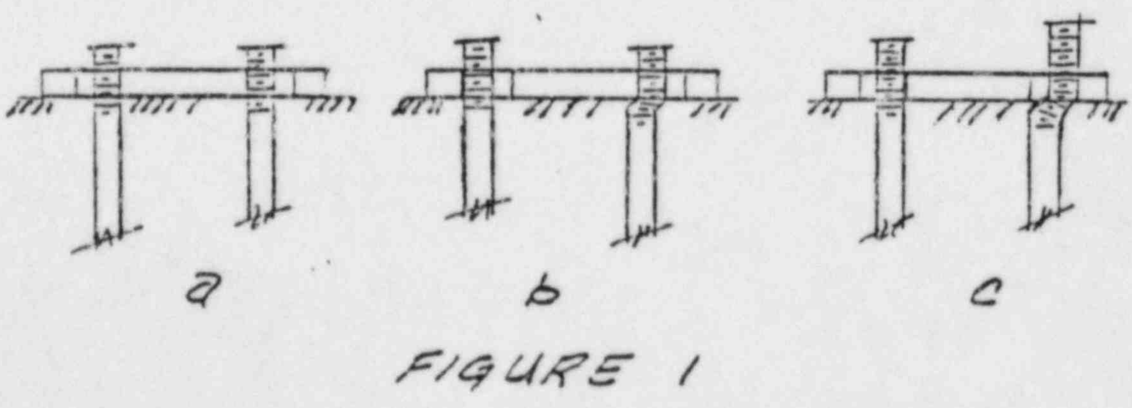

FIGURE 1

The above example consisted of a stiff plate and a flexible bolt. Another condition can also occur, and that is a stiff bolt and a flexible plate, as shown in Figure 2 following.

As shown in Figure 2b, at the end of a 1/4 cycle the original circular hole for bolt A has deformed into an eliptical type of configuration. At the end of the 1/2 cycle, there is now a gap on both sides of bolt A, as shown in Figure 2c below, and there is no bearing between bolt A and the plate. At the end of the 3/4 cycle, the hole for bolt B has now deformed into an eliptical type of configuration, as shown in Figure 2d. At the end of the first full cycle, as shown in Figure 2e below, there are now two permanently elyptical-type holes with gaps twice as large as before the cyclic motion began, and neither bolt A or B is in bearing. If the original gap for a 1" diameter bolt was 1/8", the gap now is 1/4", and this would definitely be considered an oversized hole in that particular direction. This is not allowed for bearing type connections, as Applicants should agree.

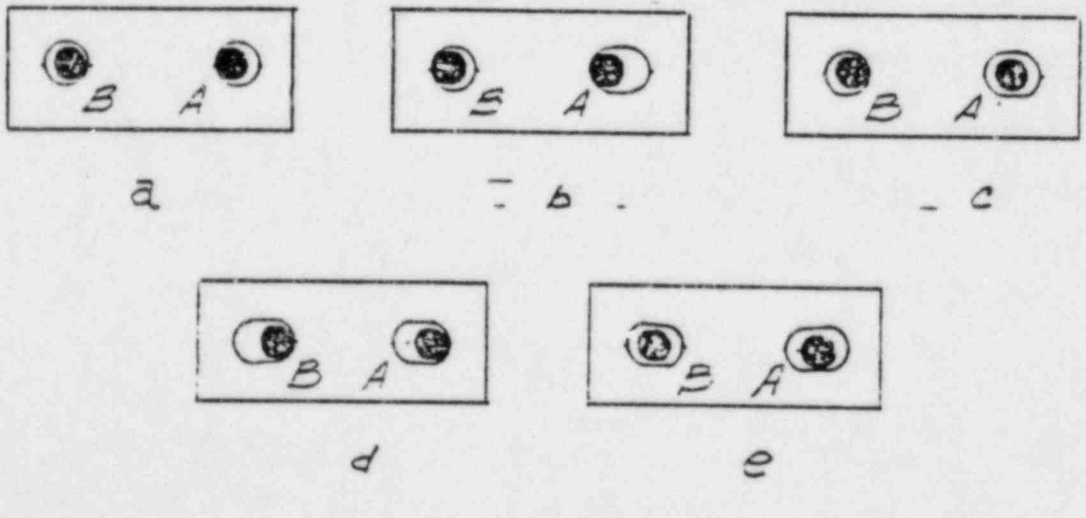

FIGURE 2

The deformation discussed in example 2 is possible since the AISC Code at 1.5.2.2 allows the bearing stress of the plate to exceed the yield strength of the plate in the bearing type connection. The deformation discussed in example 1 (the condition which the Applicants cite) is possible, but would conflict with Regulatory Guide 1.124. And nowhere in the AISC Code is the bolt stress allowed to exceed the yield strength in shear.

Example 2 is realistic when one considers the A307 bolt/tube steel/Richmond insert condition. When the axial force from the tube steel member is transferring this axial load to the bolt by means of shear, the NRC Special Inspection Team (SIT) (as well as the Applicants) claimed that approximately 85% of the axial force being transferred as shear is in the flange of the tube steel member closest to the concrete. The thickness of the tube steel is at most 1/2" thick and the bolt is 1-1/2" diameter (minimum) for supports within the containment. The bolt is designed for an allowable stress value equal to 10 ksi (from Table 1.5.2.1 of the AISC Code, 7th Edition), yet the allowable bearing stress of this thin tube steel member has an allowable of 48.6 ksi for yield strength equal to 36 ksi. The allowable capacity for a 1-1/2" diameter bolt is equal to 17.67 kips. Due to the high allowable for bearing stress, the allowable force for the tube steel member is equal to 36.45 kips. This high allowable will permit deformations for the bearing type connections when cyclic loads are not a consideration. For this reason, example 2 shown above is more realistic for the supports at Comanche Peak than the Applicants' example and position. In either case, the gap is an unacceptable condition for a dynamically loaded structure, and is not permitted under the AISC Code, Section 1.15.12 discussed in item 1, page 3, of this affidavit.

7. Applicants state:

"The effect of gaps in seismic analyses cannot be defined in absolute terms. The effect is dependent on many factors, including the nature of the excitation (magnitude and distribution of frequencies), and the size, orientation and number of gaps. (Iotti, Finneran Affidavit at 13-14.)"

As indicated on page 14 of the Applicants' Affidavit, the existence of gaps in bearing type connections is a very complicated issue by the fact that non-linearities introduce additional impact loadings, as well as impact damping, and as the Applicants stated: "Clearly, consideration of such effects would require complex analyses which depart from accepted practices." (Page 14 of Affidavit.) Not only do I agree with this statement, but the AISC Code has recognized the complexity of the gap in bearing type connections due to cyclic loads. Paragraph 1.15.12 Field Connections requires high strength bolts for supports which produce impact or reversal of stress, as discussed above in Answer 1, page 3 of this Affidavit.

Therefore, the complexity to which the Applicants refer is their own doing. The Applicants decided to use bearing type connections with low strength bolts, and consequently are now attempting to justify their erroneous decision. The Applicants have resorted to crying on the Board's shoulder about how complex it would be if they were required to analyze the supports as they now exist.

8. Applicants state:

"Impact damping also occurs in seismic events where gaps are present.

"To account for this damping, however, would require consideration of effects that require complex analyses which depart from accepted design practices. (Iotti, Finneran Affidavit at 14.)"

I agree with the first sentence.

I agree with the second sentence, as discussed above in answer 7. However, I disagree with their back-up statement on page 14 of the Iotti/Finneran Affidavit, that the impact damping values would be greater than those specified by Regulatory Guide 1.61, for the following reasons: If the Applicants' position is that a higher damping value would be allowed for bearing type connections, it is obvious that Regulatory Guide 1.61 does not allow bearing type connections for cyclic loads, or it would have been listed as a specific item, with a higher damping value. But since bearing-type connections are <u>not</u> common industry practice for seismically qualified supports, Regulatory Guide 1.61 did not list it. Therefore, the Applicants' conclusion that a higher damping value should be allowed due to the bearing type connection would conflict with Regulatory Guide 1.61, as well as the AISC Code (to which Applicants are committed.)

9. Applicants state:

"Material damping will take place as the gap is transversed without a corresponding feed of energy from the seismic event.

"This is a beneficial effect for the seismic response of the system. (Iotti, Finneran Affidavit at 14-15.)"

I agree with the first sentence, as far as it goes, and if one is not concerned with the inelastic behavior and unpredictable behavior of the connection.

I disagree with the second sentence, because you lose the ability to predict the response of the system; you do not know where supports will be moving due to the bearing type connection; you do not know which supports will have the inelastic deformations of the bolts.

10. Applicants state:

"Each of the factors discussed in Findings 7-9 cannot be accounted for in the typical linear response spectrum analyses, as are used at Comanche Peak. (Iotti, Finneran Affidavit at 15.)"

I agree with this sentence, but that does not necessarily mean that the Applicants' position is a correct one. To begin with, IE Bulletin 79-02 required the Applicants to perform tests on expansion anchor bolts. The Applicants neglected to measure the amount of displacement that occurs at the allowable shear value. This is the Applicants' own negligence.

Another important factor which the Applicants were negligent on is the use of the Richmond insert/A307 bolt/tube steel connection. 10 CFR 50.34(a)(2) states:

"50.34 **Contents of applications; technical information**

"(a) Preliminary safety analysis report. Each application for a construction permit shall include a preliminary safety analysis report. The minimum information to be included shall consist of the following: . . .

"(2) A summary description and discussion of the facility, with special attention to design and operating characteristics, unusual or novel design features, and principal safety considerations." (Emphasis added.)

This Richmond insert/A307 bolt/tube steel connection is not mentioned in the Applicants PSAR, although it _is_ unusual and novel, as I have stated and the Applicants' own witnesses have admitted. (_See_ Walsh, Tr. 3145/6-3146/8; Krishnan, Finneran, Scheppele, Reedy, and Chang, Tr. 5061/18-5065/8.)

In addition, during the 7/3/84 meeting in Bethesda between the NRC Staff and Cygna Energy Services regarding the Cygna Phases 1 and 2 Independent Assessment Program, during a discussion between the Staff's Mr. Terao and Cygna's Ms. Williams, Mr. Terao also indicates that he recognizes that this is an unusual and novel design and points out the importance of the design organization's (such as Gibbs & Hill) having followed ANSI N45.2.11, Section 6.2, which states:

> "The extent of the design verification required is a function of the importance of the safety of the item under construction, the complexity of the design, the degree of standardization, the state of the art, and the similarity with previously proven designs."

Mr. Terao discusses examples of an unconventional design, then states (7/3/84 Meeting Tr. 57):

> "I don't really see that there's a problem with Richmond inserts, just like there is no problem with the modeling of dual function restraints, in other words, just the Richmond inserts alone, taken by themselves, there's no problem.
>
> "But it has to do with the design considerations that go along with it. And one of design considerations is the use of the tube steel with the holes in it as anchorage for the Richmond insert."

(_See_ full discussion, 7/3/84 Staff/Cygna meeting Tr. 50-57.)

11. Applicants state:

> "Each of the factors discussed in Findings 7-9 can only be accounted for with difficulty by performing nonlinear time history analyses. (Iotti, Finneran Affidavit at 15.)"

I agree with this statement. Based upon this statement by itself, it would seem reasonable that the Board require the Applicants to either perform the non-linear time-history analysis which they reference above or utilize a friction-type connection in the supports that are already constructed. But, as discussed in answer 12. below, the utilization of a friction-type connection would validate the assumptions the designers used in their original analysis.

12. Applicants state:

"Identifying the effects of gaps by comparison of the results of nonlinear time history (with gaps) and response spectrum (without gaps) analyses is difficult and one may not discern whether particular results are attributable to differences in individual variables or assumptions or the analytical techniques themselves. (Iotti, Finneran Affidavit at 15-16.)"

I agree with this statement. From what the Applicants have just stated, it would appear that they must be required to install at all supporting connections a friction-type connection to validate their original assumptions, and to have them fabricated as friction-type connections. The Applicants may, in the future, state that their being required to redesign their supports for friction-type connections would be costly (in the hopes that the Board will give them yet a third chance), but as stated above in the previous answers, the Applicants should have done it right to begin with.

13. Applicants state:

"Comparison of the results obtained by response spectra analyses and nonlinear time history analyses which simulate actual gaps in systems show that "a) the seismic response spectrum method, which ignores the nonlinearities, is more conservative than the non-linear time domain method (which includes gaps), and

"b) the effect of gaps on reduction of response frequency is negligible due to the transient nature of the seismic acceleration loading."

"(Iotti, Finneran Affidavit at 16-17.)"

I disagree with Applicants' statements, because if what Applicants state were true, the AISC Code would allow bearing type connections in dynamically loaded structures and supports -- it does not. If the Applicants wish to use the nonlinear time domain method (which includes gaps) to be less conservative than the response spectra method, that would be their option; but as stated above in answer 12, this is not realistic.

In summary, I believe that the Applicants did not properly consider the effects of gaps in the initial or final (i.e., vendor certified) design of pipe supports. The AISC Code does not allow bearing type connections in supports where there is a cyclic type load. The Applicants, on the majority of their supports, have cyclic type loads. They utilize bearing type connections and are therefore in conflict with the AISC Code (to which they are committed). The Applicants rely on references to inelastic deformations to justify their position but omit the consideration of full cyclic loads in the inelastic deformation discussions. They depend on damping factors that are not recognized by the NRC in Regulatory Guide 1.61 for a justification, after the fact, of their negligence. Because of these gaps, the Applicants are not able to predict how these systems will react to imposed loadings.

If they planned to use this unusual and unique design, Applicants should have initially included it in their PSAR -- they did not. They freely admit that it would be difficult to properly analyze the as-built condition of the supports as they now exist. And finally, Applicants state that the gaps that do exist at Comanche Peak in pipe supports (which I believe are in violation of the AISC Code) are more conservative than the Code requires the Applicant to comply with. In essence, Applicants are trying to convince the Board that not complying with the AISC Code is conservative. I do not agree.

Attachments:

Attachment A -- "Structural Design Guide to AISC Specifications for Buildings," by Paul F. Rice and Edward S. Hoffman, pages 264 through 271 -- (see answer 1, page 2)

Attachment B -- 59 drawings (received on discovery re: Applicants' Motion for Summary Disposition regarding generic stiffnesses), demonstrating reversible loads -- (see answer 1, page 5)

Attachment C -- Copies of an example of the Material Identification Log and associated hanger drawing for support H-BR-2-5B-001-009-3, regarding Applicants' practice re: inspection of bolt holes in base plates -- (see answer 2, pages 8-9)

Attachment D -- 3/9/84 TUGCO Office Memorandum to Distribution from Jerry C. Walker, Subject: Resolution of QAI-0001, and attached 2/22/84 TUGCO Office Memorandum from Boyce Grier to Antonio Vega, Subject: Investigation of Allegations QAI #0001, regarding allegations of oversize bolt hole -- (see answer 2, pages 9-10)

Attachment E -- PSE Manual, Section V, Hilti Concrete Anchor Bolts, Rev. 0, 1/8/82, page 8 of 10, Figure 6, re: allowable load for Hilti bolt -- (see answer 3, pages 11-12)

Attachment F -- 4/19/84 letter with relevant attachments, from L. M. Popplewell, Project Engineering Manager, TUGCO, to Ms. Nancy Williams, Project Manager, Cygna Energy Services, advising Cygna that Hilti joints perform as a friction joint -- (see answer 3, page 13)

The preceding CASE's Answer to Applicants' Statement of Material Facts As To Which There Is No Genuine Issue was prepared under the personal direction of the undersigned, CASE Witness Mark Walsh. I can be contacted through CASE President, Mrs. Juanita Ellis, 1426 S. Polk, Dallas, Texas 75224, 214/946-9446.

My qualifications and background are already a part of the record in these proceedings. (See CASE Exhibit 841, Revision to Resume of Mark Walsh, accepted into evidence at Tr. 7278; see also Board's 12/28/83 Memorandum and Order (Quality Assurance for Design), pages 14-16.)

I have read the statements therein, and they are true and correct to the best of my knowledge and belief. I do not consider that Applicants have, in their Motion for Summary Disposition, adequately responded to the issues raised by CASE Witness Jack Doyle and me; however, I have attempted to comply with the Licensing Board's directive to answer only the specific statements made by Applicants.

Mark Walsh

(Signed) Mark Walsh

STATE OF TEXAS

On this, the 12 day of August, 1984, personally appeared Mark Walsh, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes therein expressed.

Subscribed and sworn before me on the 12 day of August, 1984.

Samuel W. Nestor

Notary Public in and for the State of Texas

SAMUEL W. NESTOR
My Commission Expires
1-31-85

My Commission Expires: ____________

Structural Design Guide to AISC Specifications for Buildings

Paul F. Rice
Edward S. Hoffman

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CONNECTIONS

General

The latest AISC Specifications permit a wide variety of connections. The basic requirement, appropriate with the sophisticated combinations of different types of steel to be connected, different design requirements of connections, and different means of connections, is a performance requirement consistent with the overall development of the Specifications. This requirement states simply "... that the design of connections be consistent with the assumptions as to the type of construction...." (1.2). Each of the detailed requirements for the design of connections simply builds upon this basic requirement. By implicitly or explicitly requiring that the design of a particular type of connection be consistent with the design assumptions as to the type and amount of force to be transmitted, and rotation capacity (or rigidity) consistent with the rotation assumed necessary to develop the connection forces, the basic performance requirement is completed (1.2).

The Specifications explicitly recognize inelastic behavior in connections of members designed as elastic: "virtually unchanged" angles at the joints in rigid frames, "nonelastic" deformation of parts of connections in Type 2 and 3 construction, and "inelastic rotation" for wind connections with Type 2 construction (1.2). Elastic behavior in the connections of members under plastic design is implicitly recognized (2.1).

Scope

For the purposes of this Chapter, connections are most conveniently considered as classified on two bases; (1) materials used (rivets, bolts, pins, or welds), and (2) the assumed behavior of the connection (design requirements: rigid, semi-rigid, or plastic for moment; shear transmission only; tensile or compressive force only; or combinations). In addition to forming joints between two or more steel members or parts of members, connections are required to elements composed of other structural materials. For composite action with concrete elements not bonded by encasement, shear connections are required (1.11.1). Shear connections may utilize specially designed shear connectors or standard welded stud connectors (1.11.4; 1.4.6). For connection of steel column bases to transmit any direct tension or shear, anchor bolts are required (1.22).

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It is not intended in this chapter to duplicate the design aids, detail data, and examples in the *AISC Handbook*, Part 4, Connections. Equally, space limitations do not permit presentation of a wide range of examples to illustrate even the recently published research in this area. (See "Selected References".) Rather, the purpose here is limited to explanations and illustrations of all applicable Specification requirements that might be overlooked or troublesome in routine work. This aim will include indication of reasonable interpretations to resolve apparent conflicts or ambiguities in the Specifications, and extension of such interpretations where the Specifications seem to have omissions. It has been desirable to extend this aim somewhat in that design aids for bearing plate and base plate connections were included as well as an extension of concrete bearing connection design to cover an apparent gap between the AISC Specifications and the ACI Building Code. During the interim between preparation and publication, AISC specifications were revised to agree with the latest ACI Building Code.

Rivets, Pins, and Bolts

Rivets and Pins. The requirements for the use of rivets and pins were established many years ago and were in many AISC Specifications. Since most of the late research has been directed toward welded, and more recently high-strength bolted connections, there has been little change in the Specifications for the use of rivets. Familiarity with the requirements for, and a sharply reduced use of, rivets in building construction results in little need for interpretations of these Specifications. Rivets of Grades 1 and 2 are available under ASTM A502 (1.4.3). Allowable stresses (for tension and bearing only) are given in Table 1.5.2.1 (1.5.2.1). Net sections for tension members must be used (1.14.2); computed as prescribed (1.14.3); and allowance of $\frac{1}{16}$ in. made plus the nominal diameter of the rivet holes (1.14.5).

The use of pin connections, originally popular in truss construction, has declined in modern steel building, and is usually encountered only for very special situations requiring special design. The general requirements for the use of pins are brief and essentially unchanged from previous Specifications (1.14.6).

Perhaps the most used application of these Specification requirements today will be in alterations or additions to existing buildings in which rivets or pins were used. For new construction, bearing-type connections can not be assumed to share stress with welds (1.15.10). If used in combination, the welds must be designed for the entire stress. In strengthening existing construction, bearing connections can be assumed to carry the in-place loads, and the new welds designed only for the additional stress (1.15.10).

Bolts. Bolts may be classified by strength as (1) low, A307, for F_t = 20 ksi; and (2) high, A325, for F_t = 40 ksi, and A490, for F_t = 54 ksi . . . (1.5.2.1). The ordinary low strength (A307) bolts are usable only in bearing connections (1.5.2.2). The high strength bolts may be designed for either bearing or friction connections (1.5.2.1).

The use of ordinary (A307) bolts is limited by a number of Specification requirements. The allowable stresses are low: tension F_t = 20 ksi on the threaded area; and shear F_v = 10 ksi (1.5.2.1). The slip before full bearing is achieved on a group of ordinary bolts effectively rules out the sharing of stress in a mixed connection. Holes are to be taken as $\frac{1}{16}$ in. larger than the nominal diameter (1.23.4), and the ordinary bolt does not expand to fill out the hole like a driven rivet nor can it be used for dependable friction. Stress sharing may not be assumed between ordinary bolts and rivets or welds (1.15.10; 1.15.11). In addition, low-strength bolts are not permitted in important field connections including column splices in all buildings with $H \geqslant 200$ ft., and where width/height < 0.25; also where width/height < 0.40, for $H \geqslant 100$ ft.; beam-column or column-bracing connections where $H > 125$ ft.; frames carrying cranes with more than five-ton capacity; and connections subject to vibration, impact, or stress reversal (1.15.12); nor for flange-to-web nor cover plate-to-flange connections of built-up girders (1.10.4).

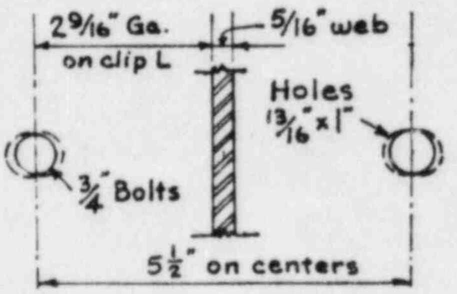
High strength bolts (1.16.1) and welds are considered essentially equivalent as connections, and, for friction-type joints assembled prior to the welding, the high-strength bolts may be assumed to share stress with welds in a mixed connection (1.15.10) or with rivets (1.15.11). Gross sections may be used for the design of compression members (1.14.2), and for the flanges of both built-up and rolled-shape girders provided the area of holes is equal to or less than fifteen percent of gross flange area (1.10.1). For tension members net section area is the basis of design (1.14.2). In friction-type joints resisting direct tension, the shear stress permitted with hi‸ strength bolts must be reduced (1.6.3).

Slotted Holes for Bolted Shear Connections. The use of short-slotted holes is permitted under 1974 AISC Specification for "Structural Joints Using ASTM A-325 or A-490 Bolts," Section 3, subject to the approval of the designer. They can be used in either friction-type or bearing-type connections, provided a washer is installed over the hole.

The normal hole size for a $\frac{3}{4}''$ ϕ bolt is $\frac{13}{16}''$, whereas a short-slotted hole is $\frac{13}{16}''$ deep by $1''$ long (or $\frac{3}{16}''$ longer in the horizontal dimension). While the Specifications state that the hole can be either vertical or horizontal, the authors suggest only the horizontal slotted method be used. End clip holes only would be slotted, not the holes in the connection beam or column. See sketch, a full scale view of the end clip holes and bolt relationship for a typical $\frac{5}{16}''$ thick web.

The advantages to this system are many, several of which are:

1. Greater erection speed with less field burning of misaligned holes.
2. The use of one size clip angle with a set gauge will accommodate web thickness from $\frac{3}{16}''$ to $\frac{9}{16}''$.
3. The reduction in sizes of clips to fabricate and stock should help reduce costs.
4. The speed of erection (and elimination of mill web thickness tolerance problems) should help reduce cost.



Short-slotted holes layout for clip Ls - shear connection

Welds

General. Full penetration groove-welds can be designed for full development, same stress as the base metal (1.5.2.1), by selection of the specified matching electrode and welding process (1.17.2). For all fillet, plug, and slot welds, and partial penetration groove-welds, reduced permissible stresses upon the effective throat area (1.14.7) are specified (1.5.2.1). In no case may the stresses exceed that for the base metal, or if different, the weaker base metal (1.5.2.1).

Special Considerations. A number of minor special considerations arise in the specification of welding. Generally, net sections are not a consideration except for plug and slot welds in which the gross area of the holes is deducted to check the fifteen percent maximum allowed (1.10.1; 1.14.3). The Specifications require preheating for various conditions, including all work when the temperatures are below 32°F (1.23.6). Except for single- and double-angle or similar minor members, welds are to be laid out to avoid eccentric axial force or such eccentricity must be considered in the design of the connection

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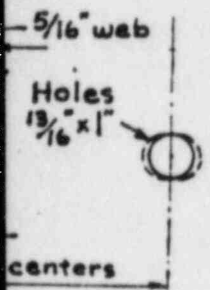

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and the member connected (1.15.3). For the usual shear connection requiring flexibility to accommodate the necessary simple-end rotations assumed, the locations of the welds and the selection of the connection elements must be coordinated (1.15.4).

As previously noted, where welding at high-strength bolted friction-type joints is required as a mixed connection with shared stress, the final tightening of the bolts is required prior to the welding. The *sequence* of completing purely welded connections is also important, though not explicitly covered by the Specifications (1.23.6). The heat generated in the operations of welding creates intense shrinkage strains which, if restrained, leave corresponding residual stresses (1.23.6). These stresses can be relieved by local inelastic yielding, but where local inelastic yielding is also restrained or limited, warping and lamellar tearing* may result. For many welded assemblies, the simple precaution of a specified *sequence* of welding may be employed to balance the strains and to avoid warping. Even after this precaution, certain complex assemblies may be expected to retain adverse residual stresses. For cases where this condition is anticipated or suspected, stress relief by heating must be specified by the Engineer (1.23.6). (Note: this service is not provided unless it has been specified and will normally be an added cost.)

The use of a proper *sequence* to avoid creation of shrinkage stresses or to minimize same can also be specified in many connections where lamellar tearing might occur. Particularly with thicker sections, where both the direction of the shrinkage is completely restrained and the resulting stress is normal to the surface of the section, consideration should be given to the welding sequence. If the condition can not be eliminated by a practicable sequence as a first choice for a solution, it may be possible to relieve the strains without developing large stresses by use of soft wire "cushions" or by revision of the entire connection detail. At least for simple cases it should, of course, be more economical to specify a particular welding sequence. (See Examples this chapter.)

Connection Design

Classification. In addition to the general requirements previously cited for the design of connections, certain arbitrary minimum design requirements for connections have been established. All connections for members carrying calculated stress must be "designed to support not less than six kips" (except lacing, sag bars, and girts), presumably six kips shear in flexural members, six kips tension in ties, and six kips bearing in compression members, all at allowable stress levels (1.15.1). Eccentric connections of axially loaded members are to be designed to transmit the resulting moments as well as the axial force (1.15.2). These minimum requirements naturally become most significant in the design of light members such as axially loaded members in trusses. Connections for such members are required to meet an additional requirement that they transmit the design load or the minimum six kips, whichever is larger, and develop at least half of the effective strength of the member (1.15.7). Note: joists are regarded as a special very limited-size truss in which the minimum connection capacity is simply specified as twice the design load for open web steel joists (4.5); or for the longspan and deep longspan joists, as the design stress or half the allowable strength of the member (103.5b). (See Chapter 4: Joists; Examples.)

As noted previously, connection types may be classified on the basis of the connection method or the design function. Broadly, connections may be described as *flexible* (for the transmission of shear only, 1.15.4), or *rigid* (maintaining the angle between the members connected and transmitting full moment capacity of the most flexible element at the

*"Commentary on Highly Restrained Welded Connections," *Engineering Journal*, AISC, 10, No. 3, 1973.

joint as well as the shear, 1.15.5), or *semi-rigid* (transmitting a pre-determined fraction of the full moment capacity as a rigid joint and further loads in shear as a flexible joint with corresponding angle change to supply rotation for the additional loads, 1.15.5; 1.2).

Flexible Connections. "Flexible" connections are designed to transmit shear without exceeding allowable unit stresses on the connectors as a group or the connection as a whole. The use of an average capacity for each of several connector elements sharing the total load is justified by allowing self-limiting localized stresses determined by an elastic joint analysis to exceed the yield point and create inelastic localized deformations of the connector materials, or by inelastic deformations of the connection elements (1.15.4). The simplest examples of localized deformation occur in the assembly of bearing-type bolted connections where the cumulative tolerances permitted exist on (1) out-of-round in the bolts, (2) oversize holes ($\frac{1}{16}''$), and (3) center-to-center location of the holes in the different elements connected. The extreme degree of such inelastic action occurs with a two-bolt bearing-type connection where one bolt is loosely fitted and one is very tight. Until the material of the connected element surrounding the loaded bolt or the bolt yields and deforms ($+\frac{1}{16}''$), the load is not shared and a 50 percent adjustment will be developed as the load increases. For larger (and thus more important) members, more bolts or rivets will be required and the degree of adjustment required on each will be less. Lesser adjustments are required for a long line of bolts or rivets intended to share stress equally. Even if perfectly fitted, yielding and inelastic deformations occur, maximum at and beginning at the first loaded bolt or rivet, and decreasing to a minimum at the last. (See Figs. 5-1

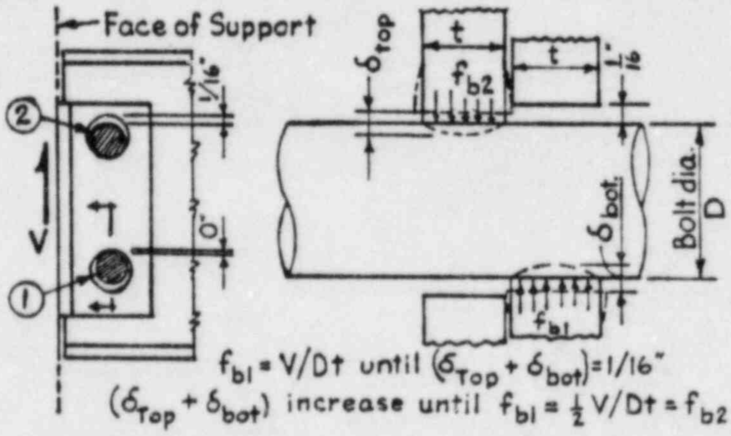


FIG. 5-1 Self-Limiting, Localized Deformations—Two Bolts.

and 5-2.) After this localized inelastic adjustment in the connectors for shear transmission, consider the inelastic adjustments that occur to reduce the "elastic theory" moments.

Inelastic deformation in the connection elements, typically angles, will occur and reduce the restraint which would transmit moment. The common double-angle shear bearing connection is extremely stiff longitudinally for the transmission of shear, and it depends upon the minor inelastic bearing deformations around each fastener to equalize the shear stresses in the fasteners. The same double-angle member is relatively flexible and will twist to permit a relatively large angular rotation reducing moment transmission. (See Fig. 5-3.)

Experience and tests confirm the practical assumptions of shear transfer only and the

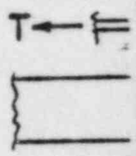


FIG. 5-2 Self-Li

FIG. 5-3 Self-Limi Angles.

use of an average s
served in one series
limits correspondin
mately the same for
Figure 5-4 presents
reported from thes
"s" (see Fig. 5-3)
support. Coping t
and required angle
deep connections.

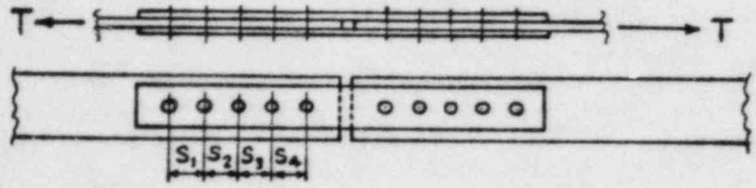
For Type 2 const
design drawings; al
capacity for the se
signed for one half

[1]"Moment-Rotation
neering Journal, AISC

e-determined fraction of
r as a flexible joint with
oads, 1.15.5; 1.2).
transmit shear without
or the connection as a
tor elements sharing the
etermined by an elastic
zed deformations of the
tion elements (1.15.4).
sembly of bearing-type
ist on (1) out-of-round
tion of the holes in the
tic action occurs with a
and one is very tight.
bolt or the bolt yields
ment will be developed
rs, more bolts or rivets
be less. Lesser adjust-
re stress equally. Even
mum at and beginning
he last. (See Figs. 5-1

Bolt dia. D
16"
Dt = f_{b2}
Bolts.

tors for shear trans-
the "elastic theory"
s, will occur and re-
ble-angle shear bear-
on of shear, and it
fastener to equalize
is relatively flexible
oment transmission.
ansfer only and the



Inelastic deformations occur successively in the plates at each fastener and in the fasteners, beginning and largest at the first loaded, and continuing until the elastic strains in the spaces s_1, s_2, s_3, and s_4 become proportional to equal stress in all fasteners.

FIG. 5-2 Self-Limiting Deformations—Axial Stress on Line of Separate Fasteners.

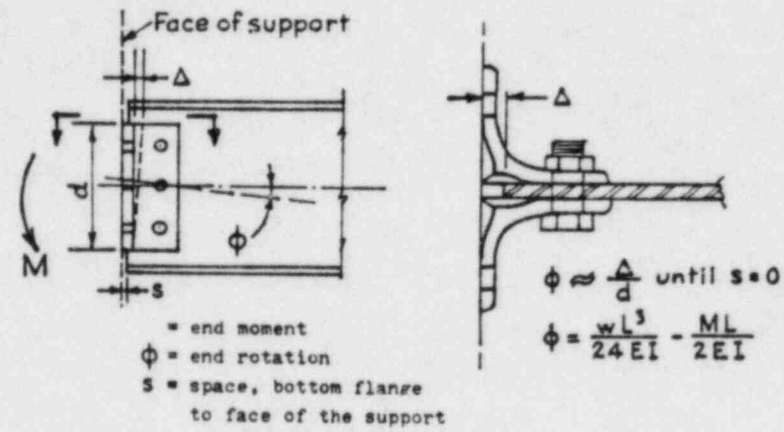


FIG. 5-3 Self-Limiting Deformation (Twist) in the Connection Elements (⌋⌊) Two Angles.

use of an average shear stress per unit weld or separate fastener. The actual rotations observed in one series range from 0.84 to 0.97 times Φ_0, the "simple beam rotation." These limits corresponding to moments ranging from three to sixteen percent were approximately the same for a single end plate connector or the common double-angle connector.[1] Figure 5-4 presents the usual device for an approximate analysis. An additional caution reported from these tests is that the moment stiffness increases abruptly when the space "*s*" (see Fig. 5-3) closes and the lower flange transmits compression to the face of the support. Coping the bottom flange where a quick analysis of the proportions of depth and required angle change show the usual clearance to be inadequate may be desirable for deep connections.

For Type 2 construction (flexible connections) all the reactions should be shown on the design drawings; alternatively, only those exceeding one half the tabulated uniform load capacity for the sections used, together with a general note that connections shall be designed for one half the capacity unless otherwise noted, should be shown.

[1] "Moment-Rotation Characteristics of Shear Connections," Kennedy, October, 1969, 6, No. 4, *Engineering Journal*, AISC.

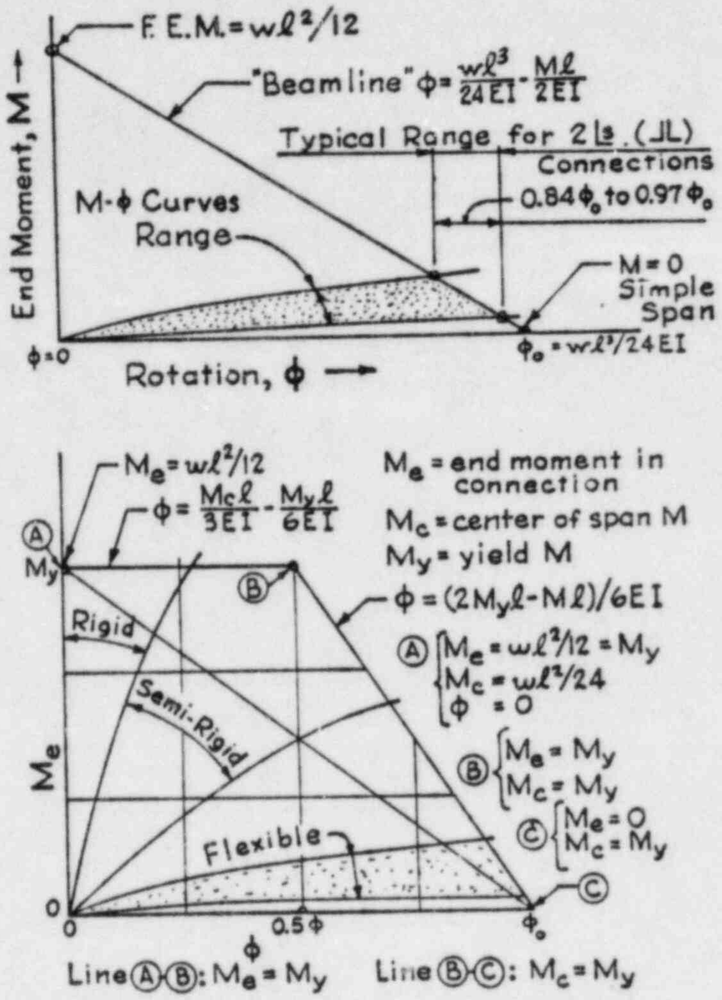


FIG 5-4 Uniformly Loaded Elastic Beam Line—Rotations at Connection.

Rigid Connections (Type 1 Construction). The AISC Specifications requirement is quite realistic: that rigid connections hold the original angles "virtually" unchanged (1.2). This requirement in elastic design is usually satisfied by connections designed to develop the full section of the flexural member or the full moment at yielding of the more flexible member connected. It will be noted from Fig. 5-4 that the rigid frame analysis ($\Phi = 0$ at the allowable stress) may be satisfied by such a connection which would have a very small rotation at 0.66 to $0.60F_y$, but would be capable of a significant rotation at yielding of the flexural member (line A-B).

A diagram similar to Fig. 5-4 but with point A representing an end moment, $M_e = M_p$, and point C, a center span moment, $M_c = M_p$, can be prepared for plastic design. Connections capable of achieving full collapse load (hinges at both ends and center of span) would be required to reach $\Phi = 0.5\Phi_0$, point B. The simpler concept of "plastic redesign," where only end hinges are required to form at the factored load, would require connections with a somewhat less rotation capacity, along line A-B. See Fig. 5-5.

Semi-Rigid Connections (Type 3 Construction). (See Fig. 5-4.) Ideally, the semi-rigid connections for Type 3 construction will behave elastically between the $\Phi = 0$ ordinate

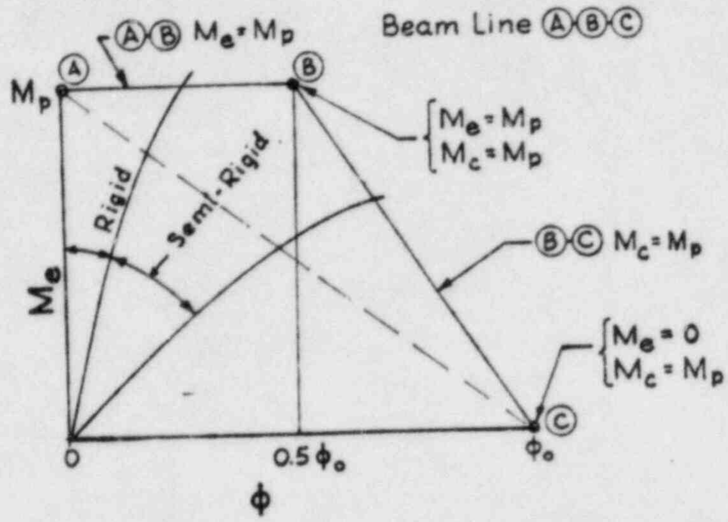


FIG. 5-5 Uniformly Loaded Plastic or Rotations at Connection.

and the "rigid" connection up to a predetermined end moment. Upon reaching this predetermined end moment (M_y for the connection), a rotation capacity sufficient to develop the yield moment at the center of the span, $M_c = M_y$, should be available. In practical cases where the nearest available rolled section will be above the design capacity required, the excess capacity will be provided at the midspan. As in plastic redesign, end hinges only will form at the full design load. Since these hinges are designed for $M_e = M_y$, more rotation capacity is required (to cross line B-C).

Masonry Bearing Connections

General. The AISC Specifications provide very conservative allowable stresses for bearing on masonry and concrete which apply in the absence of Code (statutory Building Code) regulations (1.5.5). For all masonry laid up in mortar, most statutory codes also provide low allowable stresses. Usually, codes distinguish among solid masonry units, bricks or block, and hollow units as well as among different classes of mortar and masonry materials. Values so prescribed range in general from 50 psi to 400 psi. The AISC Specification is therefore seldom applicable since it includes only stone masonry, $F_p = 0.400$ ksi, and brick laid in "cement" mortar,* $F_p = 0.250$ ksi (1.5.5). *The authors recommend use of the masonry bearing values prescribed in local Codes or those recommended by national associations dealing with masonry products.* For bearing stresses on concrete, the AISC Specifications, $F_p = 0.35 f_c'$ on the full area and $F_p = 0.35 f_c' \sqrt{A_2/A_1} \leq 0.70 f_c'$ on fractions of the area, utilize recent ACI Building Code (ACI 318-71) refinements for economy.** The ACI Building Code is of course usually applicable under local statutory codes. *For beam-bearing plates and column base plates on concrete, the authors recommend the use of bearing values prescribed by the ACI Building Code.*

Beam Bearing Plates. The approved design (Chapter 2, pp. 82-83, *AISC Handbook*) for beam bearing plates is the formula:

$$t = \sqrt{3 f_p (n)^2 / F_b}$$

(*Continued on page 274*)

---

*All mortars utilize cementitious materials and the term "cement" can be quite properly applied to all.

**Supplement No. 3, 1974.

FOR OFFICE AND ENGINEERING USE ONLY

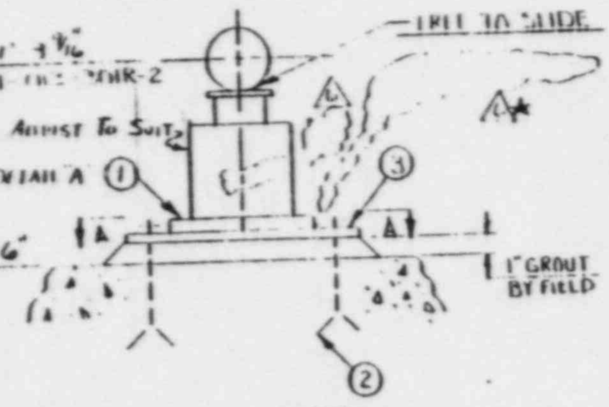
ATTACHMENT B

BLUELINE 1-5-81

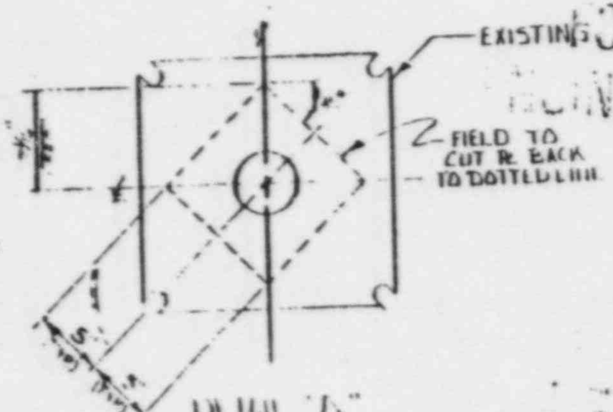
AS-BUILT

VENDOR CERTIFIED DRAWING REV. NO. 6, DATE 6/11/80

FIELD ADJUST TO SUIT. SEE DETAIL A



ELEV. LKG. NORTH



DETAIL "A"

FOR OFFICE AND ENGINEERING USE ONLY

BRP Iso. CT-1-SB-OP. [illegible]
Data Point [illegible]
Pipe Mat'l. [illegible]
Insul. — Bldg. SB

NOTE:

4) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA [illegible]

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
	PIPE SUPPORT CONSISTING OF	ONE	
1	#13 "F" Fig. 82 w/Travel Stops w/Load Flange. Hot Load 2943#, Cold Load [illegible] w/ Load Column Extended 1 1/2"	1	
2	3/4" x 10" Hilti Kwik Concrete Anchors, TW-5A	4	
3	[illegible] SEE SECTION "AA"	1	
	HANGER ASSEMBLY SKETCH & ENGINEERING BUNDLE & TAG MARKS CT-1-013-006-S22S		
	Apply one coat of Carbo Zinc #11 to above material except threads which shall be coated with rust preventative.		

REV	DATE	DWN	CHK	APP	DESCRIPTION
[illegible]	[illegible]	[illegible]	[illegible]	C	REV. [illegible]

Approved By: [illegible]
Date: [illegible]

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc

REF. DRAWING NUMBERS

PIPE: [illegible] ELECTRICAL: [illegible]
STEEL: [illegible] HVAC: [illegible]

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET						
EMERGENCY						
FAULTED						

REV	DATE	DWN	APP	DESCRIPTION
[illegible]				ISSUED FOR CONST

MOVEMENTS

X	[illegible]
Y	[illegible]
Z	[illegible]

NORM OPER DISPL.	
DX	[illegible]
DY	
DZ	

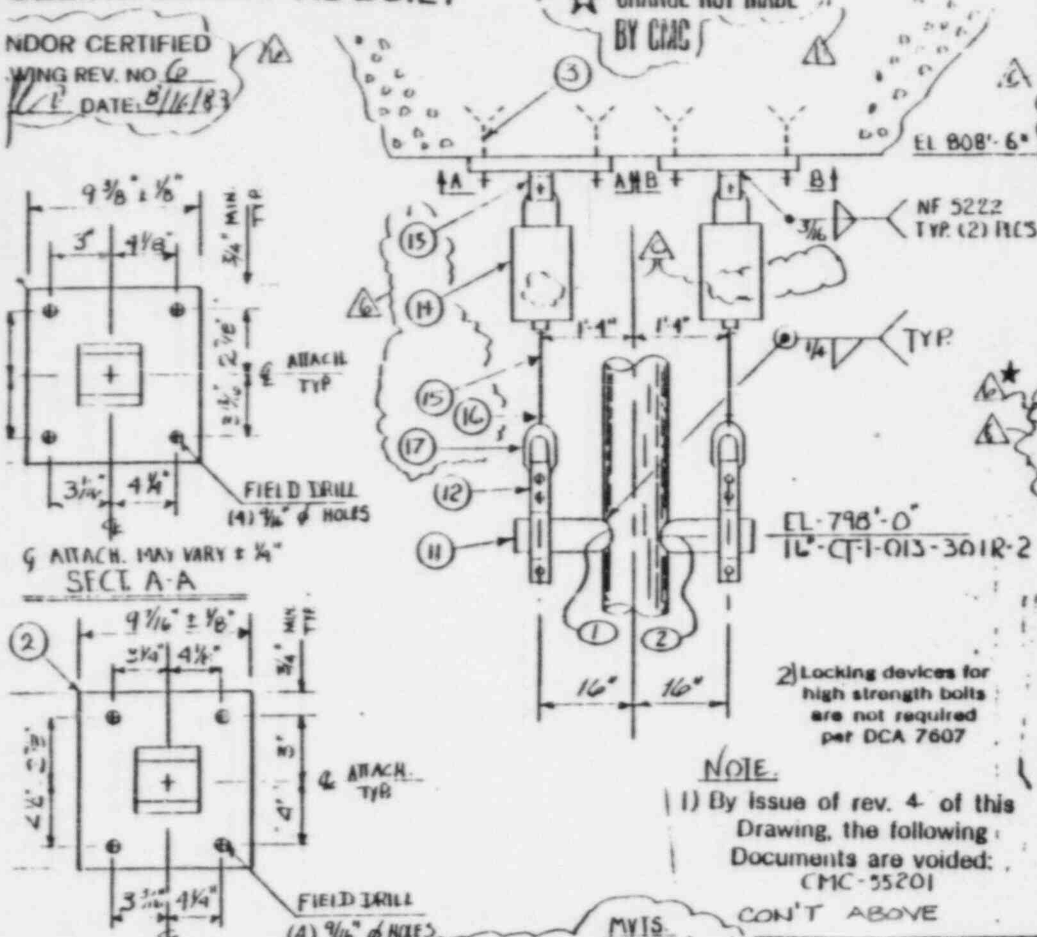
THIRD PARTY INSPECTION
CODE CLASS: ASME-III CLASS 2

CUSTOMER Texas Utilities Services, Inc.
ORDER OR CONT. NO. CP-0046A
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-006-S22S
SKETCH NO.
SHEET 1 OF 2 REV. 4

FOR OFFICE AND ENGINEERING USE ONLY

UELINE 10-9-81 AS-BUILT

NDOR CERTIFIED
WING REV. NO. 6
DATE 8/16/83



2) Locking devices for high strength bolts are not required per DCA 7607

NOTE.
1) By issue of rev. 4 of this Drawing, the following Documents are voided:
CMC-55201

CON'T ABOVE

NORM. OPER. DISPL.	
DX	+.076"
DY	+.0107"
DZ	-.02"

MVTS.
X = +.272 / -.046
Y = +.340 / -.084
Z = +.019 / -.142

SEE B&RL FOR HGR. LOC.

LOCATION PLAN

B&RL Iso. CT-1-SB-08 R.1
I.P.D. Iso. CT-1-SB-08 REV.3
Data Point 254 / PROB. AP21-32 R.0
Pipe Mat'l. SA-358, CL.1, TP 304
Insul. ——— Bldg. SB

4802

ITEM NO.	MATERIALS & OPERATIONS	QUAN.
1	1/2" C.S. IP PER SECT. A-A (SA 36 / SA 515 GR 65)	1
2	1/2" C.S. IP PER SECT. B-B (SA 36 / SA 515 GR 65)	1
3	1/2" x 5 1/2" HILTI-KWIK BOLT (3 3/4" MIN EMB)	8
4	BBD-05 WELD BEAM ATTACH (SA-36)	2
5	VSB-07 VARIABLE SPRING, HL = 556 CL = 572 MVT. .052" UP W/ TRAVEL STOPS	2
6	RET-05 END THREADED ROD 9'-6 3/4" LG.	2
7	REN-05 WELDLESS EYE NUT (A668-B)	2
8	FIN-5/8 HEX HEAD NUT	4
9	PHM 16" O.D. ... STOCK ... w/ 3/4" NUTS (SA-36)	1
10	1"x 1 1/2"x 1 1/2" STAINLESS STEEL (SA-240, TY 304) 1 1/2" LG. PER SECT. C-C	4
11	8" SCH 40 STANCHION 12" LG. FIELD TRIM TO SUIT (ASTM 358 / SA-312 TY 304)	2
12	PTC-080-0308 PIPE CLAMP (SA-36)	2
13	EFD-06 WELDED BEAM ATTACH (SA 36)	2
14	VSP-10 VARIABLE SPRING SUPPORT w/ TRAVEL STOPS, HL = 1177 CL = 1212, MVT. = .057 UP	2
15	PTT-06 ROD = 3/4" ϕ x 9' 3" T.S. (FIELD CUT TO SUIT) (SA 36)	2
16	FHN-3/4" HEAVY HEX NUTS (A 563 GR. A)	4
17	REN-06 WELDLESS EYE NUT (A 668 GR. C)	2

REV	DATE	DWN	CHK	APP	DESCRIPTION
4					REV'D AS NT'D. ~ REF: FMH SRI SEE NT. 1
5					REV'D AS NT'D; REF: CMC 61288 R3, DCA 7607, NT 2, AS BUILT
6					AS-BUILT REF: ...

MARK # CT-1-013-004-S32S
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

THIRD PARTY INSPECTION YES ☒ NO ☐
CODE CLASS: ASME-III CL 2

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

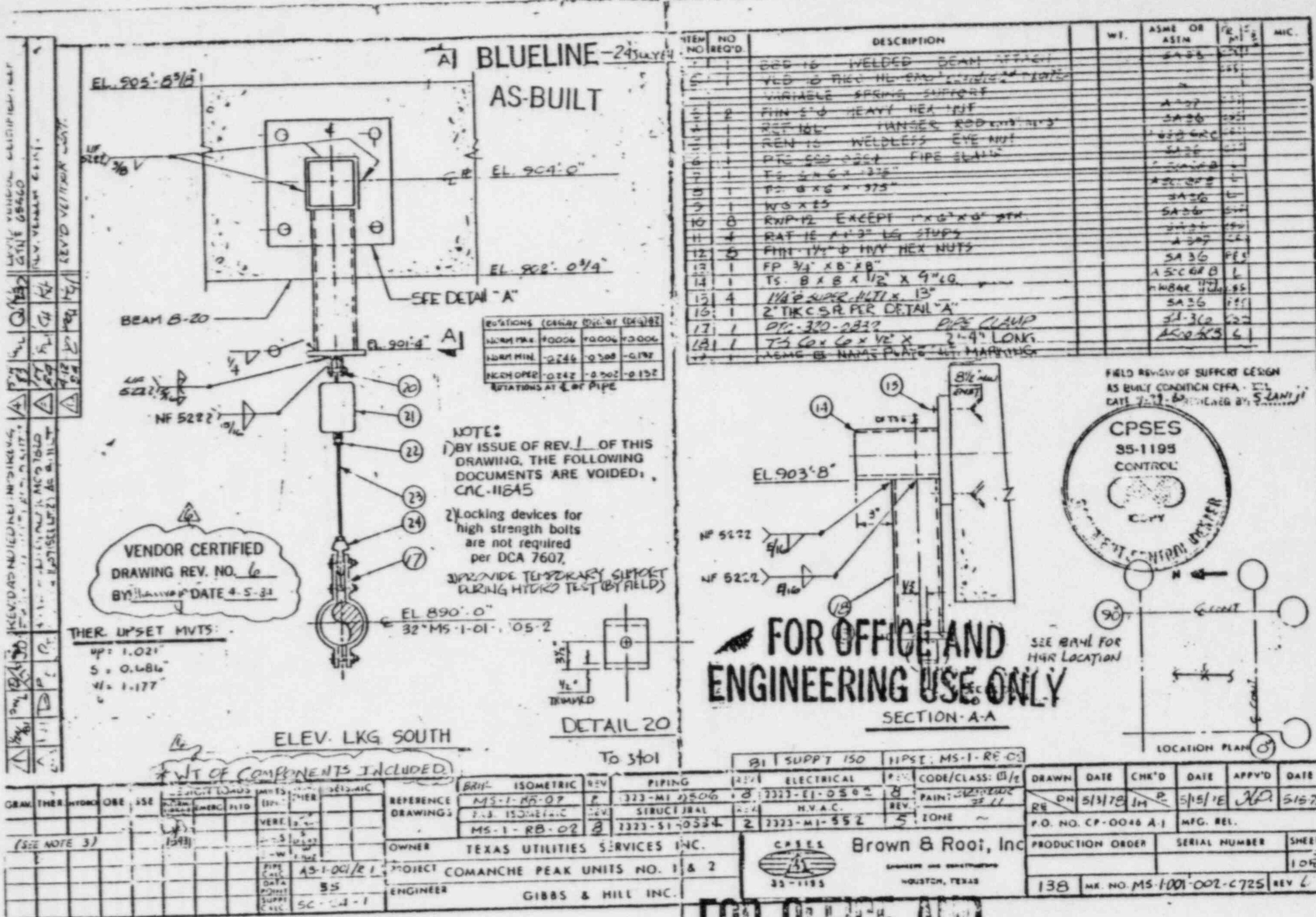
REF. DRAWING NUMBERS
PIPE: M1-0605-REV.14 ELECT: E1-0001-01, R4
STEEL: S1-0605-REV.9 H.V.A.C.: M1-0051-R..

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN		-2242				
NORMAL & UPSET						
EMERGENCY						
FAULTED						

REV	DATE	DWN	APP	DESCRIPTION
0	6/30/78	T.G.		ISSUED FOR CONST.
1	9/6/80			REVISED AS NOTED REF. ... MARK NO. WAS S32
2				REV'D. AS NT'D. - REF. F.M.H.S., ... MARK WAS CT-1-013-004-S32S
3				REV'D AS NOTED REF MK# WAS CT-1-901-001-S32S

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Coman[illegible] Peak 1 & 2
MARK NO. CT-1-013-004-S32S
SKETCH NO.
SHEET 1 OF 1 REV. 6

FOR OFFICE AND ENGINEERING USE ONLY



ROTATIONS	(DEG)	(DEG)	(DEG)
NORM MAX	+0.006	+0.006	+0.006
NORM MIN	-0.246	-0.308	-0.192
NORM OPER	-0.242	-0.302	-0.192

ITEM NO	NO REQ'D	DESCRIPTION		WT.	ASME OR ASTM		MIC.
1	1	BDB 16 WELDED BEAM ATTACH			SA 36		
2	1	VLD 8 FIG. HL EMD					
		VARIABLE SPRING SUPPORT					
3	2	FHN 1" Φ HEAVY HEX NUT			A 307		
4	1	RST 16L HANGER ROD			SA 36		
5	1	REN 16 WELDLESS EYE NUT					
6	1	PTC 550-0254 PIPE CLAMP					
7	1	TS 6 x 6 x .375"					
8	1	TS 8 x 6 x .375"			SA 36		
9	1	W8 x 15			SA 36		
10	8	RWP-12 EXCEPT 1" x 6" x 6"					
11	4	RAT 12 x 1'-3" LG STUDS			A 307		
12	8	FHN 1 1/4" Φ HVY HEX NUTS			SA 36		
13	1	FP 3/4" x 8" x 8"			A 500 GR B		
14	1	TS. 8 x 8 x 1/2" x 9" LG.					
15	4	1 1/4" Φ SUPER KLTI x 13"			SA 36		
16	1	2" THK C.S.R. PER DETAIL "A"			SA 36		
17	1	PTC-320-2832 PIPE CLAMP					
18	1	TS 6 x 6 x 1/2" x 2'-4" LONG			A 500 GR B		
	1	ASME NAME PLATE MARKING					

* WT OF COMPONENTS INCLUDED

REFERENCE DRAWINGS	BRII ISOMETRIC MS-1-RB-07, REV 8; F.S. ISOMETRIC; MS-1-RB-02, REV 8
PIPING	2323-MI-0506, REV 8
STRUCTURAL	2323-S1-0534, REV 2
ELECTRICAL	2323-EI-0505, REV 8
H.V.A.C.	2323-MI-552, REV 5
BI	SUPP'T 150
HPSI	MS-1-RE-03
CODE/CLASS	2
ZONE	~
PIPE CALC	AS-1-001/R1
DATA POINT	55
SUPP'T CALC	SC-24-1
OWNER	TEXAS UTILITIES SERVICES INC.
PROJECT	COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER	GIBBS & HILL INC.

(SEE NOTE 3)

CPSES 35-1195

Brown & Root, Inc

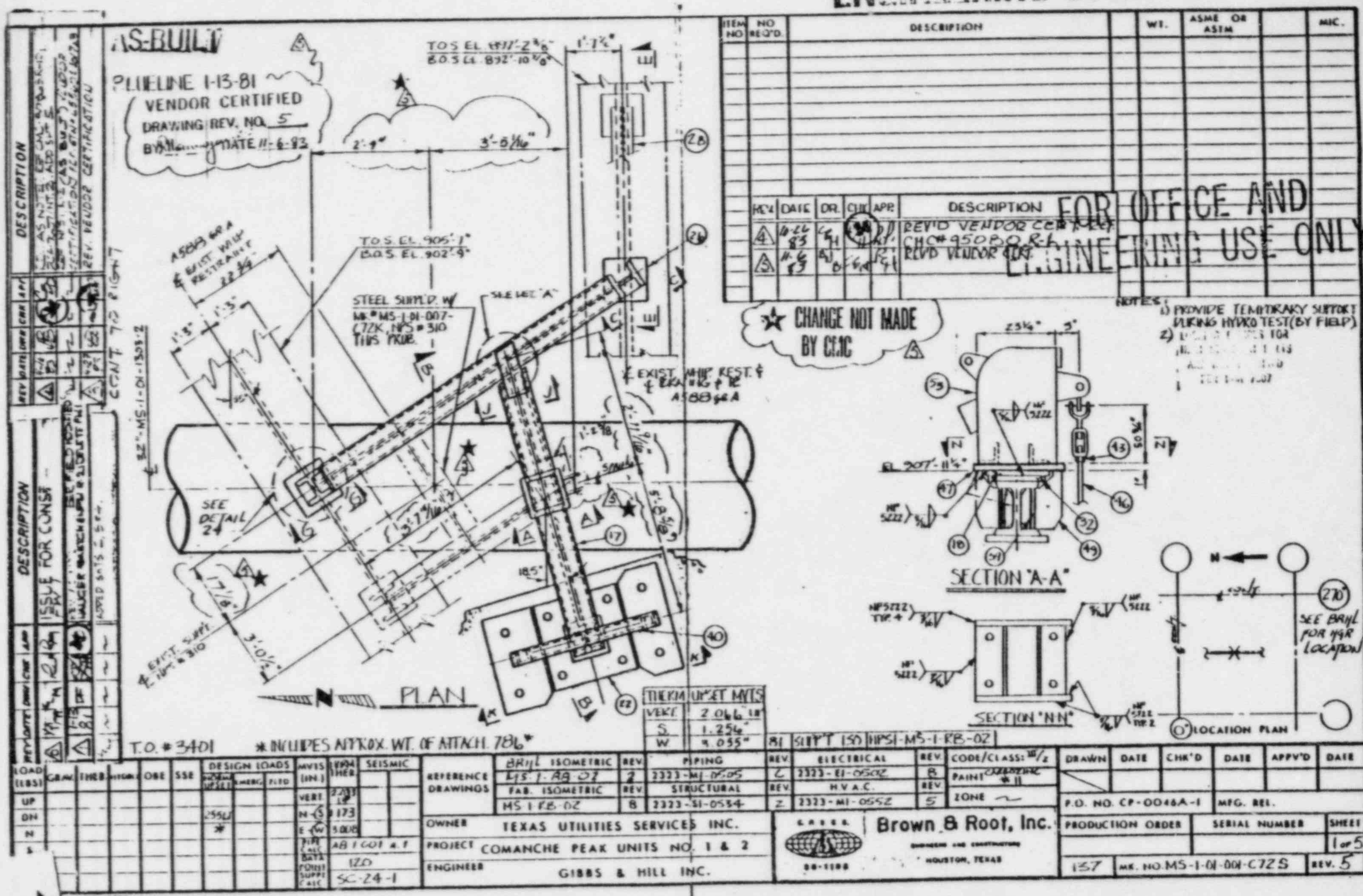
HOUSTON, TEXAS

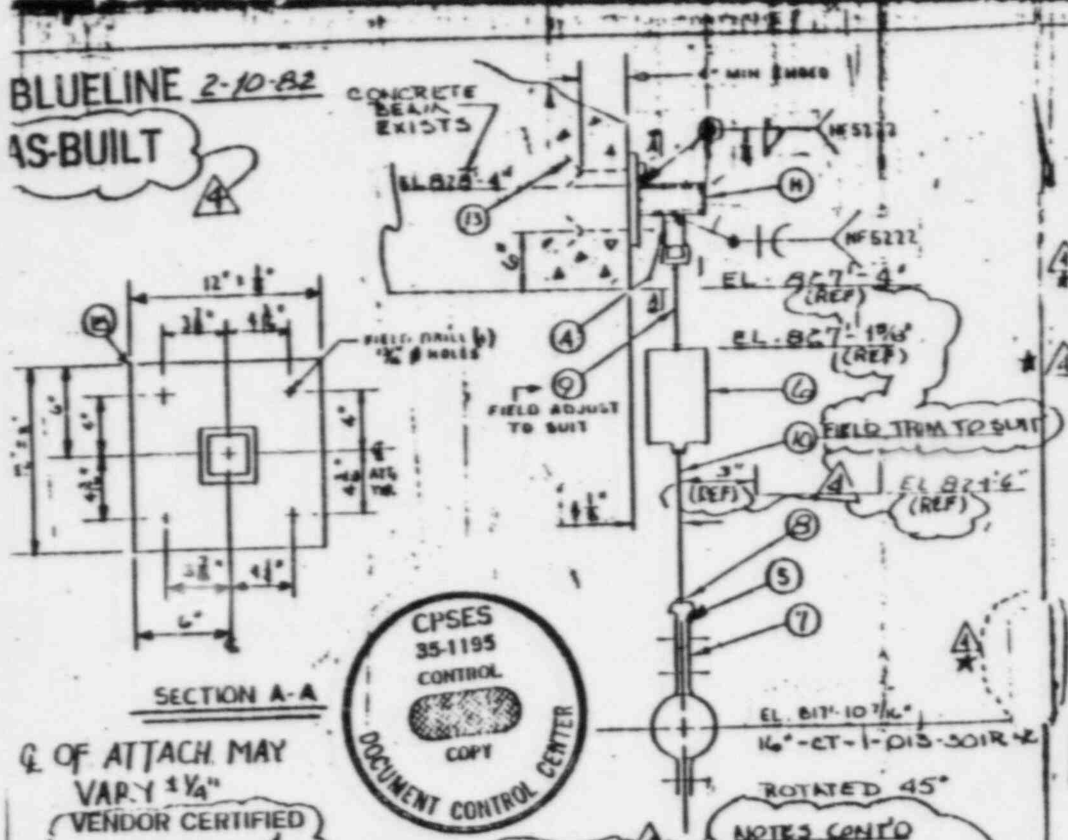
DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
DN	5/3/78	JH	5/15/78		5/15/78

P.O. NO.	CP-0046 A-1
MFG. REL.	
PRODUCTION ORDER	
SERIAL NUMBER	
SHEET	1 OF 2
138	MK. NO. MS-1-001-002-C725
REV	6

FOR OFFICE AND ENGINEERING USE ONLY

FOR OFFICE AND
ENGINEERING USE ONLY





VENDOR CERTIFIED
DRAWING REV. NO. 4
BY. [illegible] DATE 11/15/83

NOTES CONT'D
6) Locking devices for high strength bolts are not required per DCA 7637

NOTES (cont)
5) BY ISSUE OF REV. 3 OF THIS DRAWING, THE FOLLOWING DOCUMENTS ARE VOIDED:
CMC 73447

BRHL 150-CT-1-SB-08 R-1
T.P.D. Iso. CT-1-SB-08 R-1
Data Point [illegible]
Pipe Mat'l. SA-358 CL. 1 TP304
Insul. ____ Bldg. S

NOTES
4) BY ISSUE OF REV. 2 OF THIS DRAWING, THE FOLLOWING DOCUMENTS ARE VOIDED:
CMC 33089

★ NOT CHANGED BY CMC

NORM. OPER. DISPL.	
DX	+0.047
DY	+0.150
DZ	-0.080

MOVEMENTS		
X	+0.202	-0.091
Y	+0.796	-0.131
Z	+0.070	-0.450

TO. # 4802

SEE BRHL FOR H&S LOCATION
LOCATION PLAN

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	CBS	PRIM	SEC	PAN/DC
	HANGER ASSEMBLY CONSISTING OF:	ONE								
	MATERIAL EXISTS									
1	~~Carbon Steel (SA515 GR.65 or SA 36) Plate/~~	~~1~~			X			X		
	~~Detail A, TW-14#~~									
2	~~5/8" x6" Hilti Kwik Concrete Anchors, TW-2#~~	~~4~~					X			
3	~~W6x15 (SA 36) 0' 5 3/4" long, TW-1#~~	~~1~~				X		X		
4	1 1/4" Fig. 66N W/Load Pin Steel Attachment	1					x			
5	1 1/4" Fig. 290N Eye Nut	2					x			
6	#15 "A" Fig. 98N W/Travel Stops. (Hot Load-5471#, Cold Load-[illegible])	1					x			
7	16" Fig. 295HN Pipe Clamp	1					x			
8	1 1/4" Hex Nuts (SA-307 GRB)	4					x			
9	1 1/4" [illegible] Fig. 140N W/Thread Full LEngth	1					x			
10	1 1/4" [illegible] Fig. 140N W/12" Thread Both Ends	1					x			
	HANGER ASSEMBLY SKETCH AND ENGINEERING	1								
	BUNDLE AND TAG	1								
	MARK # CT-1-013-002-S42S									
	16" OT N.D.E./PAR 2.5.1 of the Unit Price Structure									
	Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative									
11	W6 x 12 x 5" LG (SA-36)	1			X			X		
12	3/4" x 1'-0" x 1'-0" LG C.S. ℞ (SA-36) per SEC A-A	1			X			X		
13	3/4" Ø x 7" LG HILTI ANCHOR	4					X			
14	TS 5" x 5" x 1/2" (A500 GR B) x 6" LG.	1				X		X		
15	3/4" ℞ (SA36/SA515 GR 65) PER SEC A-A	1			X			X		

Approved By: DCP
Date: 1/29/78

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ____ SHEET ____ OF ____

Brown & Root, Inc.

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN		5364				
NORMAL & UPSET						
EMERGENCY						
FAULTED						

REF. DRAWING NUMBERS
PIPE: A1-0616 REV. 13 ELECT: [illegible]
STEEL: A1-0608 REV. 4 H.V.A.C.: [illegible]

REV	DATE	DWN	CHK	APP	DESCRIPTION
4					REV AS NTD REF PM45 R 1; SEE NT#5
					REVISED AS NTD; REF CMC; DCA 7637; AS BUILT
					VENDOR CERTIFICATION; REF GTN 62726

REV	DATE	DWN	APP	DESCRIPTION
0				ISSUED FOR CONST. F.W.
1				IFC F.W. & REVISED AS NOTED
2				REV'D AS NOTED, REF: FIELD MODIFIED HANGER SKETCH. SEE NT. 4, DELETED F.W. 2 & REF ITEMS

THIRD PARTY INSPECTION
CODE CLASS: ASME-III-CL 2

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-002-S42S
SKETCH NO.
SHEET 1 OF 1 REV. 4

FOR OFFICE AND ...

AS-BUILT

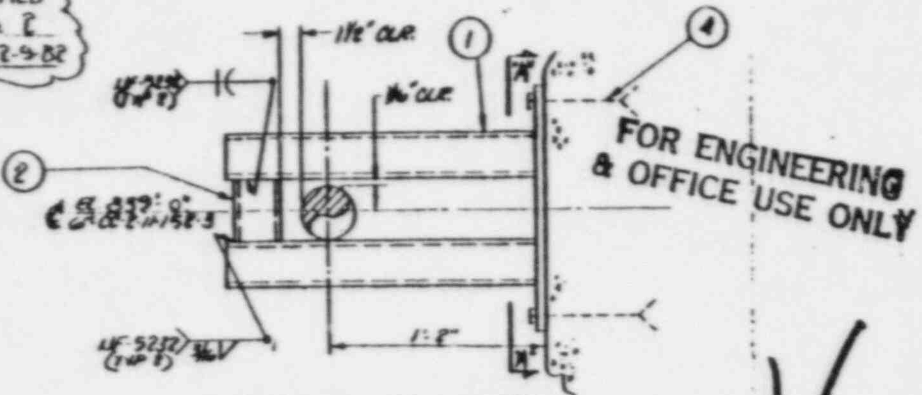
VENDOR CERTIFIED
DRAWING REV. NO. 2
BY BH DATE 12-9-82

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION
1	2	3x3x1/4x1'-10" TUBE A500 GR.B
2	1	3x3x1/4x0'-6 7/16" TUBE A500 GR.B
3	1	PL 5/8" / SECT. A-A (SA-515 GR.65)
4	4	5/8" x 6" HILTI-KWIK CONCRETE ANCHORS

APPLY ONE COAT OF C. PO. SPEC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE.

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	REV'D AS-BUILT PER CMC 80517 R.D		TER	Q	CBD
	VENDOR CERTIFICATION, CIN# 39790	~	~	~	

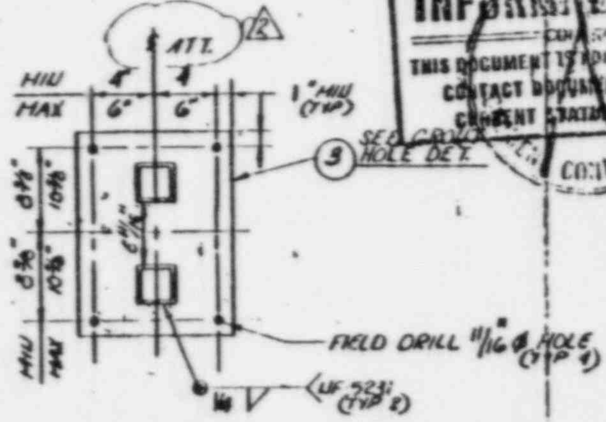
FOR ENGINEERING & OFFICE USE ONLY



ELEVATION LKG NORTH

INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.

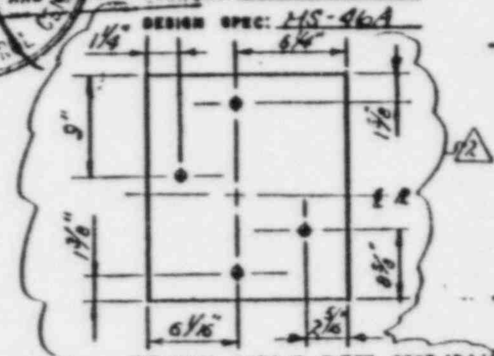
ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A



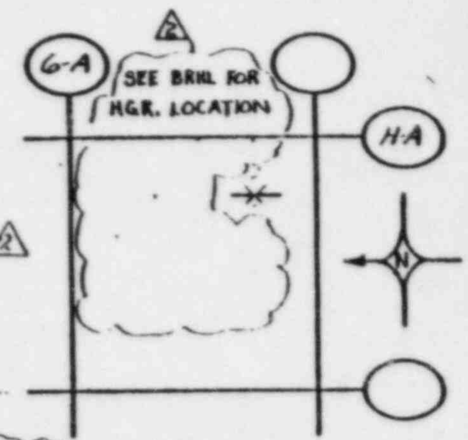
NOTE:
1. LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7603

T.O. 21100

SECTION "A-A"



GROUT HOLE DET. PROB. AB+LGC R.D



LOCATION PLAN

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS INCHES
2082	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	—					
N-S	—	—	—	—	—	
E-W	—	—	—	—	—	

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS	BRHL ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-031	0	M1-0702	8	E1-0702	8
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-031	0	S-0718	5	M1-0755	6

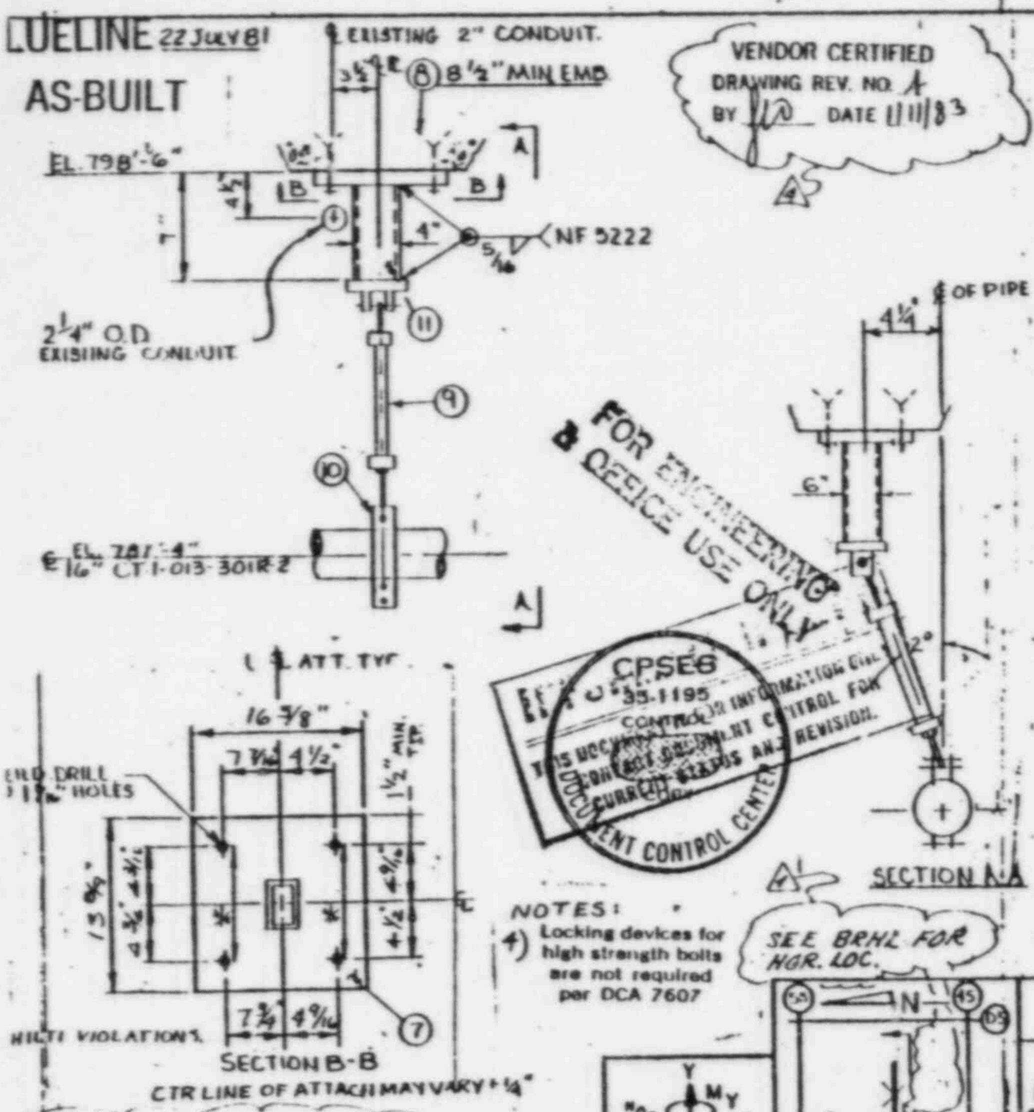
REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	REV. AS NOTED; REF. DCA 7607 (SEE NFI)	5-21-81	DMH	JW	
	ADD FMI-#1, CMC-35676, R.2, AS-BUILT				
0	IFC	12-27-79	C.A.T.		

Brown & Root, Inc.
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 35-1195

SUPPORT NO. CC-2-011-719-A23R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND



BRHL Iso. CT-1-SB-08 Rev. 1
B.R.P. Iso. CT-1-SB-8 Rev. 3
Data Point 230 / PROB (18-1-32 R.0
Pipe Mat'l. SA 358 & 1-TP 304
Insul. — Bldg. SA

T.O. 4802

THIRD PARTY INSPECTION
CODE CLASS: ASME III-2

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	C55	PRIM	SEC	AISC
7	1 1/4" C.S. PL Per Sec. B-B (SA 515 GR 65 OR SA 36)	1			X			X		
8	1"x 12" HILTI KWIK CONC. ANCHOR	4					X			
9	SRS-20-RO SWAY STRUT C.C. 8'-10"	1					X			
10	SRC-20-160 PIPE CLAMP	1					X			
11	3/8" x 6" x 4" x 0'-5 3/4" LONG. STRUCTURAL TUBING (A-500 G-B)	1				X		X		

REV	DATE	DWN	CHK	APP	DESCRIPTION
4	1/11/83		Q		VENDOR CERTIFICATION REF. GTN 62726

MARK # CT-1-013-011-S22R
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. — SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

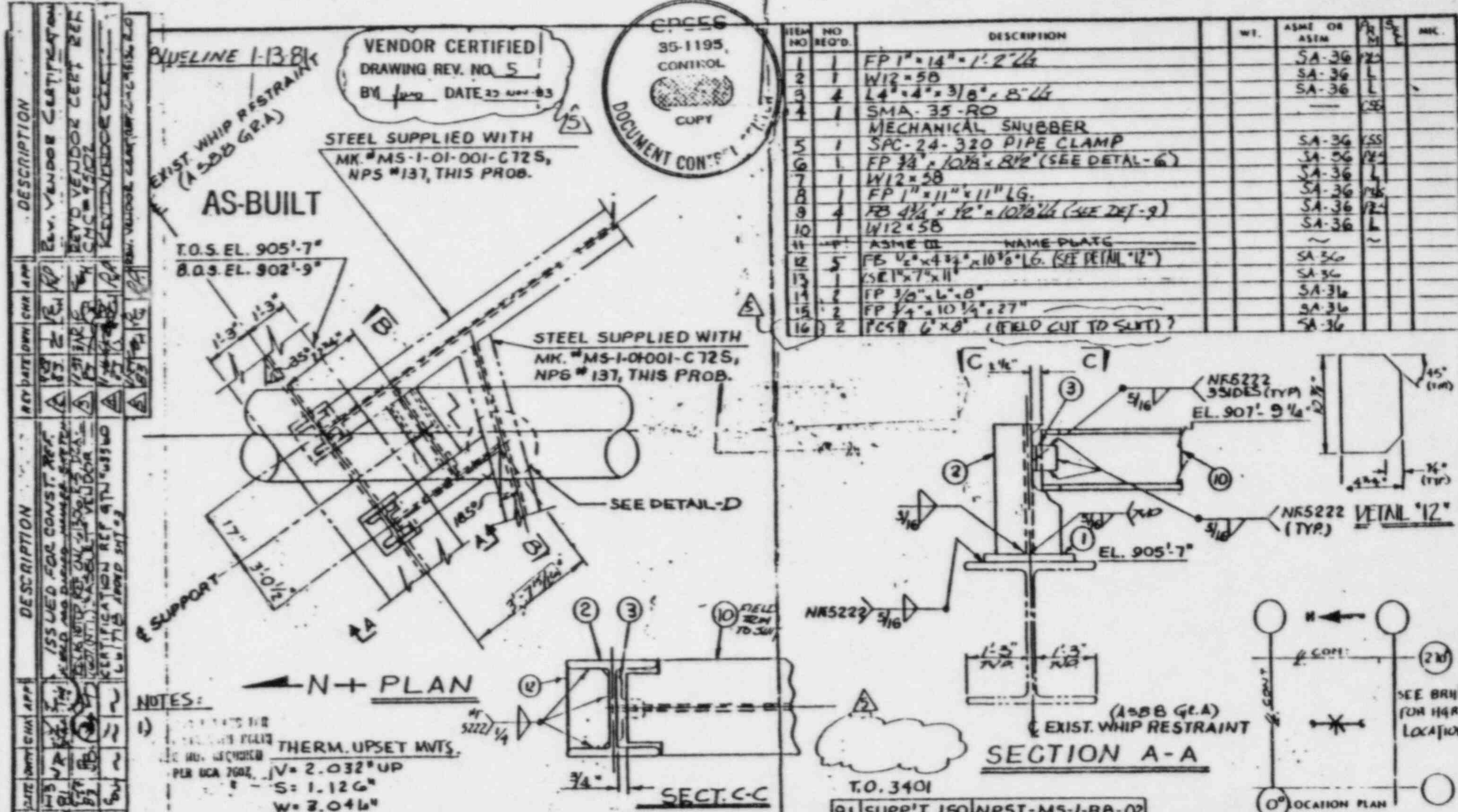
REF. DRAWING NUMBERS
PIPE: MI-0600 Rev. 11 ELECT: EI-0600 R12
STEEL: SI-0600 Rev. 17 H.V.A.C.: HI-0650 R11

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN		-3163 / -3605				
NORMAL & UPSET		-6081 / -1749				
EMERGENCY		[illegible]				
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	5-19-80		WK		ISSUED FOR CONST.
1					REVISED AS NOTED PER ITT REV. 1
2					REV'D AS NOTED REF ITT REV. 3 CMC 53215, F.M.H.S.
3	1-1-83				REV'D AS NTD REF CMC PSA 7407 (ADD NT 4) AS-BUILT

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-011-S22R
SKETCH NO. —
SHEET 1 OF 1 REV. 4

FOR OFFICE AND ENGINEERING USE ONLY



ITEM NO	NO REQ'D.	DESCRIPTION		WT.	ASME OR ASTM	P.R.M.	S.E.C.	MK.
1	1	FP 1" × 14" × 1'-2" LG			SA-36			
2	1	W12 × 58			SA-36	L		
3	4	L4" × 4" × 3/8" × 8" LG			SA-36	L		
4	1	SMA-35-RO MECHANICAL SNUBBER			—	CSS		
5	1	SPC-24-320 PIPE CLAMP			SA-36	CSS		
6	1	FP 3/4" × 10 7/8" × 8 1/2" (SEE DETAL-6)			SA-36			
7	1	W12 × 58			SA-36	L		
8	1	FP 1" × 11" × 11" LG.			SA-36			
9	4	FB 4 1/4" × 1/2" × 10 7/8" LG (SEE DET-9)			SA-36			
10	1	W12 × 58			SA-36	L		
11	1	ASME III NAME PLATE			~	~		
12	5	FB 1/2" × 4 3/4" × 10 3/8" LG. (SEE DETAIL "12")			SA-36			
13	1	(SE) 1" × 7" × 11"			SA-36			
14	2	FP 3/8" × 6" × 8"			SA-36			
15	2	FP 1/4" × 10 1/2" × 27"			SA-36			
16	2	PCSR 6" × 8" (FIELD CUT TO SUIT)			SA-36			

81 SUPP'T. ISO NPSI-MS-1-RB-02

REFERENCE DRAWINGS						
BRHL ISOMETRIC	REV.	PIPING	REV.	ELECTRICAL	REV.	CODE/CLASS III/2
MS-1-RB-002	2	2323-M1-0506	8	2323-E1-0502	8	PAINT CARBOZINC 11
FAB. ISOMETRIC	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.	ZONE ~
MS-1-RB-02	8	2323-S1-0534	2	2323-M1-0552	5	

DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
BS	11-18-80		11-25-80		11-26-80

P.O. NO. CP-0046A-1 MFG. REL.

OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL INC.

CPSES 35-1195
Brown & Root, Inc
HOUSTON, TEXAS

PRODUCTION ORDER	SERIAL NUMBER	SHEET
310	MK. NO. MS-1-01-007-C72K	1 OF 3 REV. 5

DESIGN LOADS / MVTS (IN.) / NORM. THER. / SEISMIC — FIG. CALC. AB-1-001-R1; DATA 106; SUPP. CALC. SC-24-1

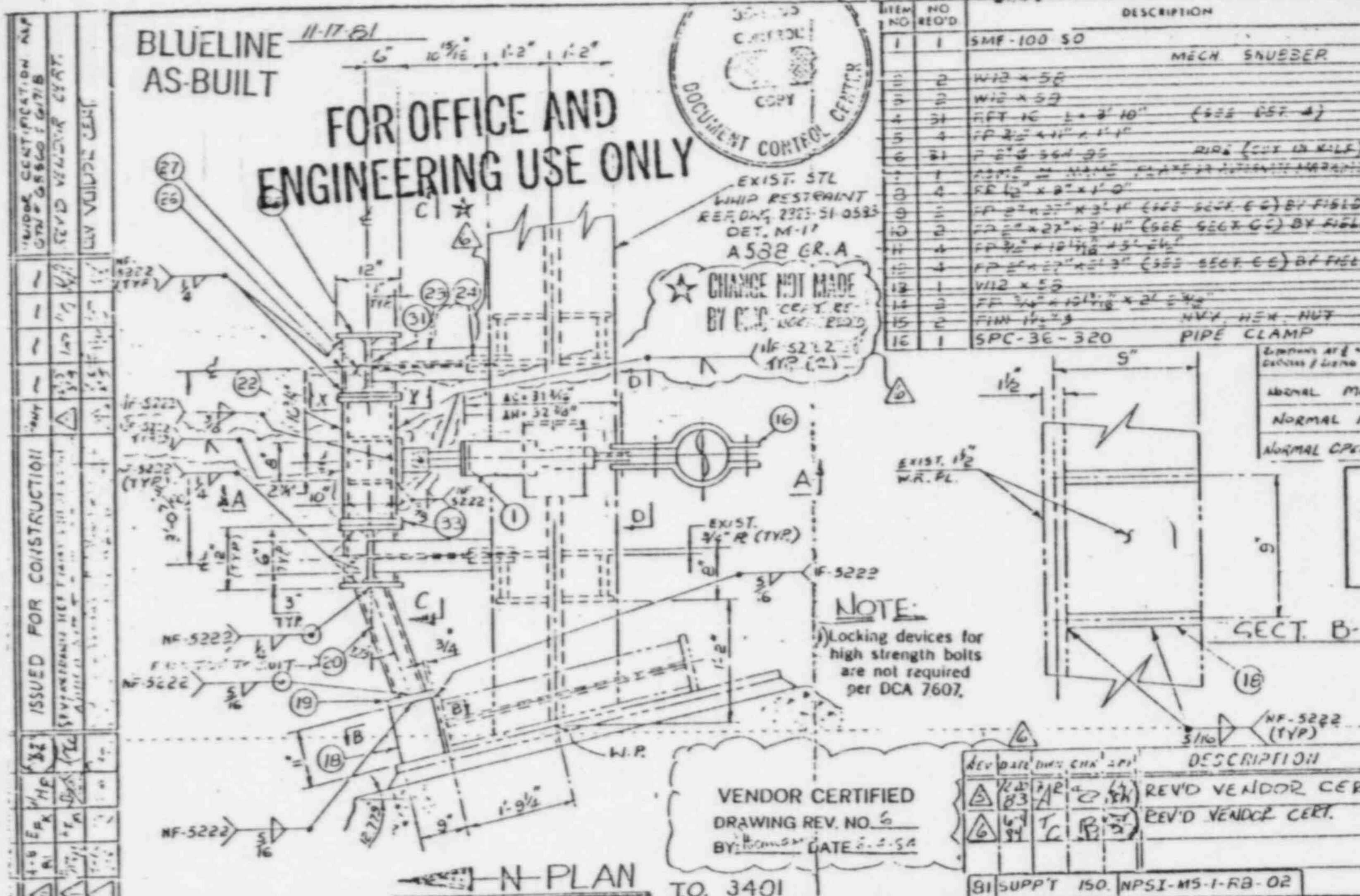
NPS FORM 103 3/78

FOR OFFICE AND ENGINEERING USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE AS-BUILT 11-17-81

FOR OFFICE AND ENGINEERING USE ONLY



ITEM NO.	NO. REQ'D	DESCRIPTION		WT.	ASME OR ASTM			MIC.
1	1	SMF-100 SO MECH SNUBBER				CSS		
2	2	W12 x 58			SA-36	L		
3	2	W12 x 58			SA-36	L		
4	31	EFT 16 ... 3' 10" (SEE DET. 4)			SA 36			
5	4	FP ... x 1' 1"						
6	31	P ... PIPE (CUT IN HALF)			... TP 304	L		
7	1	ASME ... NAME PLATE ...			—	—		
8	4	FP 1/2" x 8" x 1' 0"			SA-36			
9	2	FP 2" x 27" x 3' 11" (SEE SECT. CC) BY FIELD			SA-36			
10	2	FP 2" x 27" x 3' 11" (SEE SECT. CC) BY FIELD			SA-36			
11	4	FP 3/4" x 10 13/16" x 3' 2 1/2"			SA 36			
12	4	FP 2" x 27" x 2' 3" (SEE SECT. CC) BY FIELD			SA 36			
13	1	W12 x 58			SA-36	L		
14	2	FP 3/4" x 10 13/16" x 2' 2 3/4"			SA 36			
15	2	FHN 1 1/2" ... HVY. HEX. NUT			SA 307 GR5			
16	1	SPC-36-320 PIPE CLAMP			SA-36	CSS		

ROTATIONS AT ℄ OF PIPE IN DEGREES / LISTED IN SLD. CODE	θX	θY	θZ
NORMAL MAXIMUM	+.006	+.006	+.006
NORMAL MINIMUM	-.205	-.150	-.131
NORMAL OPERATING MAX.	-.205	-.150	-.126

THER. UPSET MVTS:-

V = 1.926 UP
S = 1.648
W = 2.897

REV	DATE	DWN	CHK	APP	DESCRIPTION
5	12-2-83	A	C		REV'D VENDOR CERT.
6	6-4-84	T.C.	B		REV'D VENDOR CERT.

SUPP'T ISO. NPSI-MS-1-RB-02

REFERENCE DRAWINGS	B.R.H.L. ISO.	REV	PIPING	REV	ELECTRICAL	REV
	MS-1-RB-002	2	2323-MI-0556	8	2323-EI-0502	8
	FAB. ISOMETRIC	REV	STRUCTURAL	REV	H.V.A.C.	REV
	MS-1-RB-02	8	2323-SI-0532	2	2323-MI-0552	5

CODE/CLASS: 5/2 — ZONE —

DRAWN	DATE	CHK'D	DATE	APP'D	DATE
BS	12-1-80	DP	12-4-80		12-10-80

P.O. NO. CP-0046A.1 — MFG. REL.

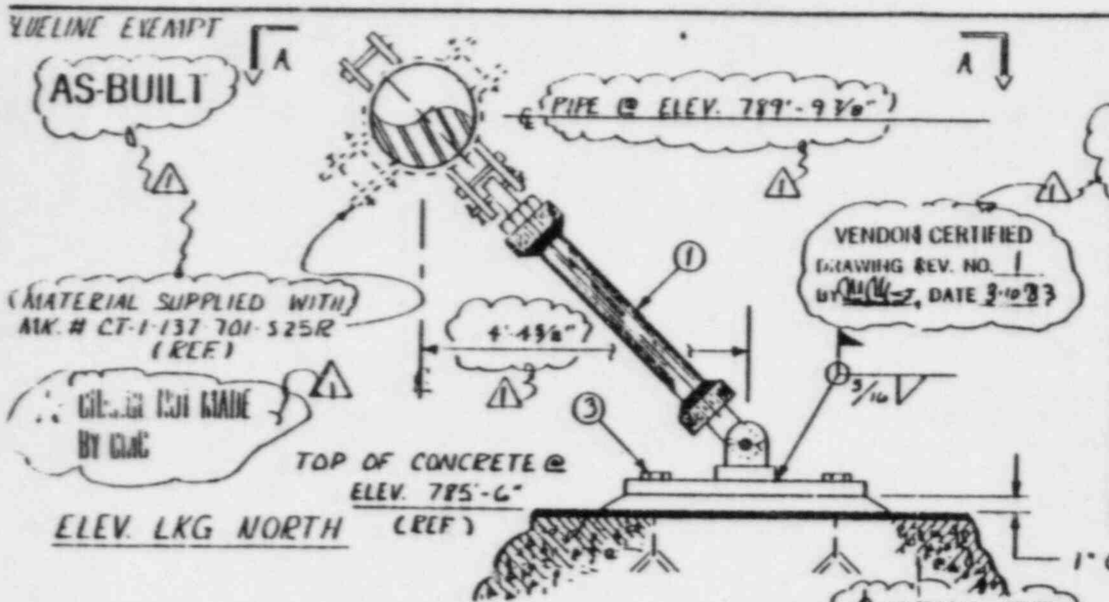
OWNER: TEXAS UTILITIES SERVICES INC.
PROJECT: COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER

Brown & Root, Inc. HOUSTON, TEXAS

PRODUCTION ORDER — SERIAL NUMBER — SHEET 1 OF 5

309 — MS-1-001-006-C72K — REV. 6

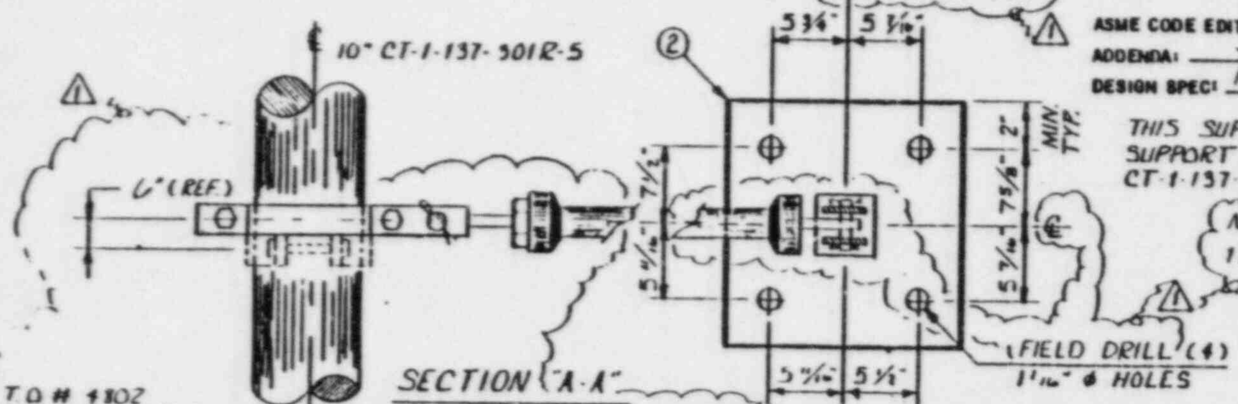
PIPE CLASS AB-1-001-R1 — 109 — SC-27-1



ITEM NO.	QTY. REQ'D.	MATERIAL DESCRIPTION
1	1	SRS-20-PC SWAY STRUT; "C-C" = 4'-7 3/4" WITH SPC-20-100 PIPE CLAMP (SA-36)
2	1	1" THK. CARBON STEEL PLATE (A-36) (SEE SECTION "A-A")
3	4	1" ϕ x 12" LONG SUPER HILTI KWIK BOLT (7 3/4" MIN. EMB.)
		PAINT: CARBO-ZINC # 11

REV	DESCRIPTION	DATE	DWN.	CHKD	APPVD.
0	ISSUED FOR CONST REF. PSE ...	...	VLM	HMP	RBG
~	(CPPA 15 ...)	~	~	~	~
~	CONT. BELOW	~	~	~	~

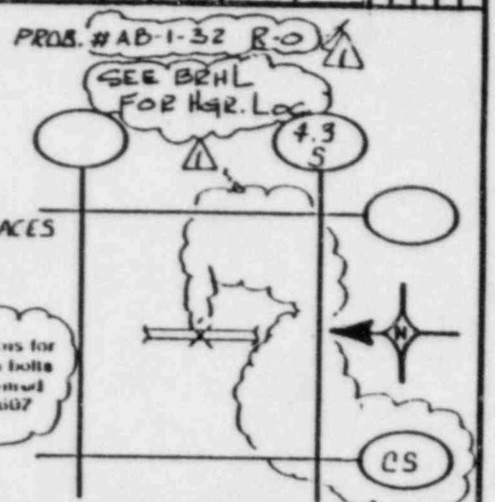
PROB. # AB-1-32 R-0



ASME CODE EDITION: ____
ADDENDA: ____
DESIGN SPEC: MS-46B

THIS SUPPORT REPLACES SUPPORT # CT-1-137-E02-S25R

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607



LOCATION PLAN

T.O # 4102

	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	PIPE MVTS INCHES
...	—	-1000 / -938	-1967 / +39	-2968 / +1590	—	9.004 / 9.018
...	—	—	—	—	—	0.021
...	—	+1095 / +1179	-96 / +2519	-636 / +2910	—	9.002

AUTHORIZED NUCL. INSP. YES ☐ NO ☒
ASME CODE CLASS ____

REF. DWGS.	BRHG. NO.	REV.	MECHANICAL	REV.	ELECTRICAL	REV.
	CT-1-SB-003	1	MT-0616	11	EI-0600-S	2
	FAB. NO.	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CT-1-SB-003	5	SI-0600	17	MT-0650	6

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	REV'D. AS NT'D; REF: CMC 66793 ...	3/10/83	JC	TEH	Q
...	DCA 7607 (NT #1), "ASBUILT VERIFIED"	~	~	~	~
—	CERTIFICATION CPPA 26082	~	~	~	~

Brown & Root, Inc.
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

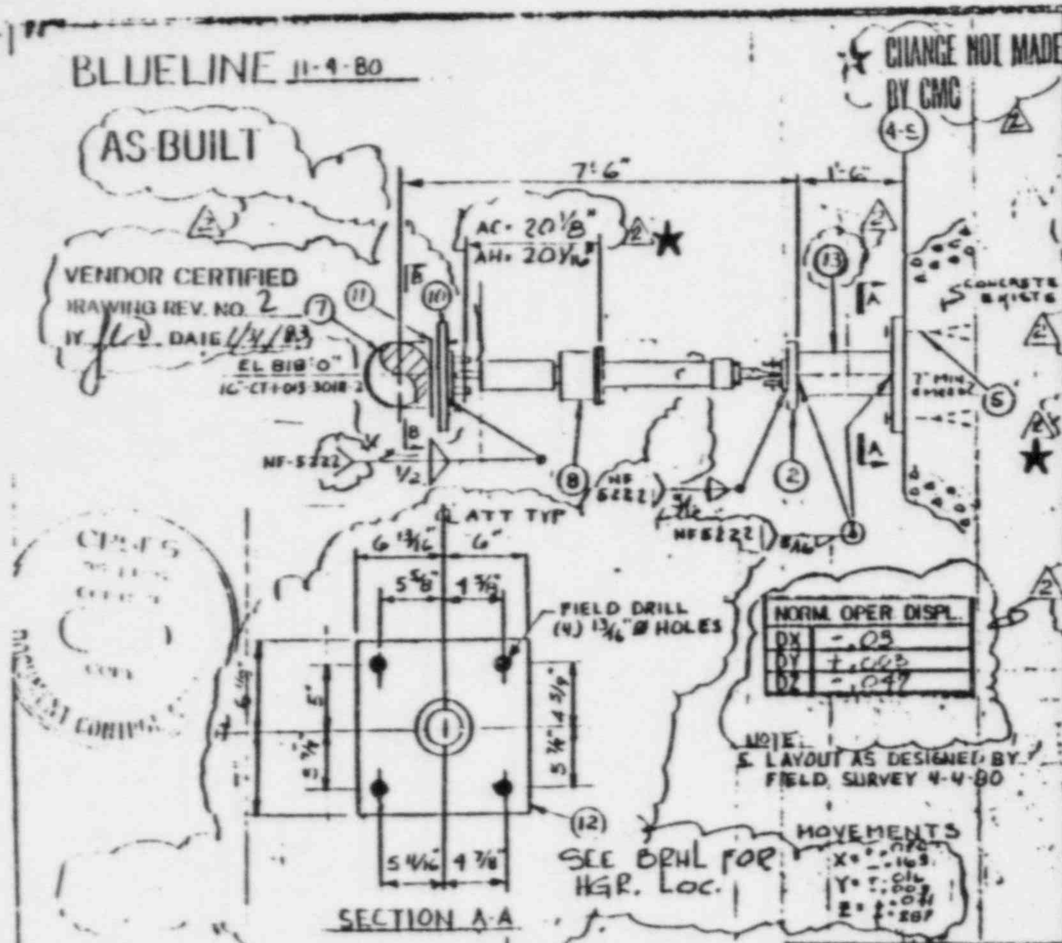
SUPPORT NO. CT-1-137-702-S25R
SHEET 1 OF 1 REV. 1

BLUELINE 11-4-80

AS BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY [illegible] DATE 1/4/83

CHANGE NOT MADE BY CMC



NOTES CONT.
6) ... for high strength bolts are not required ...

TO. 4802

MHL Fig	CT-1-SB-008 E-1
I.P.D. Iso.	CT-1-SB-B-REV 5
Data Point	1266 / 8-1-32 Revd
Pipe Mat'l	SA 358 CL.1 TP304
Insul.	— Bldg. SB

THIRD PARTY INSPECTION
CODE CLASS: ASME III-2

LOCATION PLAN

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	J	CSS	PRIM	SEC	AISC
	SEISMIC MECHANICAL SHOCK SUPPRESSOR CONSISTING OF:	ONE								
1	#10, 6" Stroke, Fig. 307N Mechanical Shock Suppressor, W-3'-7 3/16" Cold Setting-3-1/8" Hot Setting-2 7/8", 16" O.D. Pipe, Carbon Steel, Load-16140#	1					X			
2	1"x8" Carbon Steel (SA-515 GR 65 or SA-36) Plate 0'-8" Long, TV-18#	1			X			X		
3	1"x1'-8" Carbon Steel (SA-515 GR 65 or SA-36) Plate 1'-8" Long, TV-61#	1			X			X		
4	6" Schedule 40 (SA-106 GR B) Pipe, 1'-5" Long, TV-27#					X		X		
5	3/4"x10" Hilti Kwik Concrete Fasteners(1144)	4					X			
6	2 1/2"x2" ...	1			X		X			
7	... FIG 137N ... DEVELOPED LENGTH 4'-1 1/2"	1								
8	SMA ... 0.8A ... CC 6'0"	1					X			
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG MARK # CT-1-013-022-S42K	1								
9	... PLATE PER SECTION A-A	1			X		X	X		
10	... CS ... PER SECT B-B (SA36/SA515 GR65)	1			X		X			
11	CS R 1 1/4 x 4" x 22" LG (SA36/SA515 GR65)	1			X		X			
12	1" THK CS PL PER SECTION "AA" (SA36/SA515-GR65)	1			X		X			
	Apply one coat of Carbo Zinc #11 to above mat'l except ... shall be coated ...									
13	6" SCH-40 PIPE 17" LG (SA-53)						X			

REV	DATE	DWN	CHK	APP	DESCRIPTION
[illegible]					VENDOR CERTIFICATION GTU LZ 726

INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.

FOR ENGINEERING OFFICE USE ONLY

Approved By: C.E.C.
Date: 6-20-79

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. 2 SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: M-0202-REV.15 ELECT: ...
STEEL: S-0605-REV.2 HV.A.C: ...

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	[illegible]					
EMERGENCY	[illegible]					
FAULTED						

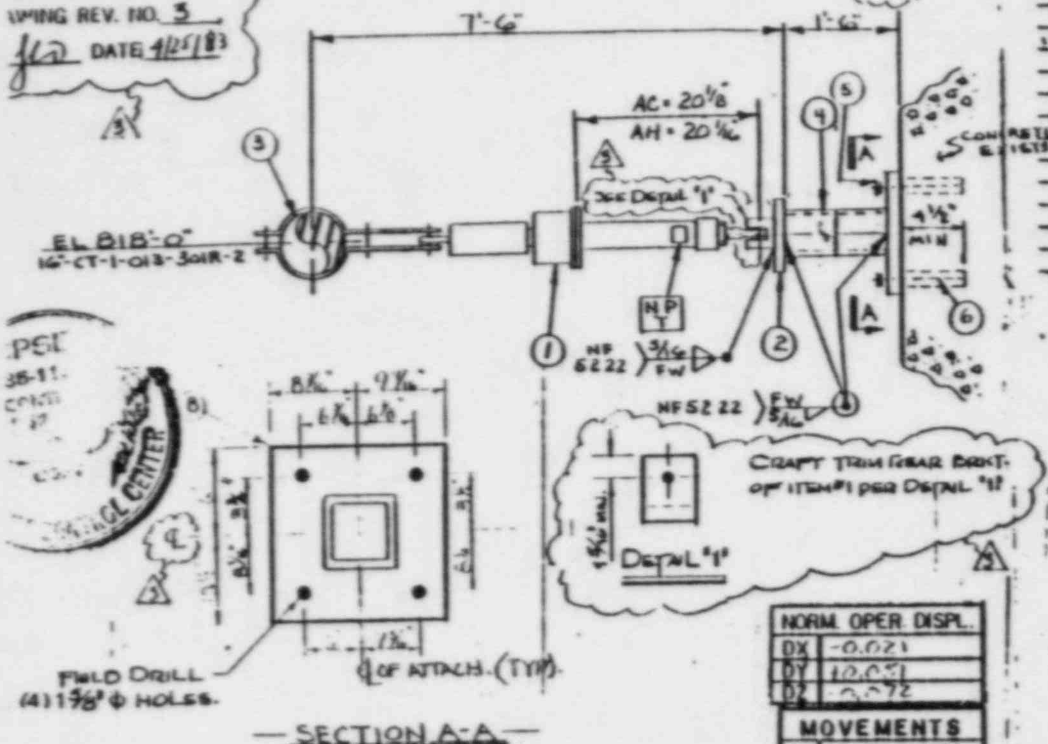
REV	DATE	DWN	CHK	APP	DESCRIPTION
0	5-7-80				ISSUE FOR CONST. BASE PLATE ONLY
1	11-4-80				REV. AS NTD, REF. FIELD MODIFIED HANGER SKETCH; ADDED SHT 2
					...
2	1-31-83				REVD AS NTD REF CMC 49328 & DCA 7602 (See NT 4)

CUSTOMER	Texas Utilities Services, Inc.
ORDER OR CONT. NO.	CP-0046
JOB NAME	Comanche Peak 1 & 2
MARK NO.	CT-1-013-022-S42K
SKETCH NO.	
SHEET 1 OF 2	REV. 2

FOR OFFICE AND ENGINEERING USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY

LUELINE
S-BUILT
NDOR CERTIFIED
WING REV. NO. 5
JCD DATE 4/25/83



NORM. OPER. DISPL.	
DX	-0.021
DY	+0.051
DZ	-0.072

MOVEMENTS		
X	+.018	-.122
Y	+.278	-.045
Z	+.063	-.388

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP.		PBS	L	CSS	PRIM.	SEC.	AISC
	SEISMIC SWAY STRUT ASSEMBLY CONSISTING OF	ONE								
1	SNA-10 RO SNUBBER	1								
2	C.S. R 1"×8"×8" (SA 36)	1			X			X		
3	SPC-14 160 PIPE CLAMP	1								

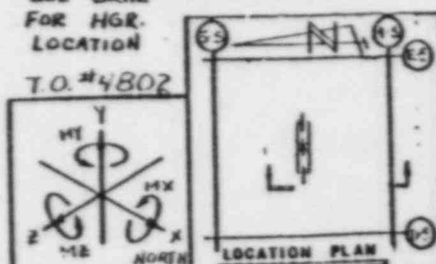
INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.

FOR ENGINEERING & OFFICE USE ONLY

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP.		PBS	L	CSS	PRIM.	SEC.	AISC
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING	1								
	BUNDLE AND TAG MARK # CT-1-013-021-S42K	1								
	NEW MATERIAL REQUIRED									
4	1/2"×4"×4" STRUCTURAL TUBING (A-500,76) GR.B) 1'-4 3/4" LONG, TW=39#	1				X		X		
5	1 1/2" HEXNUT (SA-307 GR.B)	8								
6	1 1/2" × 8 1/2" FIG 140N W/ THREAD FULL LENGTH	4					Δ			
5	~~1 1/4"×1'-4" CARBON STEEL (SA36 OR SA516 GR 60) PLATE, 1'-4" LONG, TW=91#~~	1				X		X		
8	CARBON STEEL PLATE 1 1/4"×1'6 1/2"×1'-6" LG PER SECTION A-A (SA 36)	1								

Approved By: E.EC
Date: 6-20-79

SEE BRHL FOR HGR. LOCATION
T.O. #4802



NOTES:
1) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 2607

BRHL ISO. CT-1-SB-008 Rev.1
I.P.D. Iso. CT-1-SB-8-REV.5
Data Point 164 / PROB# AB-1-32 Rev.0
Pipe Mat'l. SA 358 CL.1 TP304
Insul. ___ Bldg. SB

THIRD PARTY INSPECTION YES ☒ NO ☐
CODE CLASS: ASME III-2

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ___ SHEET ___ OF ___

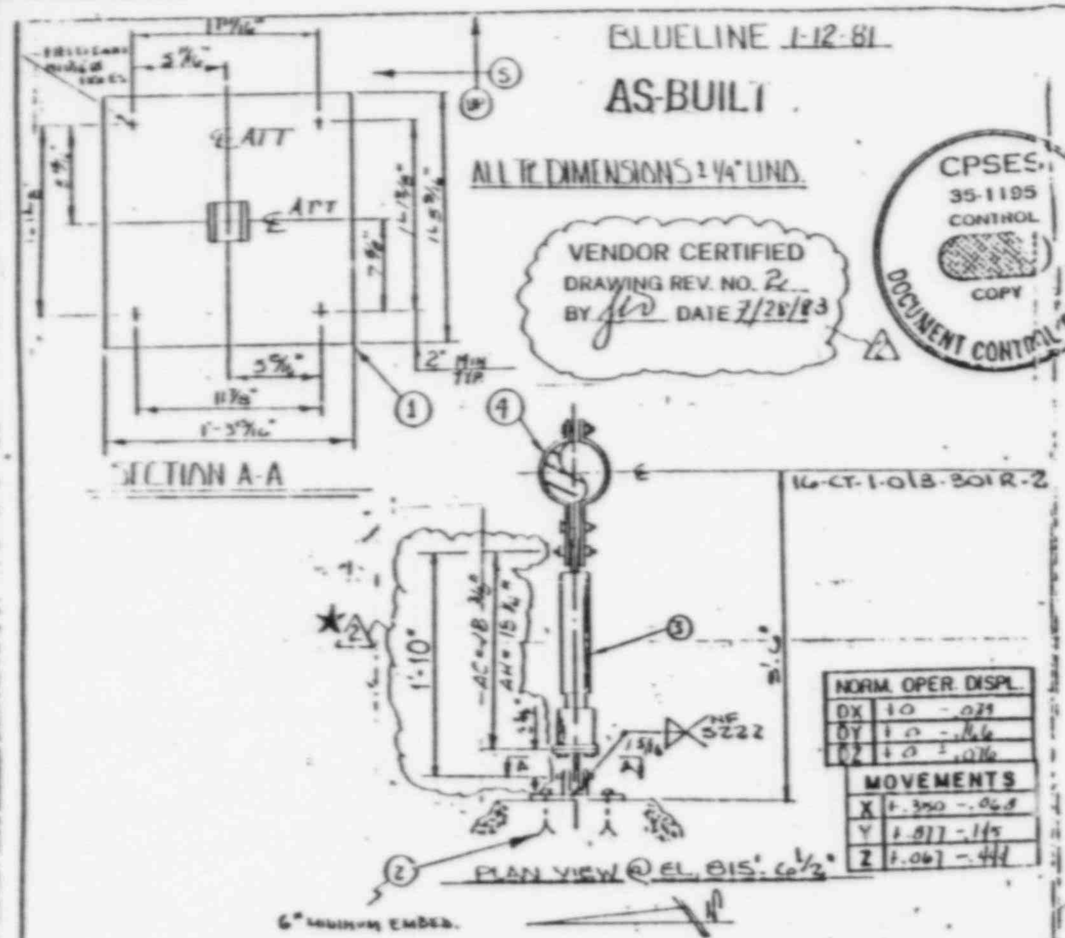
Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: M1-0612-REV.13 ELECT: E1-0602-01 REV.9
STEEL: S1-0605-REV.9 H.V.A.C.: M1-2535 REV.12

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—					
NORMAL & UPSET	±2738	—				
EMERGENCY	±4247	—				
FAULTED	—					

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	12-8-80			M	ISSUED FOR CONST; REF. FIELD MODIFIED HANGER SKETCH; 1 TF, R-1; NPSI, R.OA
1	11/1/81		W		REV AS NOTED. REF. CMC 41369 & DCA
					... AS BUILT
4		Q			VENDOR CERTIFICATION. REF: GTN# 62726
5	4/25/83				REV'D. VENDOR CERTIFICATION REF. CMC#90040 R.1

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-021-S42K
SKETCH NO. —
SHEET 1 OF 1 REV. 5



NOTES:

4) Locking devices for high strength bolts are not required per DCA 7607

★ CHANGE NOT MADE BY CMC

ITEM NO.	NO REQ'D	PART CALL-OUT	DESCRIPTION	MATERIAL	MIC. NO.	WT.
1	1	C.S.TR. 1/4" THK	(SEE SECT. A-A)	SA-36		
2	4	ASA-1-12	(CONC. ANCHOR)			
3	1	SMF-10-80	SNUBBER			
4	1	SPC-14-160	PIPE CLAMP	SA-36		

SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG MARK # CT-1-013-019-S42K — 1

Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative.

REV	DATE	DWN	CHK	APP	DESCRIPTION
A	1-28-81				REV'D VENDOR CLARIFICATION, REF. NCR# M-73405

Approved By: C.E.G

Date: 6-20-79

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

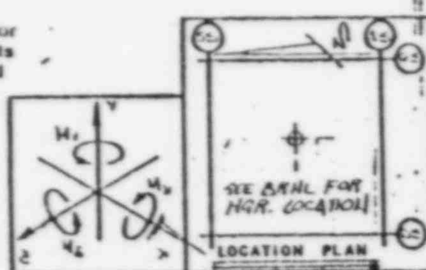
Brown & Root, Inc.

REF. DRAWING NUMBERS

PIPE: M1-0612 REV 13 ELECT: EI-0602-01 REV B

STEEL: SI-0605 REV 5 H.V.A.C.:

CONDITIONS	Fx	Fy	Fz	Mx	My
DESIGN					
NORMAL & UPSET			175		
EMERGENCY			174		
FAULTED					



Prob. No. CI-1-SB-0 R-1

B.R.P. Iso. CT-1-SB-8 REV. 8

Data Point 260/1908 ...

Pipe Mat'l. SA 358 CL.1-TP304

Insul. ~ Bldg. SB

THIRD PARTY INSPECTION

CODE CLASS: ASME III-2

REV	DATE	DWN	CHK	APP	DESCRIPTION
A	1-12-81	R	H		ISSUED FOR CONST. - REF FIELD MODIFIED HANGER SKETCH, ITTR-L NPSI R-0A. DELETED NT'S 1-3
~	~	~	~		
A			Q		Evd. As Bltd Ref: CMC 49349 DCA 7607 (NT4) AS-BUILT
~	~	~	~	~	VENDOR CERTIFICATION, REF: GTH#

CUSTOMER Texas Utilities Service, Inc.

ORDER OR CONT. NO. CP-0046

JOB NAME Comanche Peak 1 & 2

MARK NO. CT-1-013-019-S42K

SKETCH NO.

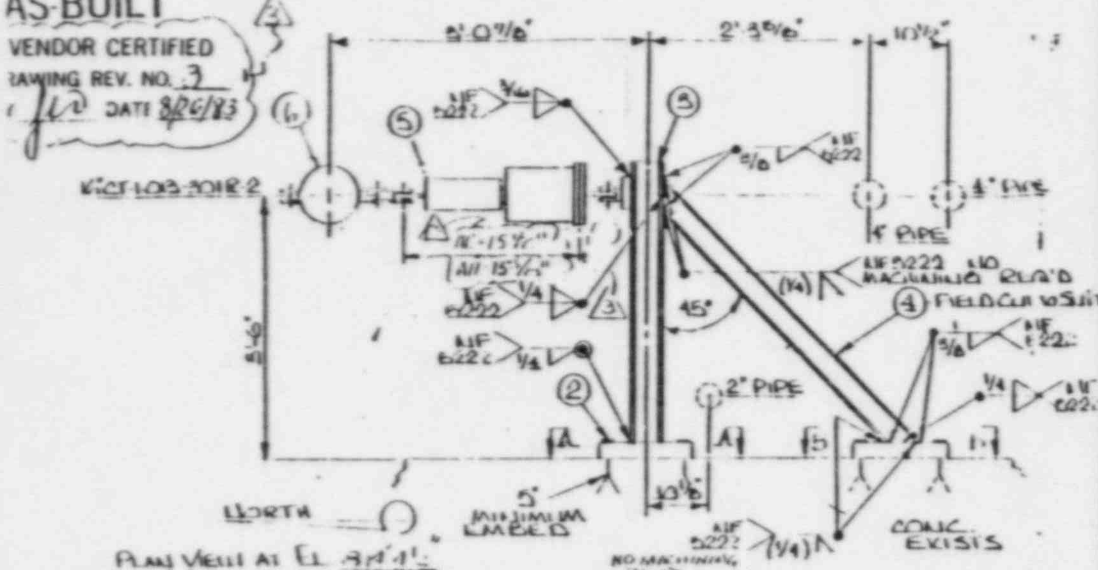
SHEET 1 OF 1 REV 3

FOR OFFICE AND ENGINEERING USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE

AS-BUILT
VENDOR CERTIFIED
DRAWING REV. NO. 3
DATE 8/26/83



MOVEMENTS	
X	
Y	
Z	

NORM OPER DISPL.	
DX	+0.079
DY	+0.182
DZ	-0.012

NOTE
4) Locking devices for high strength bolts are not required per DCA 7607

ITEM NO.	NO. REQ'D	PART CALL-OUT	DESCRIPTION	MATERIAL	MIC. NO.	WT.
1	2					
2	8					
3	1			SA 36		
4	1			SA 36		
5	1		SNUBBER			
6	1			SA 36		60
7	1					
8	1					
9						

SEISMIC ASSEMBLY SKETCH AND ENGINEERING
BUNDLE AND TAG
MARK # CT-1-013-018-S42K

Apply one coat of Carbo Zinc #11 to above mat'l except ... which shall be coated ... preservative.

REV	DATE	DWN	CHK	APP	DESCRIPTION
2					REV'D VENDOR CERT REF NCR-M-77925
3					REV'D VENDOR CERT REF. CMC 19016

Approved By: C.F.L.
Date: 6-20-79

QUAN | SHIP

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: M1-0612 R 13
STEEL: S1-0005 R 9
ELECT:
HV.A.C.:

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET						
EMERGENCY						
FAULTED						

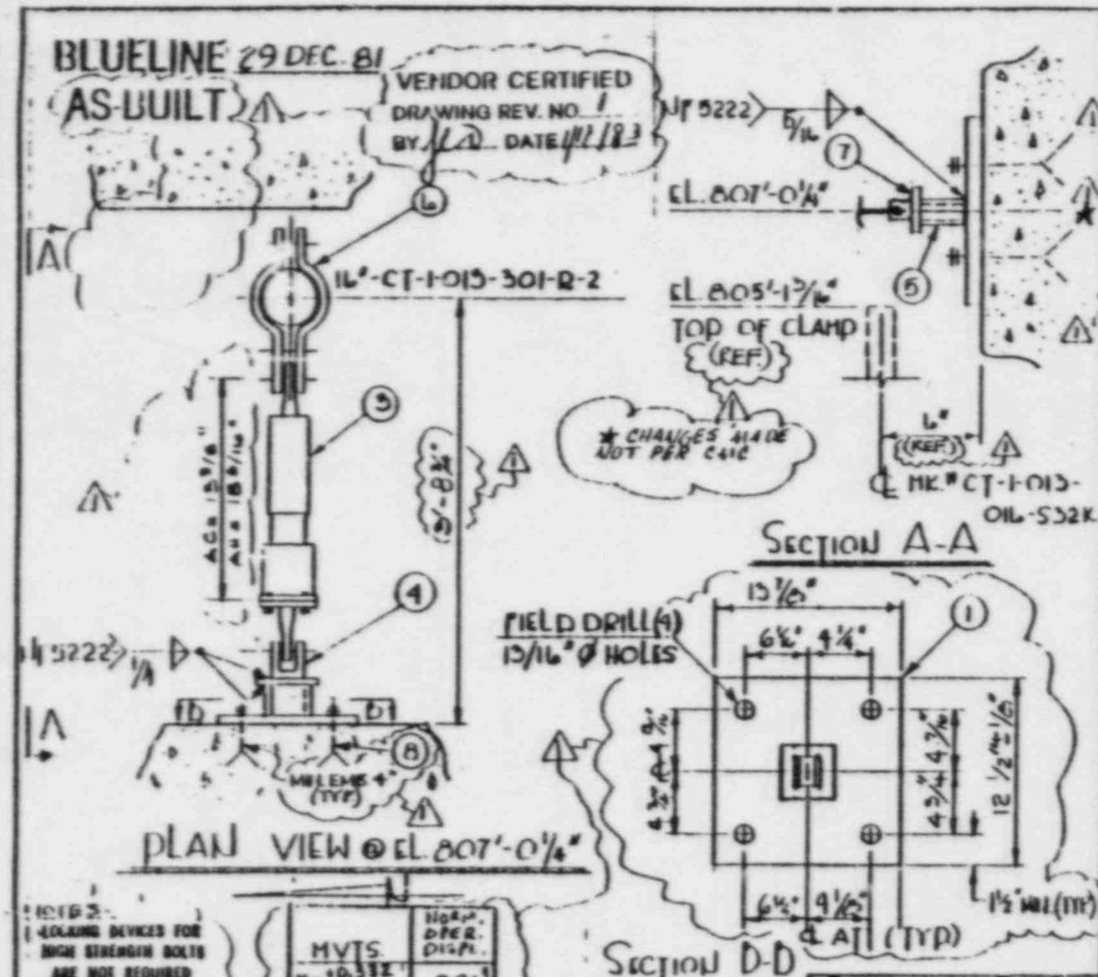
REV	DATE	DWN	CHK	APP	DESCRIPTION
2					
3					REVD AS NOTED ... AS BUILT

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-018-S42K
SKETCH NO.

SEE BRHL FOR HANGER LOCATION
LOCATION PLAN

THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III 2

NEW Iso.
BRP Iso. CT-1-SB-BR 3
Data Point 350 / PROB. ...
Pipe Mat'l SA 358 CL 1 TP 304
Insul. — Bldg. SB



Brip. Iso. CT-1-SB-8 R.1
D.R.P. Iso. CT-1-SB-8-R3
Data Point 38/PROB XB-1-32-R.0
Pipe Mat'l. SA358 CL.1TP304
Insul. ——— Bldg. SD

TO. 4802

LOCATION PLAN

THIRD PARTY INSPECTION
CODE CLASS: ASME III -2

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
1	1" C.S. R. PER SECTION D-D SA36/SA515 GR.62	1	
2	3/4" x 10" HILTI KWIK BOLT ANCHORS 3" MIN. EMB.	4	
3	SHP 5 TYPE SQ SNUBBER (LOAD-1963) C-C 20 1/4"	1	
4	XRB-10 REAR BRACKET (A36/CS36)	1	
5	1/2" TS 5"x4"x1/4" LG. (A500 GR. B)	1	
6	SPC-10-16C PIPE CLAMP (SA36)	1	
7	1/2" C.S. R. 5"x5" (SA36/SA515 GR.62)	1	
8	3/4"x7" LG HILTI KWIK BOLT	4	

MARK # CT-1-015-017-S32K
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS R9
PIPE: M1-0409-R.14 ELECT. E1-0601-01
STEEL: S1-0602-R.12 H.V.A.C. M1-0451-R1

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	—	—	±1285	—		
EMERGENCY	—	—	±1463	—		
FAULTED	—	—				

REV	DATE	DWN	CHK	APP	DESCRIPTION
A		FA			ISSUE FOR CONST., REF. CMHS & LIT R1
1					REVISED PER CCN; A.R. / ADDED "A" POINT; REMOVE CERTIFICATION; REF. GTN 61226

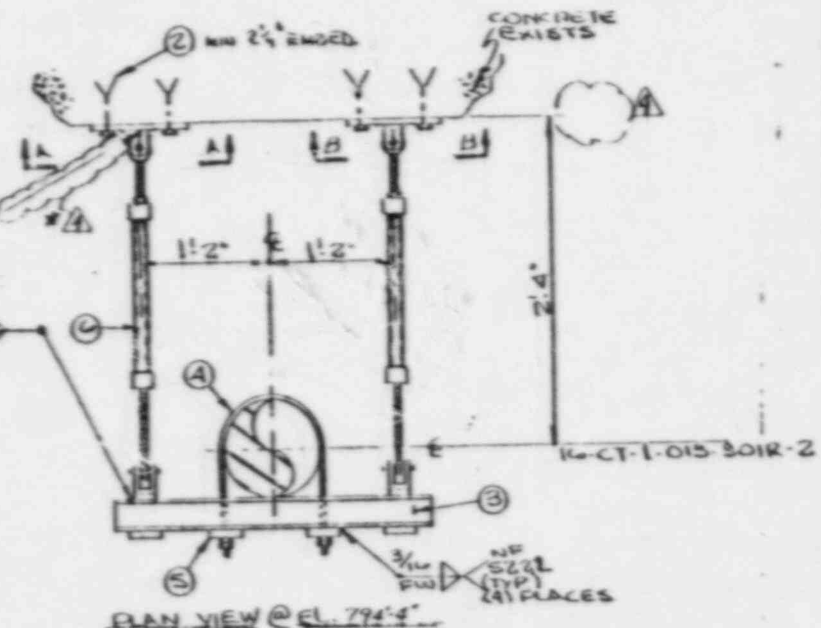
CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-015-017-S32K
SKETCH NO.
SHEET 1 OF 1 REV. 1

FOR OFFICE AND ENGINEERING PURPOSES COPY

CONTROLLED DOCUMENT CONTROL COPY

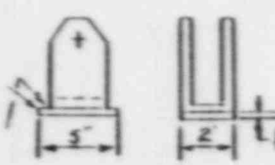
...E LINE 11-14-80

BUILT
...OR CERTIFIED
...G REV. NO. 4
... DATE 3/23/83



...TE:
...ING DEVICES FOR
... STRENGTH BOLTS
... NOT REQUIRED
PER DCA 7607

... NOT MADE BY CEJC



T/04802

BRP Iso. CT-1-SB-B-REV 3
Data Point 253...
Pipe Mat'l. SA 358 CL 1 TP 304

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	CSS	PRIM	SEC	AISC
1	PL 1" x 8 1/8" x 9 5/8" (SA-36)	1			X			X		
2	BSA-12-5/2 Conc. Anchors	8					X			
3	C 4 x 5.4 x 3'-8 3/4" (SA-36) P.B.I.C.=1"	2				X		X		
4	PHS-160 STD U-BOLT (SA-36) L=14 1/2	1					X			
5	RWP-07 (SA-36)	4					X			
6	SAS-06-8A SWAY STRUT C.C.=31 1/2"	2					X			
7 ④	PL 1/2" x 2" x 5" (SA-36) SEE DETAIL I	4			X			X		
8	PL 1" x 9 1/4" x 10 3/8" (SA-36)	1			X			X		

REV	DATE	DWN	CHK	APP	DESCRIPTION
④	3/23/83	...	...	...	REVISED VENDOR CERTIFICATION

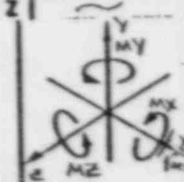
MARK # CT-1-013-014-S32R
PAINT: CARBO ZINC # 11

Approved By: C.E.C.
Date: 6-20-79

QUAN	SHIP		PBS	L	CSS	PRIM	SEC	AISC

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

MOVEMENTS	
X	.0216 / ...
Y	.0266 / ...
Z	~



THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III-3

Brown & Root, Inc.

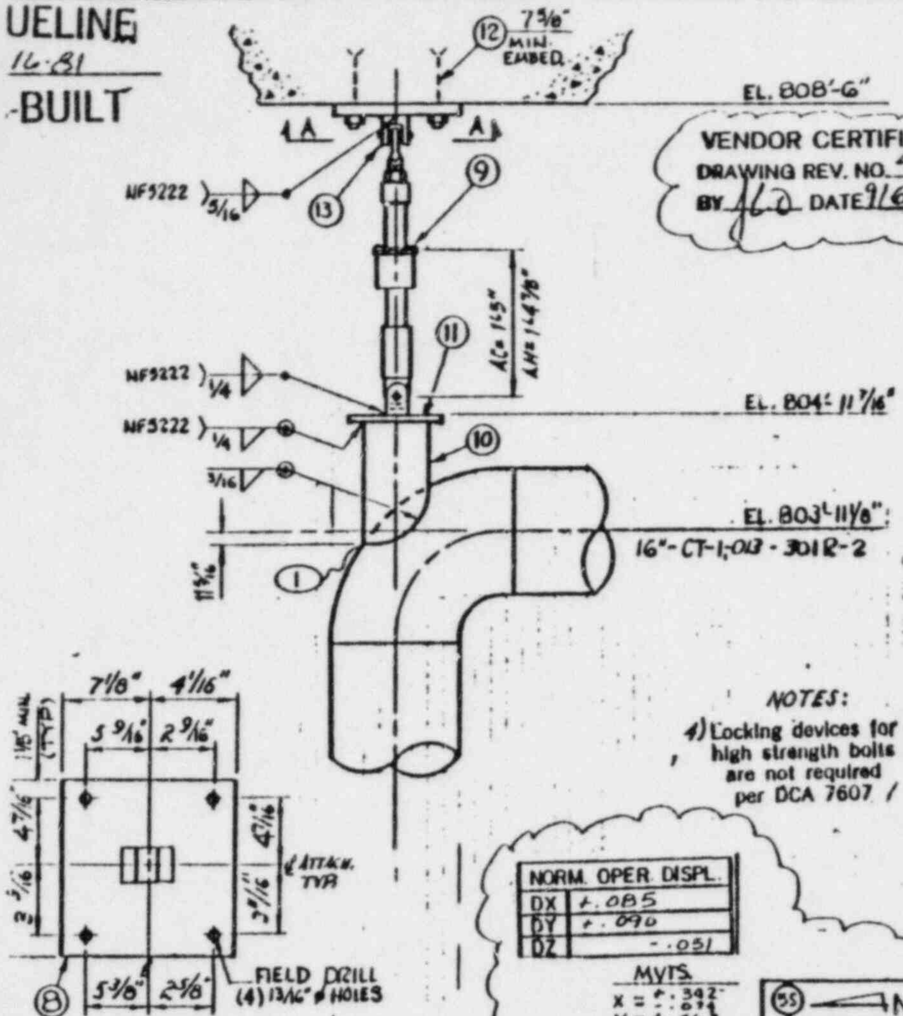
REF. DRAWING NUMBERS
PIPE: M1-0205 REV ... ELECT: ...-0601 ...-01 REV 4
STEEL: ...1-0402 REV 12 H.V.A.C.: ...

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET			...			
EMERGENCY			...			
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
	11-14-80	E	...	...	ISSUE FOR CONST, REF FIELD ...
△	...	...	...	...	...
△	...	Q	...	...	REV AS NOTED. REF CMC 48246 DCA ... (SEE NOTE 1) "AS BUILT"
△	...	...	Q	...	...

CUSTOMER: Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-014-S32R
SKETCH NO.
SHEET 1 OF 2 REV. 4

UELINE
16-81
-BUILT



FOR OFFICE AND ENGINEERING USE ONLY

VENDOR CERTIFIED
DRAWING REV. NO. 4
BY [illegible] DATE 9/16/83

NOTES:

4) Locking devices for high strength bolts are not required per DCA 7607

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	CSS	PRIM.	SEC.	AISC.
8	CS PLATE, 7/8" THK, PER SECT A-A (SA36/SA515 GR 65)	1			x			x		
9	SMA-3-SO SNUBBER L=1'-7 3/16"	1					x			
10	8" SCH. 40S PIPE STANCHION W/REB. L=1'-8 9/16" (SA312-TP304)	1				x		x		
11	CS PLATE, 3/4" x 12" x 12" (SA36/SA515 GR 65)	1			x			x		
12	3/4" x 10" HILTI-KWIK CONC. ANCHORS	4					x			
13	XRB-10 REAR BRACKET (A668D/SA36)	2					x			

FOR OFFICE AND ENGINEERING USE ONLY

CPSES 35-1195 CONTROL COPY DOCUMENT CONTROL CENTER

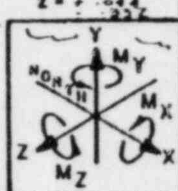
MARK # CT-1-013-013-S32K
PAINT: CARBO ZINC # 11

REV	DATE	DWN	CHK	APP	DESCRIPTION
4	9-6-83	Q	[illegible]	[illegible]	VENDOR CERTIFICATION REF GTN# 62726

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ____ SHEET ____ OF ____

NORM. OPER. DISPL.	
DX	+.085
DY	+.090
DZ	-.051

MVTS
X = +.392
Y = +.461
Z = +.073



SECTION A-A

BRHL Iso. CT-1-SB-008R.1
I.P.D. Iso. CT-1-SB-8 Rev. 3
Data Point #253/PROB.# AB-1-32 R.0
Pipe Mat'l. SA358 TP304
Insul. ~ Bldg. SB

T.O. 4802

THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III-2

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

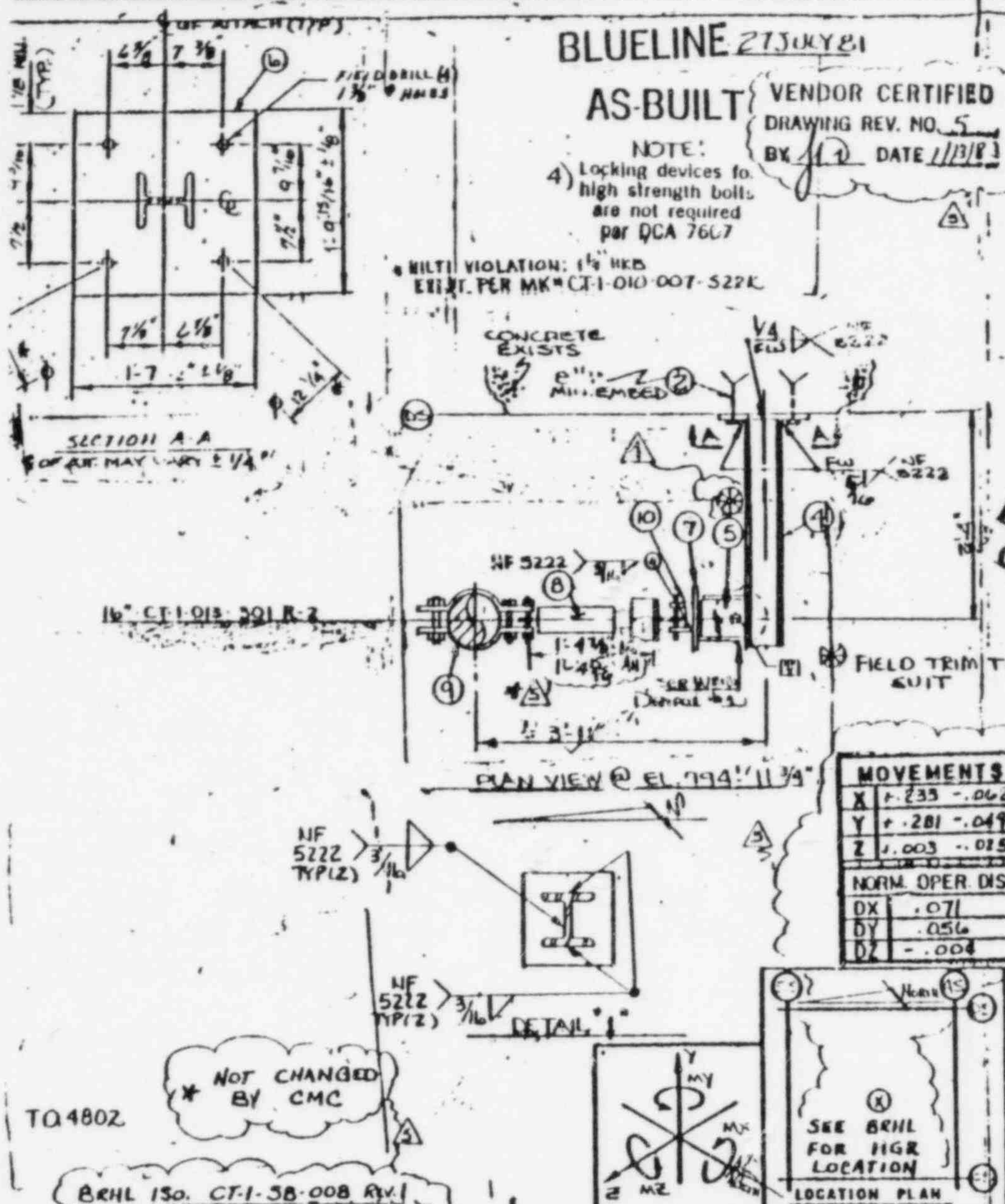
REF. DRAWING NUMBERS
PIPE: M1-0605 Rev. 14 ELECT: E1-0601-01 R-9
STEEL: S1-0602 Rev. 12 H.V.A.C.: M1-0651 R-6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	—	—	—	—	—
NORMAL & UPSET 4	—	±2156	—	—	—	—
EMERGENCY	—	±3392	—	—	—	—
FAULTED	—	—	—	—	—	—

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	7/1/80	ECE	RK	[illegible]	ISSUE FOR CONST. REF. IIT R.1
1	1/-/81	RP	DF	[illegible]	REV'D AS NOTED. REF. FMHS. MK # WAS CT-1-013-013-S32K.
2	5/-/81	Suy	DF	[illegible]	REV'D AS NOTED REF MK # WAS CT-1-901-013-S32K
3	7-26-82	RKM	[illegible]	[illegible]	REV AS NT'D REF CMC 57901 R1 DCA 7607 SEE NT 4 AS BUILT

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO CT-1-013-013-S32K
SKETCH NO.
SHEET 1 OF 1 REV. 4

FOR OFFICE AND



MOVEMENTS		
X	+.233	-.062
Y	+.281	-.049
Z	+.003	-.015

NORM. OPER. DISPL.	
DX	.071
DY	.056
DZ	-.004

BRHL ISO. CT-1-SB-008 Rev. 1
BRP ISO. CT-1-SB-8 REV. 3
Data Point 53 / PROB# AB-1-32 Rev. 0
Pipe Mat'l. SA 358 Cl 1 TP 304
Insul. ~ Bldg. S.B.

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	CSS	PRIM	SEC	AISC
2	1¼" X 12" HILTI KWIK CONC. ANCHORS (1144)	4					X			
4	W 8X17 (SA-36) 2'-6½" LONG	1				X		X		
5	W6X12 (SA-36) 0'-6⅝" LONG SEE DET "1"	1				X		X		
6	1" C.S. PL. Per Sec. A-A (SA 515 Gr 65 or SA-36)	1			X			X		
7	½" X 8" X 0'-8" LG. C.S. PL. (SA-36 or SA 515 Gr 65)	1			X			X		
8	SMF-3-50 SNUBBER C-C = 1'-6⅞" L=2"	1					X			
9	SPC-10-160 PIPE CLAMP (SA-36)	1					X			
10	XRB-10 REAR BRACKET (A668-D / SA36)	1					X			

SEISMIC ASSEMBLY SKETCH AND ENGINEERING
BUNDLE AND TAG
MARK # CT-1-013-012-S32K

Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative.

REV	DATE	DWN	CHK	APP	DESCRIPTION
4	7-30-81	[illegible]	[illegible]	[illegible]	REV'D AS NOTED REF. CMC 63814 REV'D DCA 7607 See note 4 "AS BUILT"
5	1/13/81	Q	[illegible]	[illegible]	VENDOR CERTIFICATION. REF: CIN# 62726

Approved By: C.E.C.
Date: 6-20-79

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

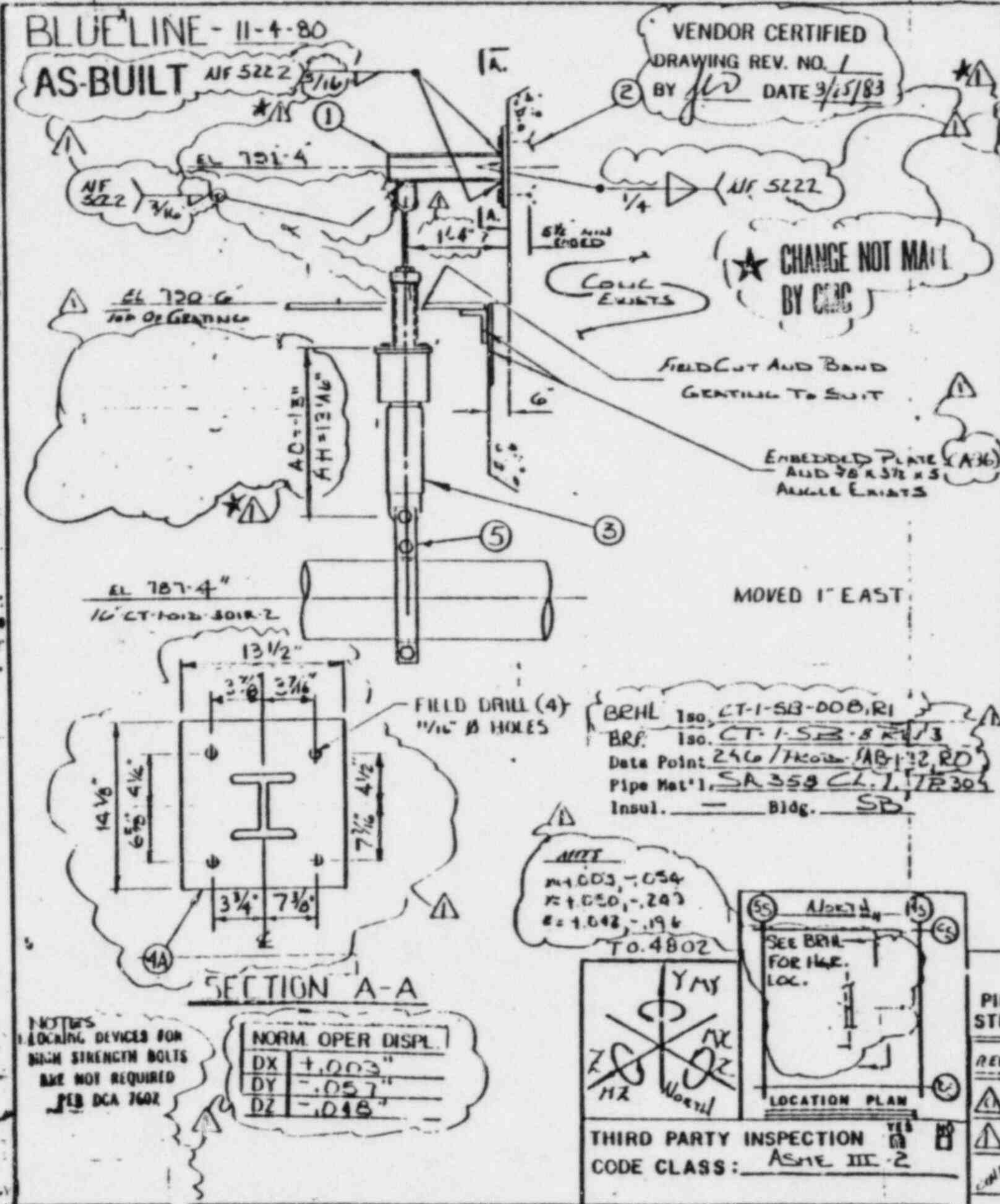
CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN 3						
NORMAL & UPSET	±896					
EMERGENCY	±1393					
FAULTED						

REF. DRAWING NUMBERS
PIPE: M1-0606 REV. 14 ELECT: E1-0601-01 REV. 9
STEEL: S1-0602 REV. 12 H.V.A.C.: M1-0650 REV. 14

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	5-19-80	[illegible]	[illegible]	[illegible]	ISSUE FOR CONST. BASE PLATE ONLY
1	[illegible]	[illegible]	[illegible]	[illegible]	REVISED AS NOTED PER ITT REV 1
2	[illegible]	[illegible]	[illegible]	[illegible]	REV AS NOTED, HGR EMHS, 1
3	[illegible]	[illegible]	[illegible]	BA	REV'D ANCHOR [illegible]

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0026
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-012-S32K
SKETCH NO. —
SHEET 1 OF 1 REV. 5

THIRD PARTY INSPECTION
CODE CLASS: ASME III-3



BRHL Iso. CT-1-SB-008,R1
BRP Iso. CT-1-SB-8 R 1/3
Data Point 246 / [illegible]
Pipe Mat'l. SA 358 CL. 1 TP 304
Insul. — Bldg. SB

NOTES: LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7602

NORM. OPER. DISPL.	
DX	+.003"
DY	-.057"
DZ	-.018"

ITEM NO.	NO REQ'D	PART CALL-OUT	DESCRIPTION	MATERIAL	MIC. NO.	WT.	PDS	L	CSS	PRIM.	SEC.	AISC.
1	1	W4X13X1'-3 7/16"		SA 36		17		X		X		
2	4	BSA58-B12	(BY FIELD)						X			
3A	1	SMA-1 RO	SNUBBER	(C-C = 2'-5 1/8")		11			X			
[illegible]	1	[illegible]	TRANSITION KIT			[illegible]						
4A	1	C.S. PL 1" THK PER	SECT. A-A	(A36/SA515 Gr 65)								
5	1	SPC 08-160	PIPE CLAMP	SA 36		47			X			
	1	PROVIDE TEMPORARY SPACER C-C = 2'8 5/16"				10						

SEISMIC ASSEMBLY SKETCH AND ENGINEERING 1
BUNDLE AND TAG 1
MARK # CT-1-013-009-S22K

Apply one coat of Carbo Zinc #11 to above mat'l except threads which shall be coated w/a rust preventative.

Approved By: C.E.C.
Date: 6-30-79

QUAN | SHIP | PDS | L | CSS | PRIM. | SEC. | AISC

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: M1-0606 Rev 13 ELECT: E1-0600 Rev 12
STEEL: S1-0637 Rev 10 H.V.A.C.: M1-0650 Rev 6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	—	329		—	—	—
EMERGENCY	—	499		—	—	—
FAULTED	—	—	—	—	—	—

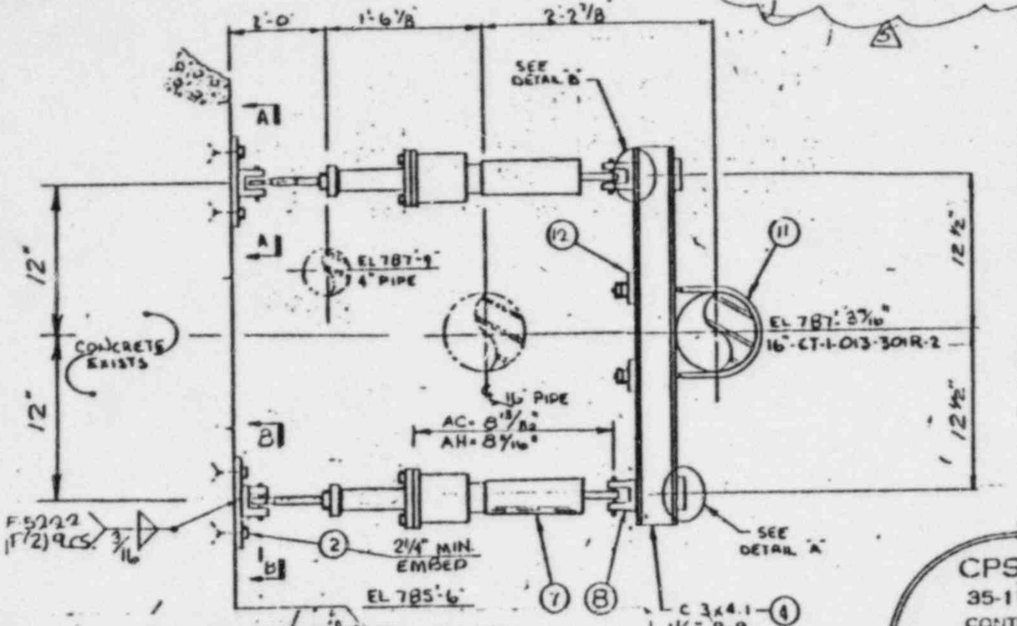
REV	DATE	DWN	CHK	APP	DESCRIPTION
1	11-4-80	MW			ISSUE FOR CONST. REF. [illegible] MODIFIED HANGERS [illegible]
1	3-25-83	[illegible]			REV AS NOTED REF CMC 59159 R-2 [illegible] "AS-BUILT"
					VENDOR CERTIFICATION REF GTN-62726

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-015-009-S22K
SKETCH NO.
SHEET 1 OF 1 REV. 1

BLUE LINE – 9 SEPT. 81

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 5
BY BU DATE 3-15-84



FOR OFFICE AND ENGINEERING USE ONLY

NOTE
14) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7607

NORM. OPER. DISPL.	
DX	+.016
DY	-.047
DZ	-.050

MOVEMENTS	
X	+.019 / -.013
Y	+.041 / -.223
Z	+.043 / -.209

T.O. 4802

THIRD PARTY INSPECTION YES ☒ NO ☐
CODE CLASS: ASME III-2

BRHL Iso. CT-1-SB-008/R.L
B.R.P. Iso. CT-1-SB-8 REV. 3
Data Point 49/PR2B = 3B-1-32/R.D
Pipe Mat'l. SA 358 CL 1, TP 304
Insul. ~ Bldg. SB

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	CSS	PRIM	SEC
	SEISMIC MECHANICAL SHOCK SUPPRESSOR								
	~~CONSISTING OF~~	ONE							
	MATERIAL EXISTS								
~~1~~	~~3/8"x8" Carbon Steel (SA-515 GR-65 or SA-36) Plate 0' 8" Long, TW-140~~	2			x			x	
2	1/2"x5 1/2" Hilti Kwik Concrete Anchors (11L41)	8						x	
~~3~~	~~# 1/2, 2 1/2" Stroke, Fig. 307N Mechanical Shock Suppressor, W-1'-3 3/4", Cold Setting 1 1/4", Hot Setting 1 1/8", W/Additional Rear Bracket, Load=... Ordered In Pairs~~	2					x		
4	C3x4.1, (SA-36) 2'-5" Long TW-180	1				x		x	
~~5~~	~~7/8" Fig. 60N Washer Plate~~	4					x		
~~6~~	~~7/8"x16" Fig. 137N U Bolt, D-1' 1 1/2", Developed Length 4' 5 3/4"~~	1							
7	SMA-1/2-60 SNUBBER	2					y		
8	XRB-06 REAR BRACKET (A660/SA36)	4					x		
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING	1							
	BUNDLE AND TAG	1							
	MARK # CT-1-013-007-S22K								
9	1/2" C.S. PL PER SECT "A-A" (SA36/SA-515, GR65)	1			x			y	
10	1/2" C.S. PL PER SECT "B-B" (SA36/SA-516, GR65)	1			y			x	
11	PUS-1L0 U-BOLT B=1'-1 1/4" (SA-36)	1					x		
12	RWP-Q7 WASHER PL. (SA-36)	4					x		
	Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative.								
~~10~~	~~ASME NAMEPLATE~~	1							
14	1/2" THK. PL 2"x3" (SA-36)	2							

REV	DATE	DWN	CHK	APP	DESCRIPTION
4	8-17-83	[illegible]	Q	CJT	REV'D AS-BUILT VENDOR CERTIFIED REF: [illegible]
5	3-15-84	BJB	[illegible]	[illegible]	REV'D VENDOR CERT., REF CMC-97275

CPSES 35-1195 CONTROLLED COPY DOCUMENT CONTROL CENTER

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: MI-0606 REV 13 ELECT: E1-0600 REV 12
STEEL: S1-0600 REV. 17 H.V.A.C.: MI-0600 REV 6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	—	—	—	—	—
NORMAL & UPSET	—	—	±741	—	—	—
EMERGENCY	—	—	±213	—	—	—
FAULTED	—	—	—	—	—	—

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	5-17-79	KC	WKP	[illegible]	ISSUED FOR: CONST. BASE PLATE ONLY
1	4/4/80	KS	RR	CLR	REVISED AS NOTED PER [illegible]
2	3/5/81	DF	[illegible]	[illegible]	REV. AS NTD, PER FMHG.
3	[illegible]	TJW	[illegible]	RR	REV AS NT'D: REF CMC 61292 RE: DCA 7607 (SEE NOTE 4) "AS BUILT"

CUSTOMER Texas Utilities Service,
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-007-S22K
SKETCH NO. ~
SHEET 1 OF 2 REV.

cb

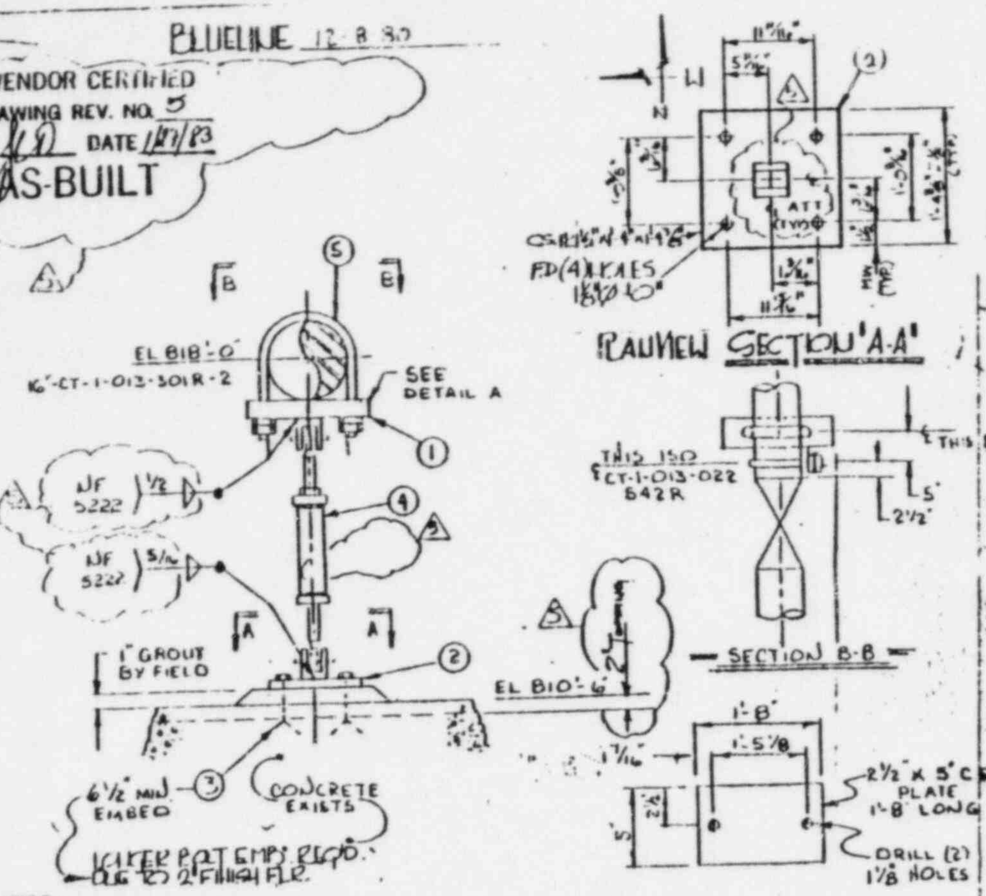
FIF/LW

FOR OFFICE AND

#3 FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE 12-8-80

VENDOR CERTIFIED
DRAWING REV. NO. 5
BY [illegible] DATE 1/17/83
AS-BUILT

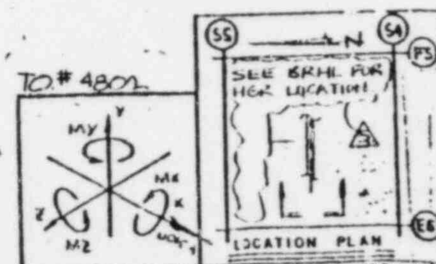


NOTES:
1) BY ISSUE OF REV. 4 OF THIS DRAWING, THE FOLLOWING DOCUMENTS ARE VOIDED:
CMC 01964 RO

NOTES CONT.
2) Locking devices for high strength bolts are not required per DCA 7607

I.P.D. Iso. CT-1-SB-8 Rev. 5
Data Point [illegible]
Pipe Mat'l SA358-CL [illegible]
Insul. ~ Bldg. SB

TO # 4802



THIRD PARTY INSPECTION YES ☒ NO ☐
CODE CLASS: ASME III-2

ITEM NO	MATERIAL	QUAN
	SEISMIC [illegible] ASSEMBLY CONSISTING OF:	
1	2 1/2" X 5" Carbon Steel (SA515-GR.65 or SA-36) Plate, 1'-8" long, TW=71#	1
~~2~~	~~1 1/2" X 1'-5" Carbon Steel [illegible] Plate [illegible]~~	~~1~~
3	1" X 12" Hilti-Kwik Concrete Anchors (1164)	4
4	SNS Type MA #2?, C-C=1'-9" WT=169#	1
5	PUH-160 TL=5 1/2", R=1'-1" (SA-36) WT=13#	1
2	1 1/2" THK PL CS. SEE SECT A-A (SA-36/SA 515 GR 65)	1
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING MARK: CT-1-013-001-S42R	1
	CARBO ZINC #11	

NPSI CERTIFIES THAT THE SUBSTITUTIONS IN HARDWARE AND MATERIAL SPECIFIED IN THE BILL OF MATERIAL ARE EQUIVALENT TO THOSE SPECIFIED BY THE DESIGNER AND SUITABLE FOR THE INDICATED LOADINGS.

6/4/80
DATE

FOR PROJECT MANAGER

REV	DATE	DWN	CHK	APP	DESCRIPTION
4	12-8-80	CF	[illegible]	M	[illegible] DELETE [illegible]
CONT	S	S	S	S	[illegible]
5	1/13/83	RVM	Q	[illegible]	REV'D AS NTD REF: CMC 57438 DCA 7607 (SEANT 2) AS-BUILT VENDOR CERTIFICATION REF. GTIT 62726

QUAN SHIP

CPSES [illegible] CONTROL [illegible] INFORMATION CONTROL FOR CHANGES AND REVISION

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: M1-0612 Rev. 13 ELECT: E1-0602 Rev. 9
STEEL: S1-0505 Rev 9 H.V.A.C. [illegible] Rev 6

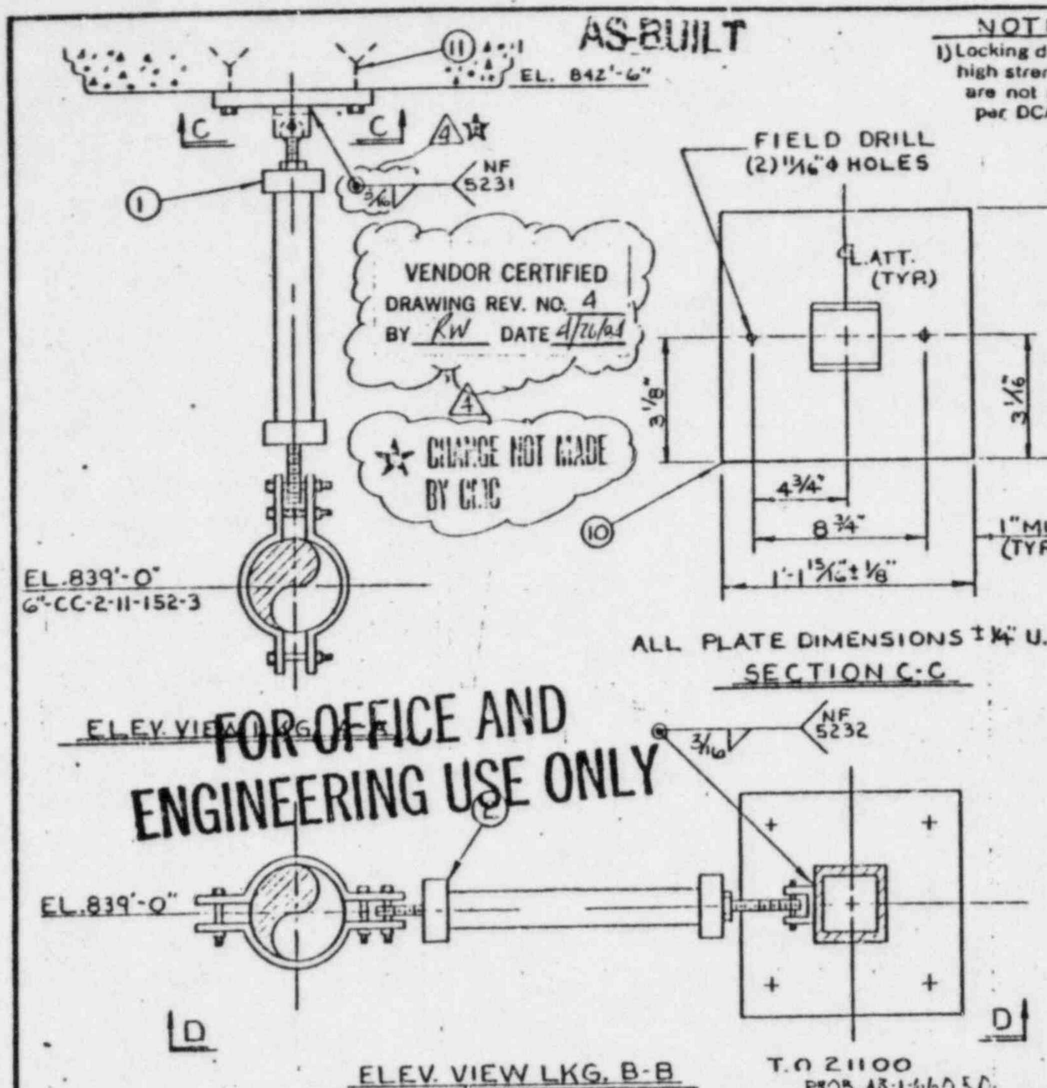
CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET		416 / 1,419 / 587 / 2,182				
EMERGENCY						
FAULTED						

REV	DATE	DWN	APP	DESCRIPTION
0/F	6/3/78	[illegible]	[illegible]	ISSUED FOR CONST. A.W. 1&2
1	1/24/79	KLM	[illegible]	REVISED PER CMC 1162 AND ITT REV. 1
2	10-15-79	JW	[illegible]	REDESIGNED & REDRAWN - ADDED [illegible] TO [illegible] PER [illegible]
3	[illegible]	[illegible]	[illegible]	REVISED AS NOTED PER NPSI REV. 3-A & ITT REV. 3

CUSTOMER [illegible]
ORDER OR CONT. NO. CP-0015
JOB NAME [illegible]
MARK NO CT-1-013-001-S42R
SKETCH NO. ~
SHEET 1 OF 1 REV. 5

AS-BUILT

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607



ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L	CSS	PRIM	SEC.	AISC
1	1	SRS-08-PC SWAY STRUT, W/			X			
		SPC-08-060 PIPE CLAMP						
2	1	SRS-08-PC SWAY STRUT, W/			X			
		SPC-08-060 PIPE CLAMP						
7A	1	1" THK. PL. PER SECT E-E (SA-36/SA515 GR55)	X					
8	1	T.S. 1/4"x4"x4"x4'-1 1/2" LG. (A-500, GR.B)		X		X		
10	1	CS PL 1" THK. PER SECT. C-C , SA-36 OR SA-515 GR65	X			X		
11	2	5/8"x8 1/2" HILTI KWIK CONCRETE ANCHORS			X			
12	4	1"x12" SUPER HILTI CONCRETE ANCHORS			X			

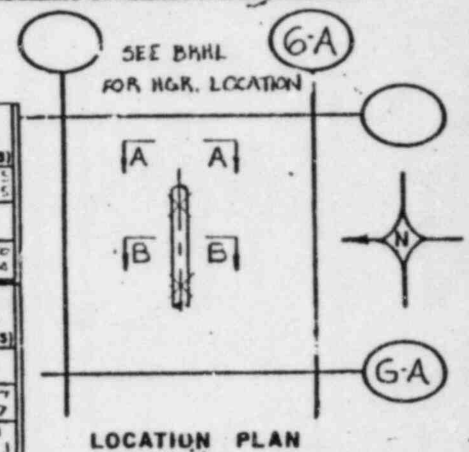
APPLY ONE COAT OF CARBO ZINC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	VENDOR CERTIFICATION; REF. 59790	[illegible]	[illegible]	[illegible]	CED
3	REV VENDOR CERT REF KP-9264	1/7/85	VM	[illegible]	[illegible]
4	REV'D VENDOR CERT.	4/27/85	AAR	[illegible]	[illegible]

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

DATA PT. 1088	SUPPORT LOADS (lbs) DESIGN	SERVICE LEVEL LIMITS A	B	C	D	PIPE MVTS (INCHES)
VERT.	—	—	—	—	—	+0.025 -0.025
N-S	—	-30 +1103	-901 +954	-1058 +1111	—	—
E-W	—	—	—	—	—	+0.010 -0.074

DATA PT. 2083	SUPPORT LOADS (lbs) DESIGN	SERVICE LEVEL LIMITS A	B	C	D	PIPE MVTS (INCHES)
VERT.	—	-652 -636	[illegible]	[illegible] 741	—	—
N-S	—	—	—	—	—	[illegible] -0.017
E-W	—	—	—	—	—	+0.011 [illegible]



SEE LOAD LISTS

REF. DWGS.	REV	MECHANICAL	REV	ELECTRICAL	REV
CC-2-AB-031	0	MI-0702	8	EI-0702	8
FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
CC-2-AB-031	0	S-0718	3	MI-0755	6

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
0	IFC	11-30-82	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
cont	(SEE NT. 1) ADDED SHT. 2, "AS BUILT"	~	~	~	~

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

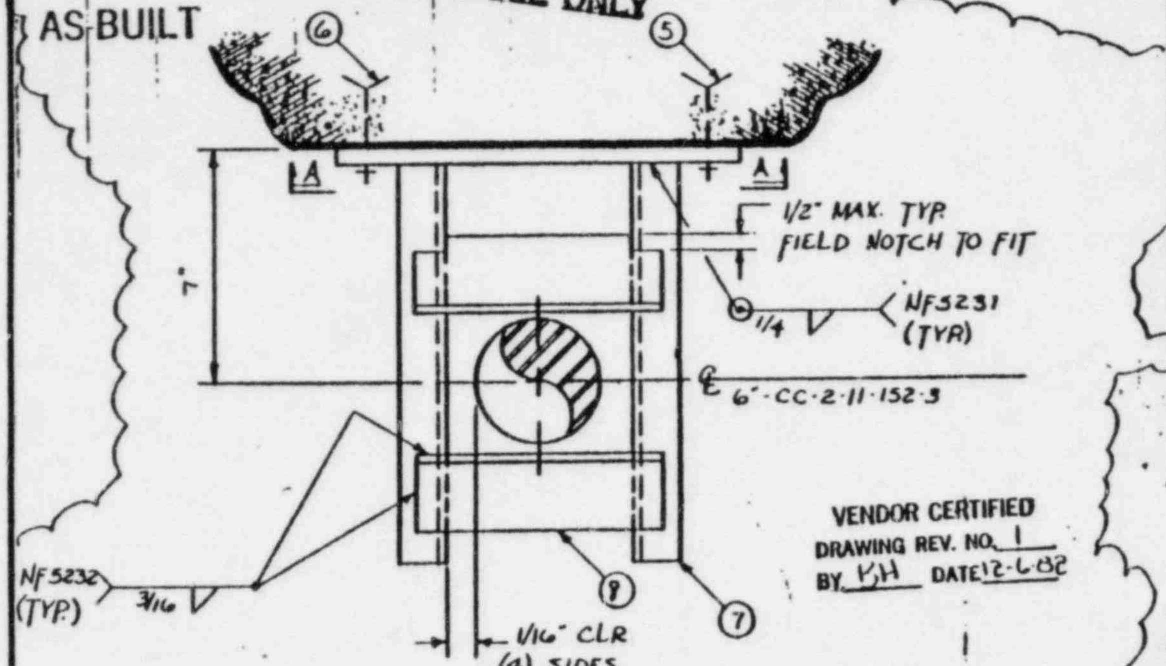
Brown & Root, Inc. ENGINEERS AND CONSTRUCTORS HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-716-A53R
SHEET 1 OF 2 REV. 4

FOR ENGINEERING & OFFICE USE ONLY

AS BUILT



PLAN VIEW
@ ELEV. 839'-9"

MVT'S	
Y	+0.023 -0.152

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607.

T.O. # 21101

VENDOR CERTIFIED
DRAWING REV. NO. 1
BY KH DATE 12-6-82

ITEM NO.	QTY. REQ'D.	MATERIAL DESCRIPTION					
4	1	5/8" THK CS PL PER SECT. A-A (SA36)	X		X		
5	1	3/4" x 7" HILTI KWIK CONCRETE ANCHORS		X			
6	3	3/4" x 10" HILTI KWIK BOLTS		X			
7	2	∠ 1/4" x 3" x 3" x 14" LG. (SA36)		X	X		
8	2	∠ 1/4" x 3" x 3" x 12" LG. (SA36)		X	X		

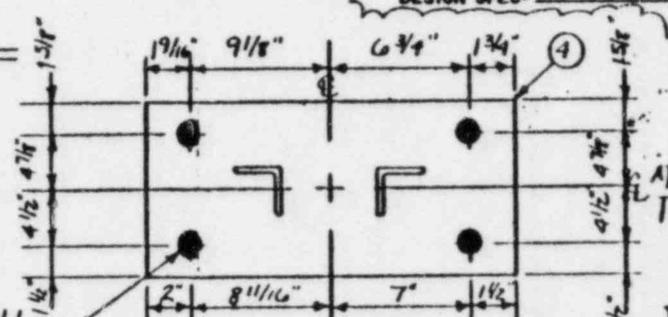
INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS PRIOR TO REVISION

PAINT: CARBOZINC # 11
PROBLEM: # AB-1-66C-REV-0

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
cont	AS-BUILT; VENDOR CERTIFICATION; GTN # 69790	~	~	~	~

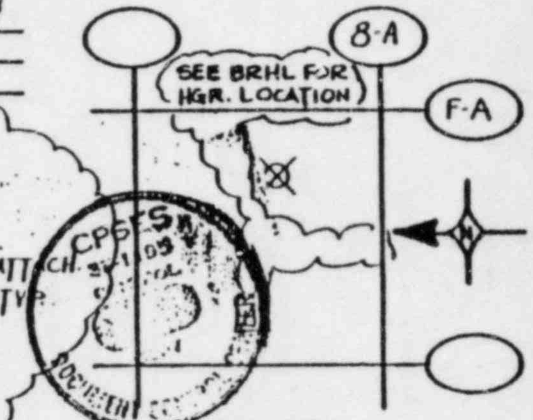
* CTR. LINE OF ATT. MAY VARY ± 1/8"

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A



FIELD DRILL
(4) 13/16" φ HOLES

SECTION 'A-A' *



LOCATION PLAN

DATA PT.	SUPPORT LOADS (lbs)					PIPE MVTS (INCHES)
2105	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	~	~	~	~	~	~
N-S	~	[illegible]	[illegible]	[illegible]	~	~
E-W	~	[illegible]	[illegible]	[illegible]	~	~

NOTE *N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☒ NO ☐
ASME CODE CLASS 3

REF. DWGS	STRESS ISO.	REV.	MECHANICAL	REV.	ELECTRICAL	REV.
	M2-3231-23	A	M1-0702	8	E1-0711	9
	BRHL ISO.	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CC-2-AB-032	1	S-0721	4	M1-0756	5

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	REVD AS NID PER CMC 69490 E	12/6/82	JR	KP	RC
cont	33449 R3 DCA 7607 (NT 1) (CONT ABOVE)	~	~	~	~
0	IFC	2-19-79	C.A.T.	[illegible]	MPA

CPSES

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

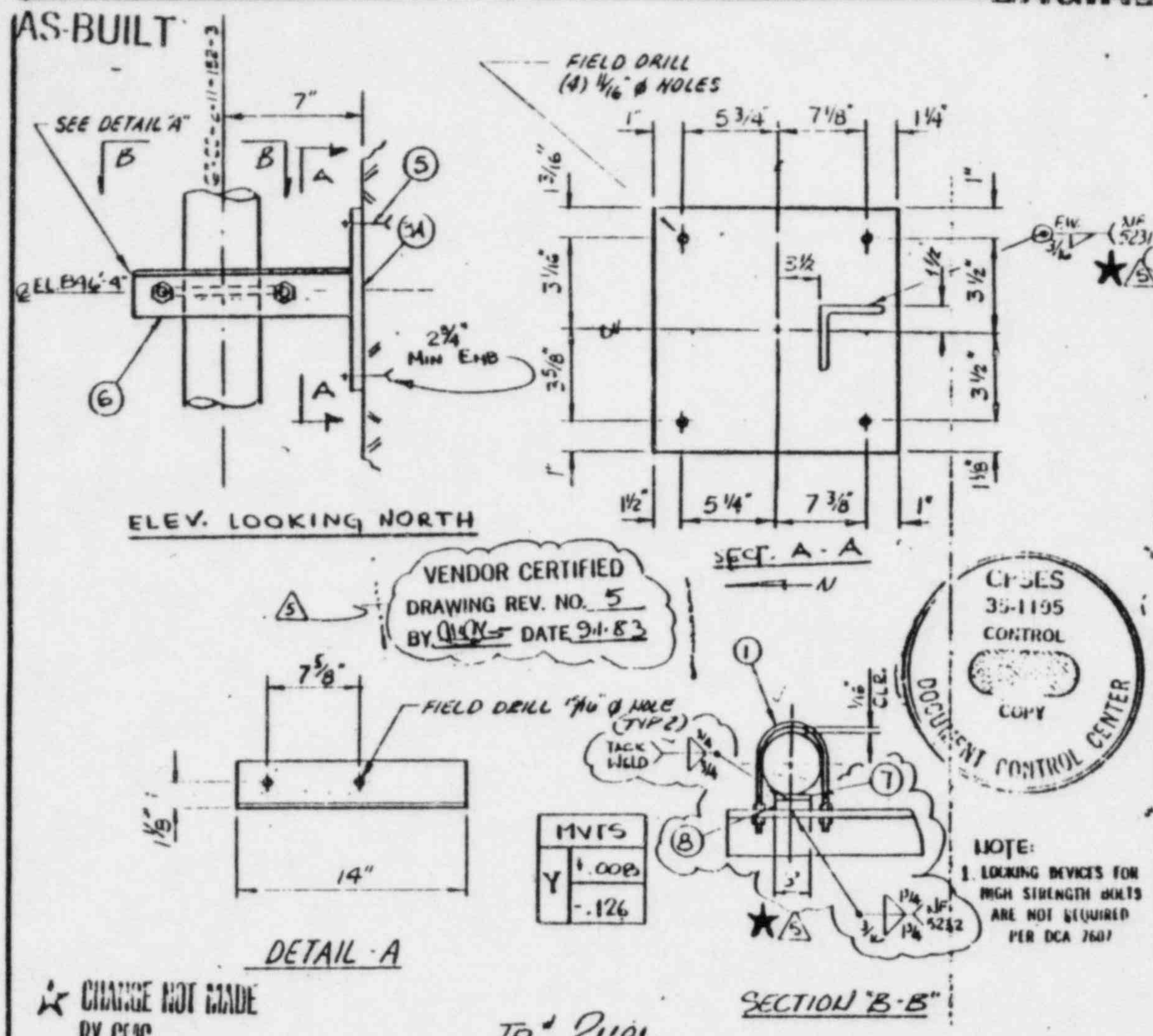
CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-710-A33R
SHEET 1 OF 1 REV. 1

FOR OFFICE AND ENGINEERING USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY

AS-BUILT



ITEM NO	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L	CSS	PRIM	SEC.	AISC
1	1	PUH-060			X	X		
2	1	3" x 3" x 3/8" ANGLE SA-36 - SEE DETAIL "A"		X	X	X		
3	1	5/8" PL SA-36 - SEE SECTION "A-A"	X		X	X		
4	4	1/2" x 3 3/4" HILTI KWIK CONCRETE ANCHOR			X	X		
5	4	5/8" x 6 1/4" HILTI KWIK CONCRETE ANCHOR			X			
6	1	3/8" x 3" x 3" ANGLE x 14" LG		X		X		
3A	1	3/8" x 9 1/2" C.S. PLATE x 15 1/8" LG (SA36 C.S.)				X		
7	1	1/4" CS R 3" x 3" A-510 GR CORE						
8	1	3/8" CS R 3" x 3 1/2" SA 36						

PAINT CARBO ZINC # 11

REV	DESCRIPTION	DATE	DWN	CHKD	APPVD
4	REV'D VENDOR CERTIFICATION REF. ABR M-7749	7/8/83	[illegible]	[illegible]	[illegible]
5	REV'D VENDOR CERTIFICATION	9-1-83	[illegible]	[illegible]	[illegible]

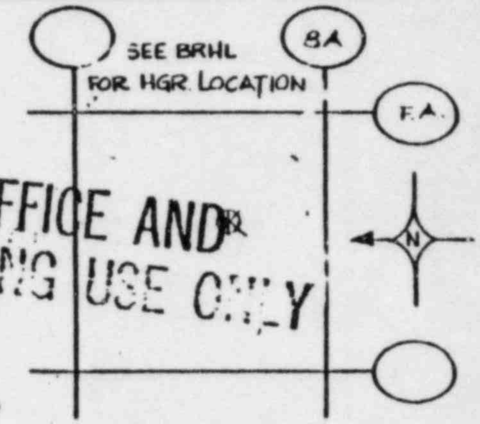
REV	DESCRIPTION	DATE	DWN	CHKD	APPVD
2	VENDOR CERTIFICATION REF. GTN 59790	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible] VENDOR CERTIFICATION [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible] M-7749				

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION: NA

CPSES 35-1195 CONTROL COPY DOCUMENT CONTROL CENTER

PROB # AB-1-66C REV. 0



LOCATION PLAN

TO # 21101.

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS (INCHES)
2106	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT						
N-S		-21, -54	195, 170	-98, 221		
E-W		-21	-62, 32	-63, 39		

NOTE: +N,E,UP / -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS	STRESS ISO	REV	MECHANICAL	REV	ELECTRICAL	REV
	M2-3231-36	A	M1-0702	8	E1-0711	9
	BRHL ISO	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0721	4	M1-0756	5

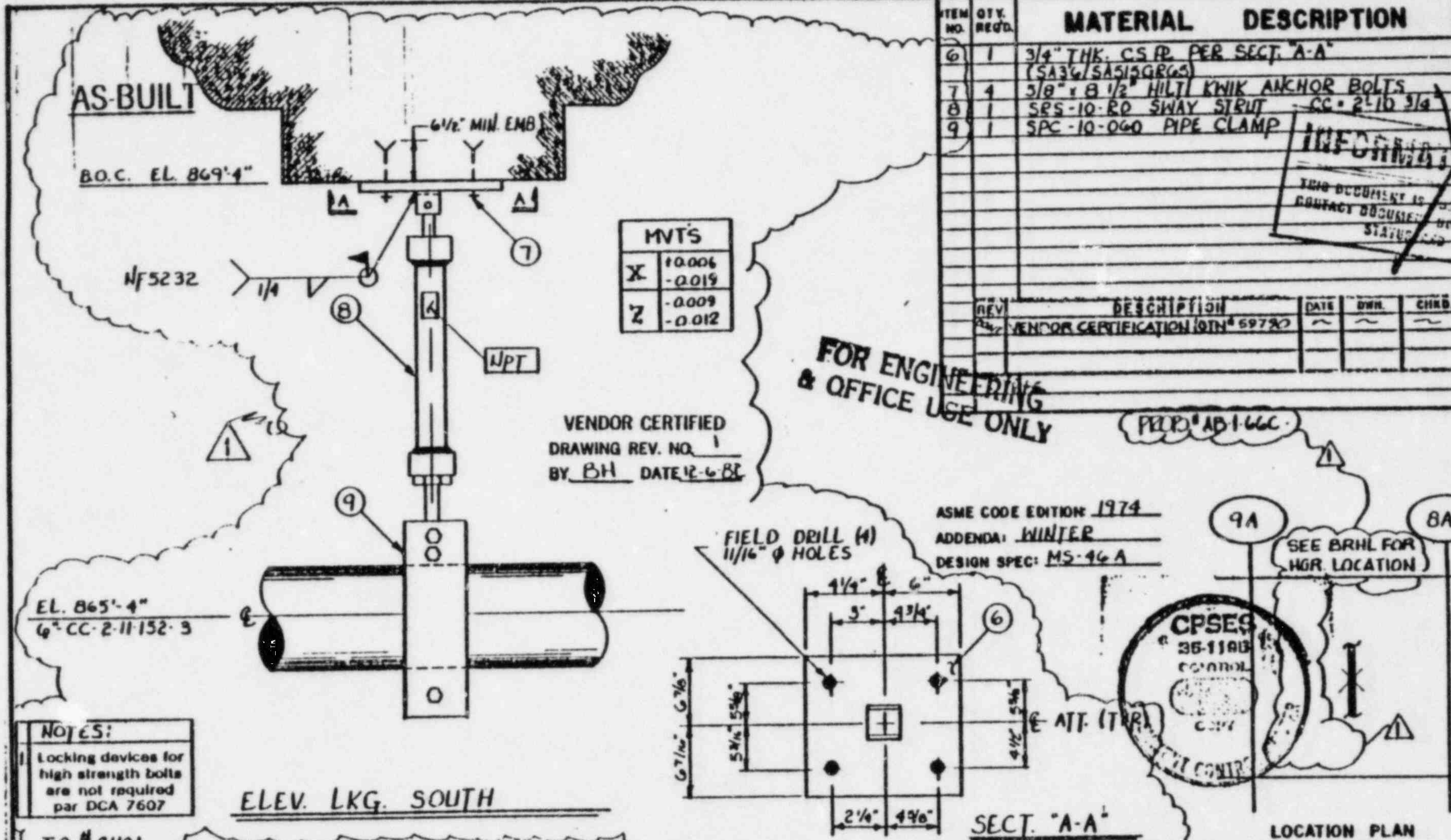
REV	DESCRIPTION	DWN.	CHKD.	APPVD.
0	IFC 11/30/79	[illegible]	[illegible]	[illegible]
1	REV'D AS NOTED REF. CMC 33421 REV 3, PHP [illegible]	[illegible]	[illegible]	[illegible]
--	REV'D VENDOR CERTIFIED DWG, DCA [illegible] AS-BUILT 5-4-81	[illegible]	[illegible]	[illegible]

CPSES 35-1195

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-11-709-AG3R
SHEET 1 OF 1 REV. 5



NOTES:
1. Locking devices for high strength bolts are not required per DCA 7607

T.O. # 21101

ITEM NO.	QTY. REQ'D.	MATERIAL DESCRIPTION
6	1	3/4" THK. CS PL. PER SECT. "A-A" (SA36/SA515GR65)
7	4	5/8" x 8 1/2" HILTI KWIK ANCHOR BOLTS
8	1	SRS-10-RD SWAY STRUT CC = 2'-10 3/4
9	1	SPC-10-060 PIPE CLAMP

INFORMATION ONLY — THIS DOCUMENT IS ... CONTACT DOCUMENT ... STATUS

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
	VENDOR CERTIFICATION (DTN# 69790)	~	~	~	~

FOR ENGINEERING & OFFICE USE ONLY

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

DATA PT.	DESIGN	SERVICE	LEVEL	LIMITS	PIPE MVTS (INCHES)
2110					
VERT.	—	1265	1265	1555	
N-S					
E-W					

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS.	STRESS ISO.	REV.	MECHANICAL	REV.	ELECTRICAL	REV.
	M2-3231-36	A	MI-0701	6	EI-0710-01	7
	(BRHL) ISO.	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CC-2-AB-032	1	S-0735	2	MI-0758	4

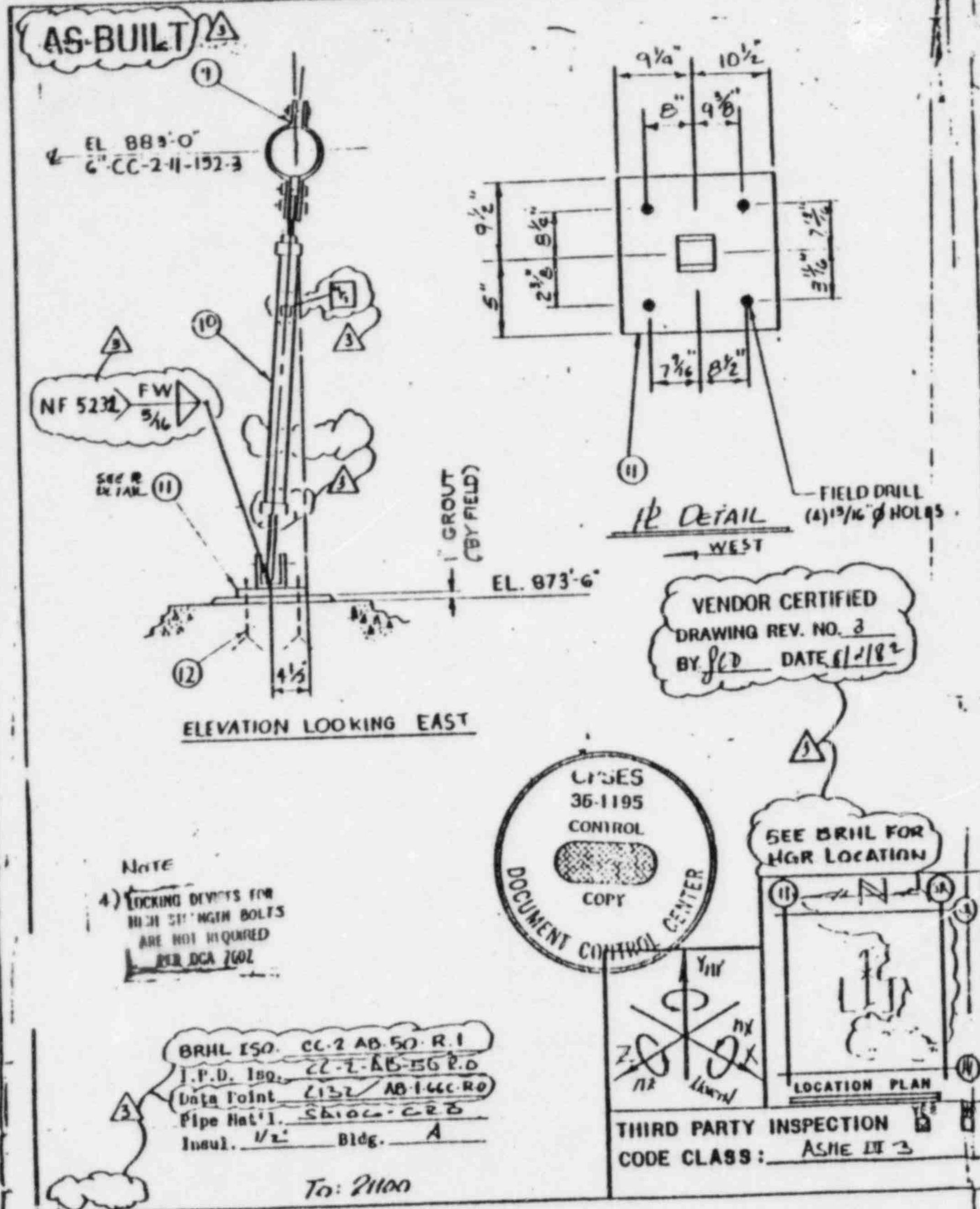
REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
0	ISSUED FOR CONSTRUCTION				
1	REVD. AS NTD. REF. CMC ... DCA 7607 (SEE NT #1) AS-BUILT				

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-705-A63R
SHEET 1 OF 1 REV. 1

FOR OFFICE AND ENGINEERING USE ONLY



ITEM No.	MATERIALS & OPERATIONS	QUAN	SHIP
	SEISMIC SWAY STRUT ASSEMBLY CONSISTING OF	ONE	
9	SMS (SWAY STRUT CLAMP) NB SPC-14-060	1	
10	SRS (SWAY STRUT) TYP PC, SIZE #14. CC DIM. = 100 9/16"	1	
11	1/2" THK. C.S. PLATE (SA-36 OR SA515 GR. 65) SEE DETAIL "A"	1	
12	3/4" ϕ x 10" LONG. HILTI KWIKI BOLT CONCRETE ANCHORS	4	
	No Adj't. By Grinnell		
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG MARK # CC-2-011-006-A73R	1	
	Apply Carbo-Zinc #11 to above mat'l except th'ds which shall be treated with a rust preventative		

FOR ENGINEERING & OFFICE USE ONLY

REV	DATE	DWN	CHK	APP	DESCRIPTION
3		JR	RL		REV'D AS BUILT REF. CMC-79196 VENDOR CERTIFICATION REF. GTN# 59790

INFORMATION ONLY

Approved By: C.F.C.
Date: 4-23-79

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. 3 SHEET OF

Brown & Root, Inc.

CONDITIONS	Fx	Fy	Fz	Mx	My
DESIGN					
NORMAL & UPSET		2808 / 154			
EMERGENCY		4004 / 236			
FAULTED					

REF. DRAWING NUMBERS
PIPE: M1-0105-01-R0 ELECT: E1-0104-2.3
STEEL: S-352- FIL.1 H.V.A.C.: 1M-0359-R4

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	6-5-79	JW	Rc	M	ISSUE FOR CONST. FW 1-22
1	1-20	FC	Fy	M	REV PER NPSI REV 0A ITEM ADDED FW #22
2		DB		RD	REV. AS NOTED Per. DCA-7607 SEE NT #4) CMC-40553 R4. VIEWS IN ITEM EVAL. 1-22, Pcl'd No. 1-3 AS BUILT

CUSTOMER Texas Utilities Service, I
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-2-011-006-A73R
SKETCH NO.
SHEET 1 OF 1 REV. 3

FOR OFFICE AND ENGINEERING USE ONLY

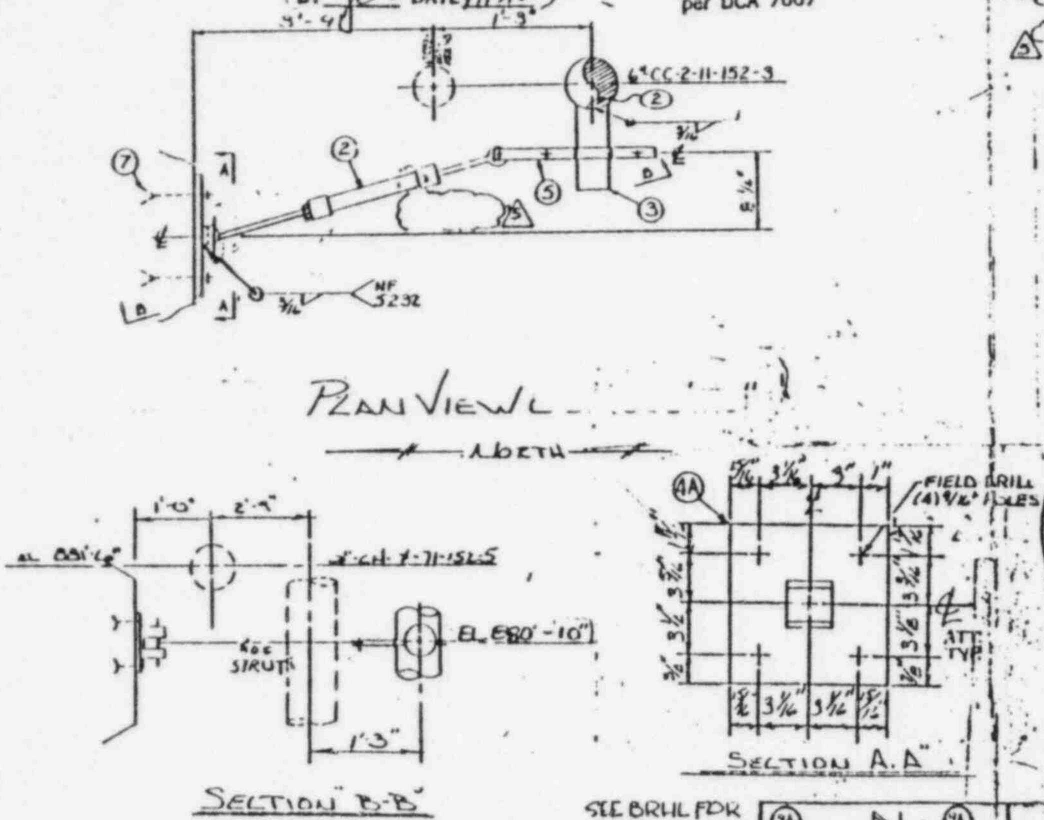
FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE (A CHANGE NOT PER CMC)

VENDOR CERTIFIED
DRAWING REV. NO. 5
BY [illegible] DATE 7/19/83

AS-BUILT

NOTE:
1) Locking devices for high strength bolts are not required per DCA 7607



SEE BRHL FOR HGR. LOCATION

ITEM NO.	NO REQ'D	PART CALL-OUT	DESCRIPTION	MATERIAL	MIC. NO.	WT.	POS	L	CSS	PRIM	SEC	AISC
1	4	BSA 12-512	Conc ANCHORS									
2	1	SRS 06 RO	SWAY STRUT		62	20			X			
3	1	[illegible]		SA106 GR.B	D	9		X		X		
4A	1	PL 3/8" x 8" x 9"		SA515 GR.65	D		X			X		
5	1	SPC-06-030	PIPE CLAMP	SA 36	D	7			X			
6	1	DWG [illegible]	ASME III PLATE									
7	4	1/2" X 5 [illegible]	Conc ANCHORS						X			

No Mat'l By GRINNELL

SEISMIC ASSEMBLY SKETCH AND ENGINEERING 1
BUNDLE AND TAG - 1
MARK # CC-2-011-005-A73R

Apply Carbo-Zinc #11 to above mat'l except th'ds which shall be treated with a rust preventative

CPSES 35-1195 CONTROL

FOR OFFICE AND ENGINEERING USE ONLY

REV	DATE	DWN	CHK	APP	DESCRIPTION
1	[illegible]	[illegible]	Q	[illegible]	REV'D AS NT'D REF. CMC 13587 DCA-7607 SEE NT. 4 AS BUILT
[illegible]		~	~	~	VENDOR CERTIFICATE; REF GTH #59710
3	[illegible]	[illegible]	[illegible]	[illegible]	REV. VENDOR CERT.

QUAN. | SHIP. | PBS | L | CSS | PRIM. | SEC.

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. (SHEET OF

Brown & Root, Inc.

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	-262 +51		-6 +41			
EMERGENCY	-262 +154		-9 +37			
FAULTED						

REF. DRAWING NUMBERS
PIPE: M1-0703-01 Rev O ELECT: M1-0704 R3
STEEL: S-0735 Rev 2 H.V.A.C.: M1-0759 R4

REV	DATE	DWN	CHK	APP	DESCRIPTION
1	6-5-79	JW	[illegible]	[illegible]	ISSUE FOR CONST. FW 1-2
2	2-26-80	[illegible]	[illegible]	JW	REV. PER NPSI REV CA
3	[illegible]	JC	[illegible]	[illegible]	REV. AS NOTED REF. CMC 31066 R1
4	[illegible]	[illegible]	[illegible]	[illegible]	REV. AS NOTED REF. CMC #35704 R1 PNDP 1134 R.1

cb

CUSTOMER Texas Utilities Service, Inc
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-2-011-005-A73R
SKETCH NO.
SHEET 1 OF 1 REV. 5

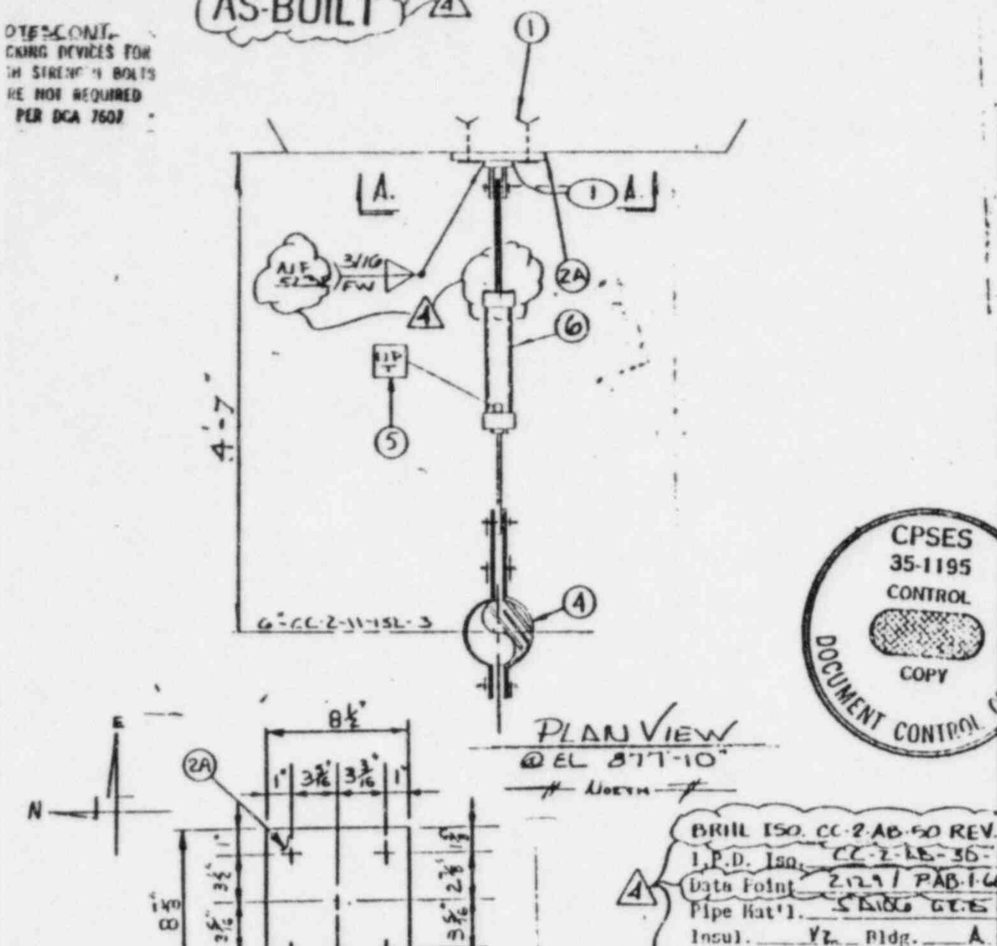
THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III-3

T.O. # 21101

PRH ISO CC-2-AB-050 R.1
I.P.D. Iso. CC-2-AB-50 R.0
Data Point 2131 / ADFLLC R0
Pipe Mat'l. SA106 GR.B
Insul. 1/2" Bldg. A

AS-BUILT

NOTES CONT.
[illegible] LOCKING DEVICES FOR [illegible] STRENGTH BOLTS [illegible] NOT REQUIRED PER DCA 7607



ITEM NO.	NO REQ'D	PART CALL-OUT	DESCRIPTION	MATERIAL	MIC. NO.	WT.
1	4	BSA 12-512	CONC. ANCHORS		—	
2	1	[illegible]		SA 36		
3	1	SRS 06-RO	SWAY STRUT		67D	20
4	1	SPC-06-060	PIPE CLAMP	SA36	D	18
5	1	DWG 2070A	ASME III PLATE			
2A	1	[illegible]	CS PLATE	SA36		
6	1	SRS-06-RO	SWAY STRUT C.C.= 3'-8"			

NO MAT'L BY GRINNELL

SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG
MARK # CC-2-011-004-A73R

Apply Carbo-Zinc #11 to above mat'l except th'ds which shall be treated with a rust preventative

CPSES 35-1195 CONTROL COPY DOCUMENT CONTROL CENTER

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REV	DATE	DWN	CHK	APP	DESCRIPTION
3	1-14-81	PJ			REV. AS NOTED REF. DCA 7607 ITEM #4 CMC 36686 & PHBP 324 - DELETED NT 31-3 (AS BUILT)
CONT	~	~	~	~	
4		JR			VENDOR CERTIFICATION REF. GTN 59790

BRHL ISO. CC-2-AB-50 REV. 1
I.P.D. Iso. CC-2-AB-30-1.0
Data Point 2129 / PAB-1-66C-R.0
Pipe Mat'l. SA106 GR.B
Insul. 1/2 Bldg. A

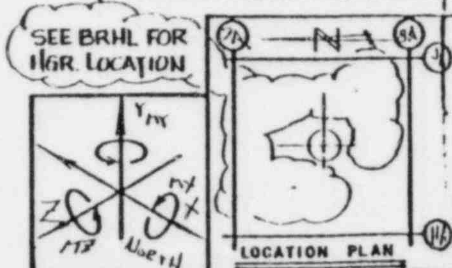
SEE BRHL FOR HGR. LOCATION

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: M1-0705-01 R.0 ELECT: E1-0704 R.3
STEEL: S-0735 R.2 H.V.A.C.: M1-0467 R.3

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	—	405 / 1420	—	—	—
NORMAL & UPSET	—	—	936 / 1960	—	—	—
EMERGENCY	—	—	1017 / 1041	—	—	—
FAULTED	—	—	—	—	—	—



REV	DATE	DWN	CHK	APP	DESCRIPTION
0	6-5-79	JW		M	ISSUE FOR CONST FW 1
1	2-7-80		M	JW	REV. PER NIST REV OA
2	4-28-80	KS	KM		REV'D AS NOTED REF. DC 324

THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III-3

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-2-011-004-A73R
SKETCH NO. —
SHEET 1 OF 1 REV. 4

VENDOR CERTIFIED DRAWING REV. NO. 4 BY JCD DATE 2/15/82

STD. 2100

FOR OFFICE AND ENGINEERING USE ONLY

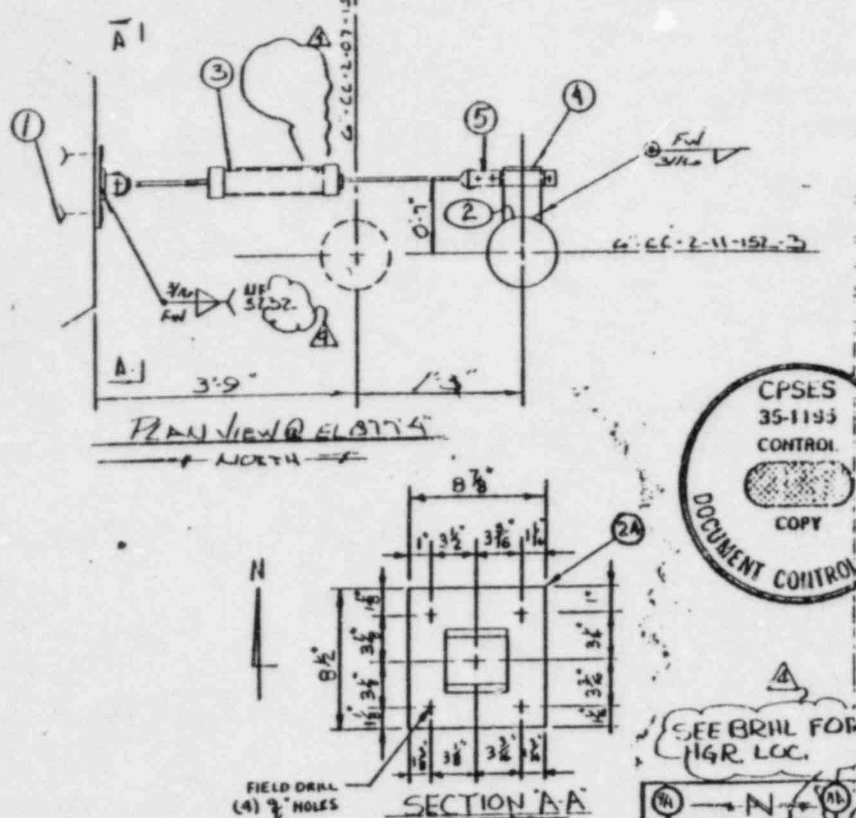
Printed in U.S.A.

ENGINEERING USE ONLY

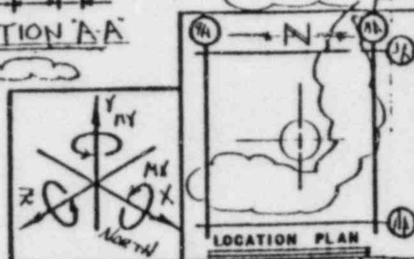
AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 4
BY [illegible] DATE 1/28/83

NOTES CONT:
4) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7607



SEE BRHL FOR HGR. LOC.



THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III-3

0.21100 BRHL Iso. CC-2-AB-50 R1
T.P.D. Iso. CC-2-AB-50 R0
Data Point 2129 VPROB AB + CC R0
Pipe Mat'l. SA106 GR B

ITEM NO.	NO REQ'D	PART CALL-OUT	DESCRIPTION	MATERIAL	MIC. NO.	WT.	PBS	L	CSS	PRIM	SEC	AISC
1	4	BSA 12-512	LONG ANCHORS									
2	1	1" x 8" x 8"	C.S. PLATE	SA36	P	3				X		
3	1	SAS 06-RO E-C=52 7/8"	SWAY STRUT		67D	20			X			
4	1	P 3" SCH 10X 5 3/8		SA106 GB	P	3			X	X		
5	1	SCP 06-C30	PIPE CLAMP	SA36	P	7				X		
2	1	DWG 2078A	ASME III PLATE									
2A	1	1/2" x 8 7/8" x 8 7/8"	C.S. PLATE	SA36/SA515			X			X		

H6 MAT'L BY GRINNELL

SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG 1
MARK # CC-2-011-003-A73R 1

Apply Carbo-Zinc #11 to above mat'l except th'ds which shall be treated with a rust preventative

FOR ENGINEERING & OFFICE USE ONLY

REV	DATE	DWN	CHK	APP	DESCRIPTION
4	1-27-83	VM	Q	CED	VENDOR CERT. REF. GTN 59790

Approved By: GFC
Date: 4-23-79

QUAN. SHIP. PBS L CSS PRIM. SEC. AISC.

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: M-0105-01-R0 ELECT: El-0704-REV.3
STEEL: S-0735 R12 H.V.A.C.: M1-0165-REV.4

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	-124 1913					
EMERGENCY	1932					
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	6-5-79	Jw		M	ISSUE FOR CONST. FW 1-2
1	2-20-80	FP	RW	JW	REV PER NPSI REV 0A
2	9-26-80	RS		RJ	REV'D AS NOTED REF BHBP 30133

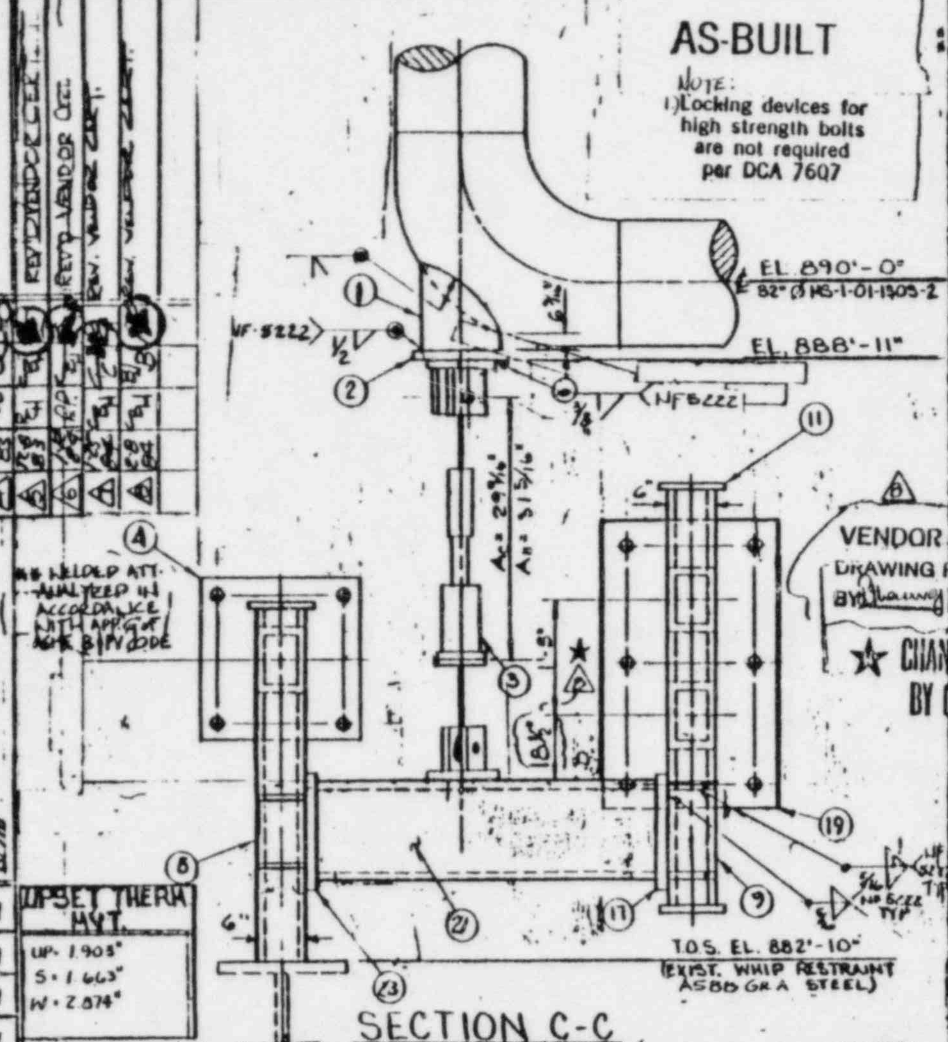
CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0050
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-2-011-003-A73R
SKETCH NO.

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE 1-13-81

AS-BUILT

NOTE:
1) Locking devices for high strength bolts are not required per DCA 7607

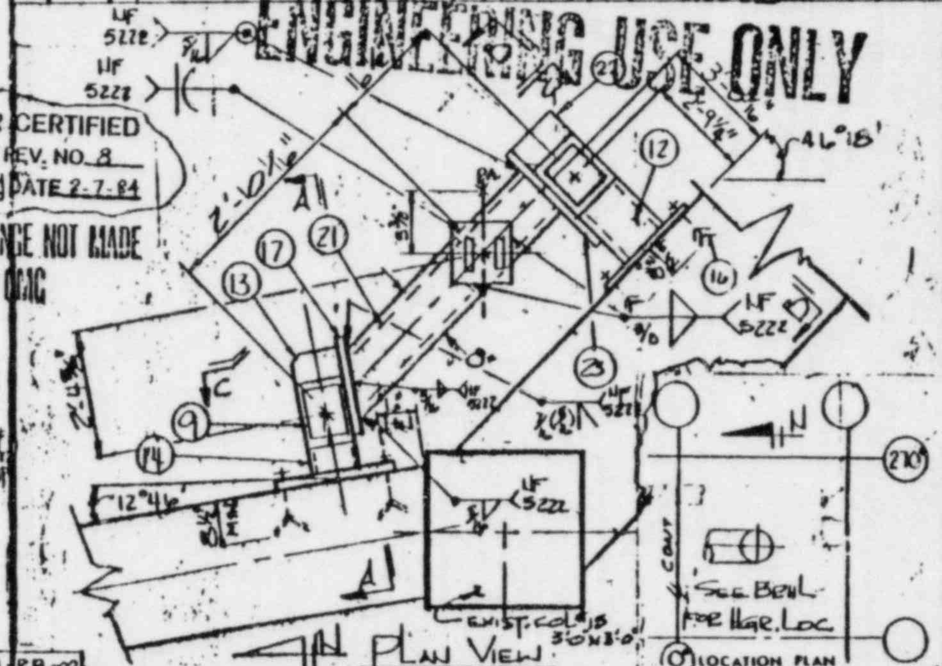


SECTION C-C

UPSET THERM MVT.

UP- 1.903"
S- 1.663"
W- 2.874"

ITEM NO	NO REQ'D	DESCRIPTION	WT.	ASME OR ASTM			MIC.
1	1	P24 SCH 60		SA106-B	L		
2	1	FP 1½" X 26" X 2'-2"		SA-36	P&S		
3	1	SMF-100-BA MECH. SNUBBER		~	CSS		
4	1	1½" C.S. PL (SEE DET A)		SA-36	P&S		
5	1	TS 10 X 6 X .500"		A-500 Gr B	L		
6	1	FP 1" X 12" X 1'-2"		SA-36	P&S		
7	2	FP ¾" X 11" X 4'-0" CUT TO SUIT		SA-36	P&S		
8	2	FP ½" X 8" X 4'-0" CUT TO SUIT		SA-36	P&S		
9	1	TS 10 X 6 X .500" X 5'-0" LG FLD CUT TO SUIT		A-500 Gr B	L		
10	1	FP 1½" X 12" X 3'-3" BY FIELD		SA-36	P&S		
11	3	FP ½" X 7" X 11"		SA-36	P&S		
12	1	TS 10 X 6 X .500" FIELD TRIM TO SUIT		A-500 Gr B	L		
13	2	FB 4" X ½" X 6"		SA-36	P&S		
14	2	TS 10 X 6 X .500"		A-500 Gr B	L		
15	6	1¼" Ø x 12" SUPER HILTI (BY FIELD)			CSS		
16	4	1" Ø x 12" SUPER HILTI (BY FIELD)			CSS		



PLAN VIEW

LOCATION PLAN

T.O. 3401

81	REV. VENDOR CERT.	ISSUED FOR CONST.	VENDOR CERTIFICATION			

LOAD (LBS)	DESIGN LOADS UPSET	EMERG	FLTD	MVTS (IN.)	THER	SEISMIC
UP	5247B	6504	5241	VERT. UP	1.903	48-1-001/R1
DN	5247	6504	5241	N-S	1.663	10
N				E-W	2.874	SC-24-1
S	4101	5510	5328			
W	4101	5510	5328			

81	SUPP'T. ISO.	NPSI-MS-1-RB-02			
REFERENCE DRAWINGS	PRELIM ISOMETRIC: MS-1-RB-02 (REV 2)	PIPING: 2323-MI-0566 (REV B)	ELECTRICAL: 2323-EI-0802 (REV B)	CODE/CLASS: III/2	
	FAB. ISOMETRIC: MS-1-RB-02 (REV 8)	STRUCTURAL: 2323-SI-0550 (REV 2)	H.V.A.C.: 2323-MI-0652 (REV 5)	PAINT: CARBOZINC 11	ZONE ~

OWNER: TEXAS UTILITIES SERVICES INC.
PROJECT: COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER: GIBBS & HILL INC.

Brown & Root, Inc.
HOUSTON, TEXAS

DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
DL	11-18-80		11-26-80		12-6-80

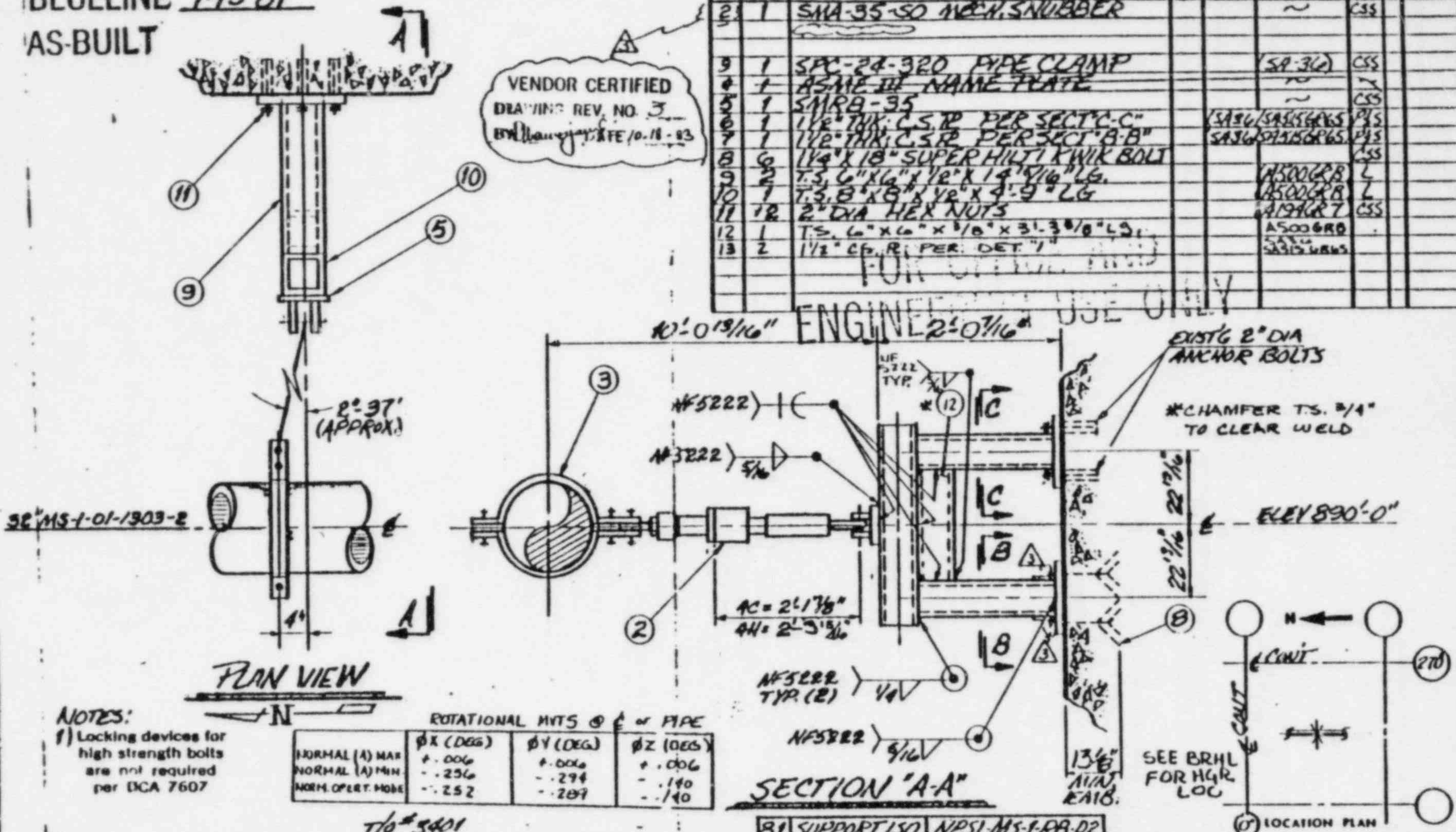
P.O. NO. CP-0048 A.1 | MFG. REL.

PRODUCTION ORDER	SERIAL NUMBER	SHEET
308	MK. NO. MS-1-01-005-C72K	1 OF 3

REV. 8

BLUELINE 1-13-81

AS-BUILT



ITEM NO	NO REQ'D.	DESCRIPTION		WT.	ASME OR ASTM	P/M		MIC.
2	1	SMA-35-50 MECH. SNUBBER			~	CSS		
3	1	SPC-24-320 PIPE CLAMP			(SA-36)	CSS		
4	1	ASME III NAME PLATE			~			
5	1	SMRB-35			~	CSS		
6	1	1 1/2" THK. C.S. PL PER SECT "C-C"		SA36	SA515GR65	P/S		
7	1	1 1/2" THK. C.S. PL PER SECT "B-B"		SA36	SA515GR65	P/S		
8	6	1 1/4" X 18" SUPER HILTI KWIK BOLT						
9	2	T.S. 6" X 6" X 1/2" X 1'-4 11/16" LG.			A500GR.B	L		
10	1	T.S. 8" X 8" X 1/2" X 4'-9" LG			A500GR.B	L		
11	12	2" DIA HEX NUTS			A194GR.7	CSS		
12	1	T.S. 6" X 6" X 3/8" X 3'-3 3/8" LG.			A500 GR.B			
13	2	1 1/2" C.S. PL PER DET. "1"			SA36 SA515 GR.65			

NOTES:

1) Locking devices for high strength bolts are not required per DCA 7607

ROTATIONAL MVTS @ ℄ OF PIPE

	ØX (DEG)	ØY (DEG)	ØZ (DEG)
NORMAL (A) MAX	+.006	+.006	+.006
NORMAL (A) MIN	-.256	-.294	-.140
NORM. OPER. MODE	-.252	-.289	-.140

T/O #3401

REV	DATE	DWN	CHK	APP	DESCRIPTION
1	4-13-81			RS	ISSUED FOR CONST. REF. FIELD MODIFIED HANGER SKETCH
2					REV'D AS NOTED PER CMC 7813
3					AS-BUILT VENDOR CERTIFICATION
					REV. VENDOR CERTIFICATION, REF. CMC # 65390
					REV'D VENDOR CERT.

LOAD (LBS)	GRAV	THER	HYDRO	OBE	SSE	DESIGN LOADS NORM UPSET	EMERG	FLTD	MVTS (IN.)		
UP									VERT.		
DN									N-S		
N									E-W		
S									PIPE CALC	AB-1-001 R.1	
E						40480	38280	59540	DATA	112	
W						40480	38280	59540	SUPT CALC.	SC-24-1	

REFERENCE DRAWINGS	BRHL ISOMETRIC	REV	PIPING	REV	ELECTRICAL	REV	CODE/CLASS: ASME/2
	MS-1-RB-002	2	2323-MI-0506	8	2323-EI-0503	7	PAINT: CARBOZINC 11
	FAB. ISOMETRIC	REV	STRUCTURAL	REV	H.V.A.C.	REV	ZONE ~
	MS-1-RB-02	8	2323-S-0532	2	2323-MI-0562	5	

81 SUPPORT 150 NPSI-MS-1-RB-02

OWNER TEXAS UTILITIES SERVICES INC.

PROJECT COMANCHE PEAK UNITS NO. 1 & 2

ENGINEER GIBBS & HILL INC.

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

DRAWN	DATE	CHK'D	DATE	APPV'D	DATE

P.O. NO. CP-0046 | MFG. REL.

PRODUCTION ORDER	SERIAL NUMBER	SHEET
		1 of 2

307 MK. NO. MS-1-001-004-C72K REV. 3

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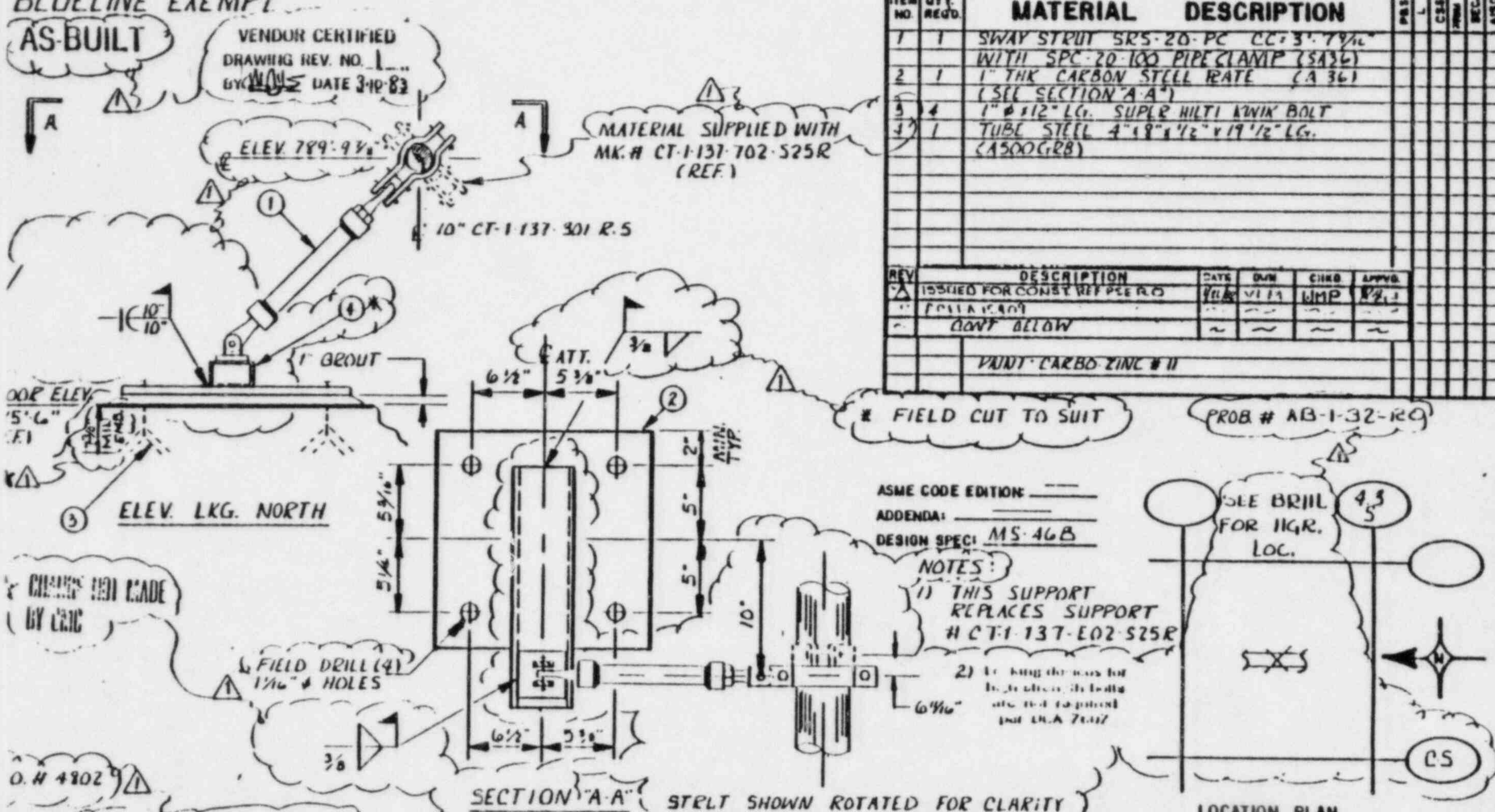
BLUELINE EXEMPT

AS-BUILT

VENDOR CERTIFIED DRAWING REV. NO. 1 BY WJS DATE 3-10-83



ITEM NO.	QTY. REQD.	MATERIAL DESCRIPTION
1	1	SWAY STRUT SRS-20-PC C.C.: 3'-7 9/16" WITH SPC-20-100 PIPE CLAMP (SA36)
2	1	1" THK. CARBON STEEL PLATE (A 36) (SEE SECTION "A-A")
3	4	1" ø x 12" LG. SUPER HILTI KWIK BOLT
4	1	TUBE STEEL 4" x 8" x 1/2" x 19 1/2" LG. (A500 GR.B)

REV.	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
0	ISSUED FOR CONST. REF. PSE R.O.	[illegible]	VLM	WMP	[illegible]
	[illegible]	~	~	~	~
	CONT. BELOW	~	~	~	~

PAINT: CARBO ZINC # 11

PROB. # AB-1-32-RQ

ASME CODE EDITION: ——

ADDENDA: ——

DESIGN SPEC: MS-46B

NOTES:

1) THIS SUPPORT REPLACES SUPPORT # CT-1-137-E02-S25R

2) Locking devices for high strength bolts are not required per DCA 7607

SEE BRHL FOR HGR. LOC.

LOCATION PLAN

	DESIGN	A	B	C	D	PIPE MVTS (INCHES)
		3352 / -72	5271 / 1624	6293 / 1241		10.001 / 0.004
						10.016 / 0.09
		-2961 / -63	4055 / 11131	5558 / 12629		10.001 / 0.002

AUTHORIZED NUCL. INSP. YES ☐ NO ☒ ASME CODE CLASS (2-3)

REF. DWGS.	BRHL ISO.	REV.	MECHANICAL	REV.	ELECTRICAL	REV.
	CT-1-SB-003	12	MI-0616	11	EI-0601-5	2
	FAB. ISO.	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CT-1-SB-003	5	SI-0600	11	MI-0650	6

REV.	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	REVD. AS NTD; REF: CMC 66908 R.1, DCA 7607 NEZ, AS-BUILT	3-10-83	VLM	[illegible]	[illegible]
CONT.	VERIFY CERTIFICATION, REF. CPPA 21082	~	~	~	~

CPSES

Brown & Root, Inc.

ENGINEERS AND CONSTRUCTORS

HOUSTON, TEXAS

CLIENT T.U.S.I.

PLANT COMANCHE PEAK

JOB NO. 2323

SUPPORT NO. CT-1-137-701-S25R

SHEET 1 OF 1 REV. 1

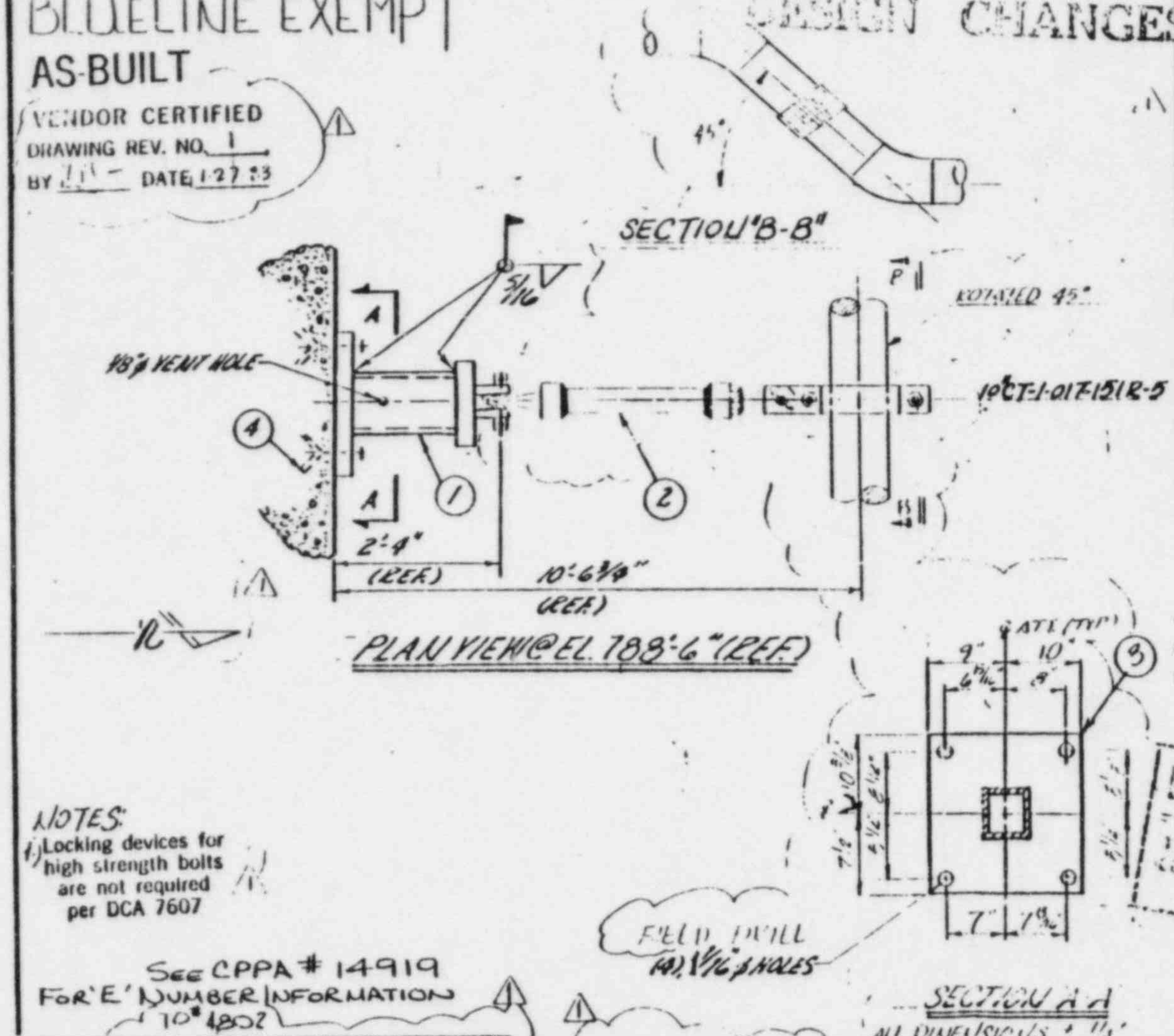
THIS DOCUMENT AFFECTED BY DESIGN CHANGES

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE EXEMPT

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 1
BY [illegible] DATE 1-27-83



ITEM NO.	QTY. REQ'D.	MATERIAL DESCRIPTION
1	1	T.S. 5×5×.500 × 2'1" LG (CUT TO SUIT) A-500 GR B
2	1	STRUT, S25-20 PC; CC = 84 3/4" W/CLAMP SPC-20-100
3	1	PL 1" THK (SEE SECTION A-A)
4	4	1"×12" SUPER HILTI-KWIK CONC. ANCHOR (MIN. EMB. = 8 1/2")

REV	DESCRIPTION	DATE	DWN	CHKD	APPVD
CONT	DCA-7607 (SEE NT. 1) "AS BUILT"	~	~	~	~
CONT	VENDOR CERTIFICATION REF CPPA 26082	~	~	~	~

(PROD# AB-1-32 R0)

ASME CODE EDITION:
ADDENDA:
DESIGN SPEC: MS-46B

ENGINEERING OFFICE USE ONLY

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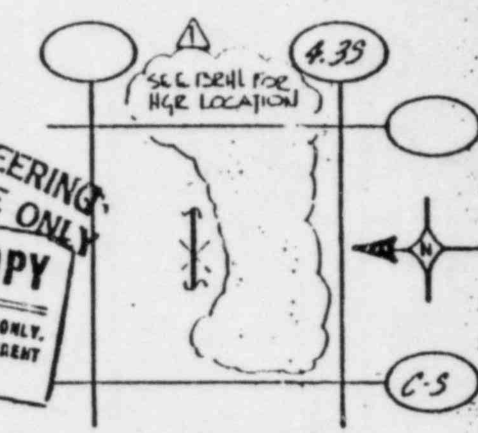


LOCATION PLAN

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

See CPPA # 14919 For 'E' Number Information (10# 4802)

DATA PT 804	SUPPORT LOADS (lbs) DESIGN	SERVICE LEVEL LIMITS A	B	C	D	PIPE MVTS (INCHES)
VERT.	—	—	—	—	—	+.002 / -.001
N-S	—	-1757 / +1862	-5289 / +2110	-7249 / +5670	—	—
E-W	—	—	—	—	—	+.007 / -.007

NOTE 4 N.E. / W-S W.S.M — AUTHORIZED NUCL. INSP. YES ☐ NO ☒ — ASME CODE CLASS

REF. DWGS.	BRHL ISO	REV	MECHANICAL	REV.	ELECTRICAL	REV.
	CT-1-SB-003	1	MP-0205	14	E1-0602-01	2
	FAB. ISO	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CT-1-SB-003	5	S1-0690	17	M1-0650	6

REV	DESCRIPTION	DATE	DWN	CHKD	APPVD
A	ISSUED FOR CONST. [illegible]	[illegible]	[illegible]	SWL	[illegible]
	(CPPA 14121)				
B	REV. AS NTD. REF: CMC 66092, R.2; CONT	2/83	CL	Q	CB

CPSES — Brown & Root, Inc. — Engineers and Constructors — Houston, Texas

PLANT COMANCHE PEAK
JOB NO. 2323

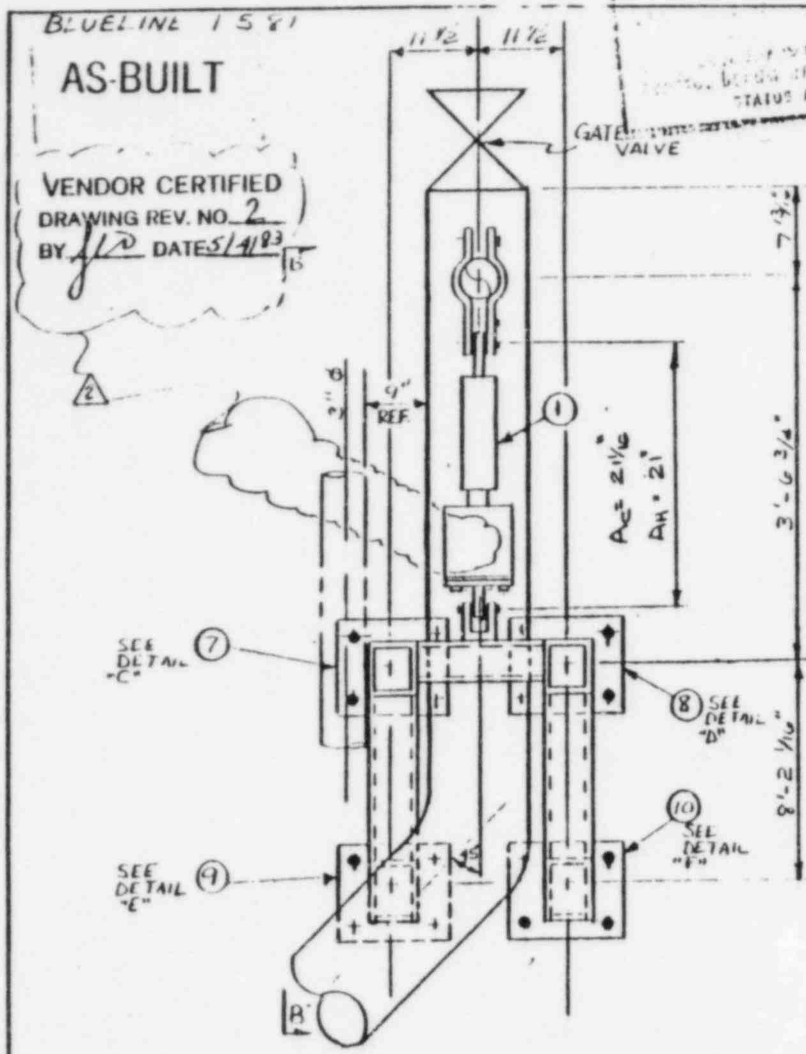
SUPPORT NO. CT-1-017-704-S25R
SHEET 1 OF 1 REV. 1

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE 1 5 81

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY. JLD DATE 5/4/83



FOR INFORMATION ONLY. CONTACT FOR CURRENT STATUS AND REVISION

FOR ENGINEERING OFFICE USE ONLY

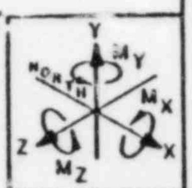
NORM. OPER DISPL.	
DX	-.025
DY	+.031
DZ	-.061

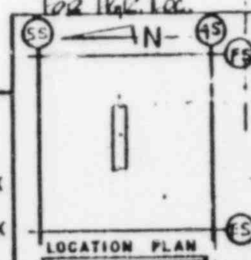
MOVEMENTS	
X	.022 -.141
Y	+.166 -.027
Z	+.054 -.332

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

TO# 4902 PLAN VIEW @ EL. 818'-0" —N

Q&HL Iso. CT-1-SB-0821
I.P.D. Iso. CT1SB8 REV 5
Data Point 266/P266 AB-1-32 06
Pipe Mat'l. SA358 CL.1 TP304
Insul. ______ Bldg. SB





THIRD PARTY INSPECTION
CODE CLASS: ASME III-2

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP.	WT	PBS	L	CBS	PRIM.	SEC
1A	SMF-10-RO SNUBBER	2		128			X		
1B	~~SMFB-10 FORWARD BRACKET~~	~~2~~					X		
2	P10" SCH40 x 9 9/16" STANCHION (SA312 TP304)	3		65			X		
5	SPC-19 100 PIPECLAMP (SA36)	2		136			X		
6	BSA 1-12 (BY FIELD)	16					X		
7	3/4" CS PL SEE DETAIL "C" (SA515GR65/SA36)	1			X			X	
8	3/4" CS PL SEE DETAIL "D" (SA515GR65/SA36)	1			X			X	
9	3/4" CS PL SEE DETAIL "E" (SA515GR65/SA36)	1			X			X	
10	3/4" CS PL SEE DETAIL "F" (SA515GR65/SA36)	1			X			X	
~~12~~	~~ASME III NAME PLATE~~	~~1~~							
13	TS 8"x6"x1/2" x 8'-10" LG (A500GRB)	2				X		X	
14	TS 8"x6"x1/2" x 12'-0" LG (A500GRB)	2				X		X	
15	TS 6"x6"x1/2"x 17" LG (A500GRB)	2				X		X	

REV	DATE	DWN	CHK	APP	DESCRIPTION
A	5-4-83	A	RD	RG	REV'D VENDOR CERTIFICATION REF. CMC 90094, R.1

MARK # CT-1-013-023-S42K
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ______ SHEET ___ OF ___

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: MI-0612 REV 13 ELECT.: EI-0602-01 REV 9
STEEL: SI-0605 REV 9 H.V.A.C.: MI-0638 REV 2

CONDITIONS	Fx	Fy	Fz	Mx	My
DESIGN	—	—	—	—	—
NORMAL & UPSET	—	—	±4706	—	—
EMERGENCY	—	—	±7458	—	—
FAULTED					

REV	DATE	DWN	CHK	APP	DESCRIPTION
A	1-5-81				ISSUED FOR CONST. REF. FIELD MODIFIED HANGER SKETCH, NPSI REV. 0-A & ITT REV. 1.
	~	~	~	~	
1	5/6				REVD AS VENDOR CMC 52343 R.1
2	~	~	~	~	VENDOR CERTIFIED, REFERENCE: GTN 62776

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-023-S42K
SKETCH NO.
SHEET 1 OF 3 REV. 2

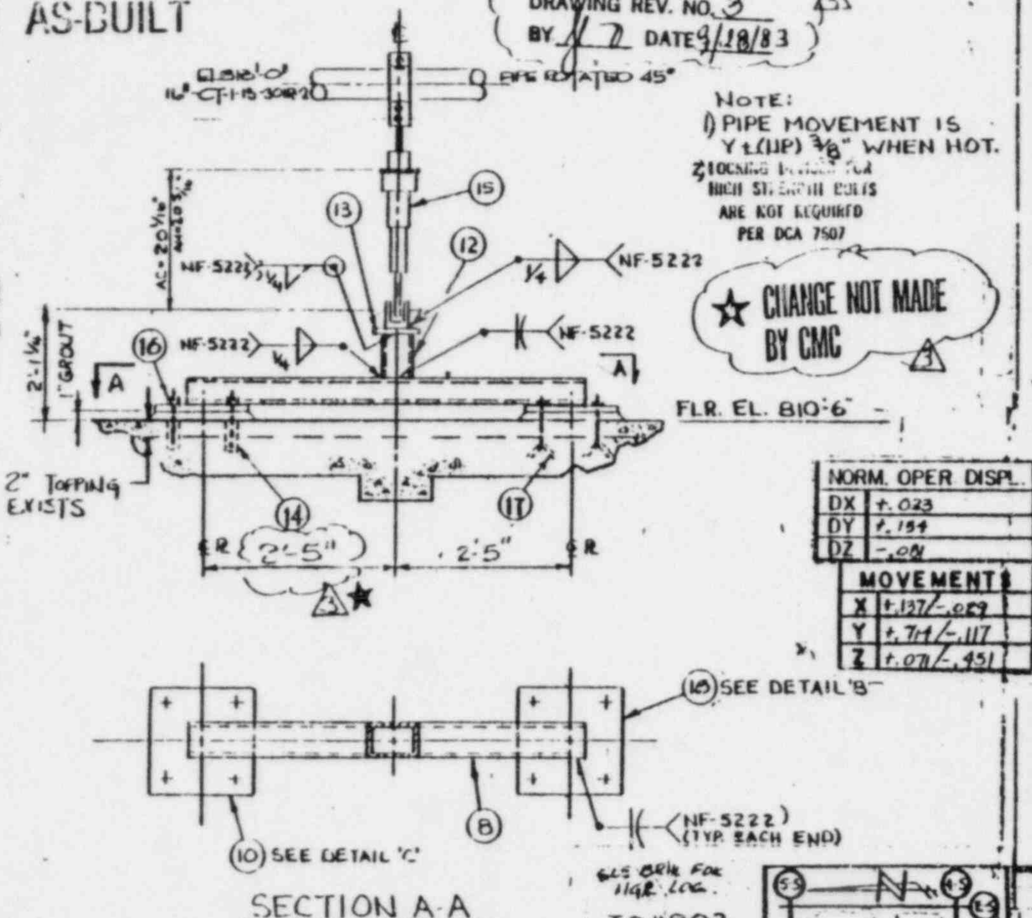
- CONT ABOVE

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE 1-16-81

AS-BUILT

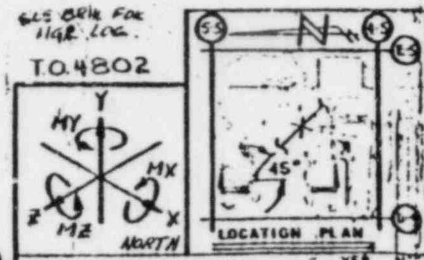
VENDOR CERTIFIED DRAWING REV. NO. 3 BY J D DATE 9/18/83



NORM. OPER DISPL.	
DX	+.023
DY	+.154
DZ	-.011

MOVEMENTS	
X	+.137/-.029
Y	+.714/-.117
Z	+.071/-.451

T.O. 4802



THIRD PARTY INSPECTION YES

CODE CLASS: ASME III-2

BRIL ISO CT-1-SB-008/S1
I.P.D. Iso. CT-1-SB-8-REV5
Data Point G2/PROB
Pipe Mat'l. SA 358 CL.1 TP 304

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
	SEISMIC MECHANICAL SHOCK SUPPRESSOR CONSISTING OF:	ONE	
1	~~#10, 6" STROKE, FIG. 307N MECHANICAL SHOCK SUPPRESSOR, W=1'-9 7/8", 16" O.D. PIPE, CARBON STEEL, LOAD=15847#~~	1	
8	T.S. 3/8"×6"×4"×5'-8" LG. (A500 GR.B)	1	
9	~~C.S.R. 1"×1'-0 1/16"×1'-3 1/4" /DETAIL 'B' (SA 36/SA 515 GR.65)~~	1	
10	C.S.R. 1"×1'-6 1/8"×1'-7 3/8" /DETAIL 'C' (SA-36/SA 515 GR 65)	1	
11	~~3/4"×10" HILTI KWIK CONE ANCHOR~~		
12	T.S. 3/8"×6"×4"×1'-1 3/8" LG. (A500 GR.B)	1	
13	C.S.R. 3/4"×0'-5"×0'-7 1/4" (SA-36/SA 515 GR.B)	1	
14	1 1/2" Ø THREADED ROD FOR RICHMOND INSERT (FIELD CUT TO LENGTH) (SA-36)	4	
15	SMA-10, PC: T-T=1/8" UP LOAD=9191# W/SPC-14-16C. SNUBBER W/ PIPE CLAMP	1	
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING	1	
	BUNDLE AND TAG	1	
	MARK # CT-1-013-020-S42K		
16	FXN-1 1/2" HEX NUTS	8	
17	1 1/4"×18" SUPER HILTI KWIK BOLTS w/13 1/8" MIN. EMB.	4	
18	1" C.S.R. (PER DETAIL "B") SA 36	1	
	Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative.		

REV	DATE	DWN	CHK	APP	DESCRIPTION
3	9/18/83	VM			REV'D VENDOR CERT

Approved By: S.F.C.

Date: 6-26-79

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

REF. DRAWING NUMBERS

PIPE: M1-0612-REV.3 ELECT: E1-0608-01 REV.9

STEEL: S1-0608-REV.4 H.V.A.C.: M1-0612 REV.6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	—	±5858				
EMERGENCY	—	9191				
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
0		KC			ISSUED FOR CONST. REF. NPSI R.O-B
1	1-16-81				REV AS NTD; REF FIELD MODIFIED HANGER SKETCH, ITT, R-1, DEL. NT 1-3, APPLY SHEET 2.
2					REV AS NOTED; REF CMC 49784, R-3 ... "AS-BUILT"

CUSTOMER Texas Utilities Services, Inc.

ORDER OR CONT. NO. CT-0435

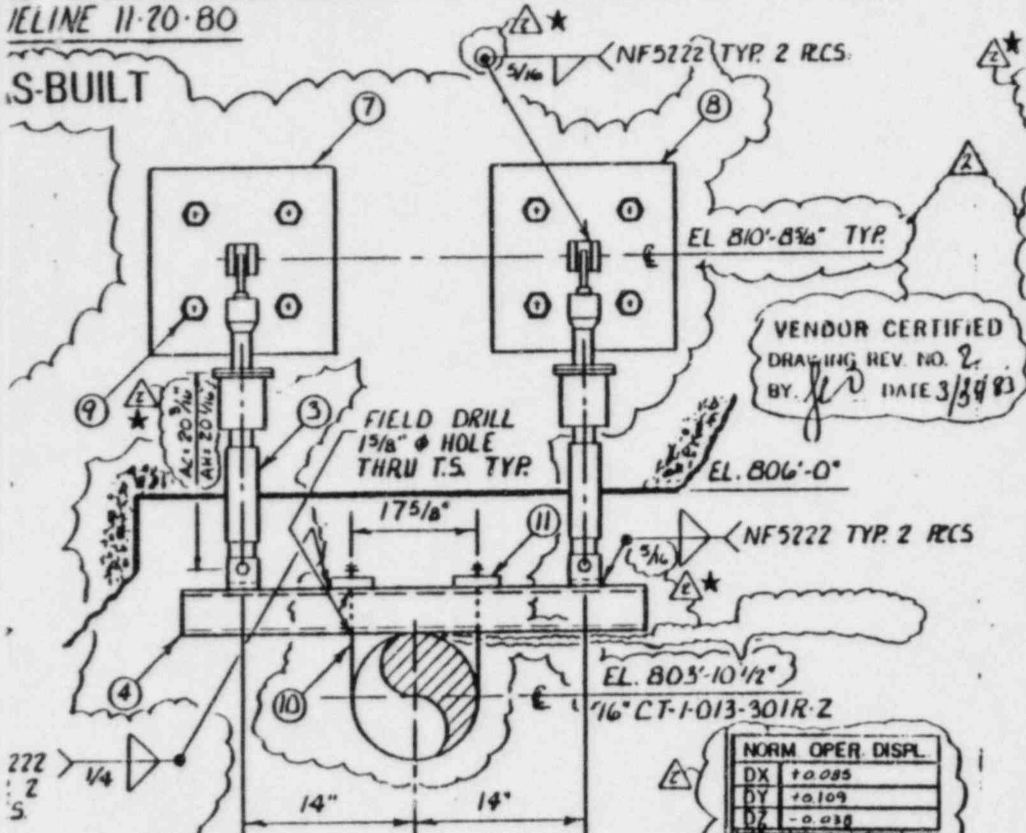
JOB NAME Comanche Peak 1 & 2

MARK NO. CT-1-013-020-S42K

SKETCH NO.

FOR ENGINEERING OFFICE USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY



NORM. OPER. DISPL.	
DX	+0.085
DY	+0.109
DZ	-0.038

MOVEMENTS	
X	+0.336/-0.074
Y	+0.591/-.098
Z	+0.031/-.253

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

★ CHANGE NOT MADE BY CLIC

T.O.# 4802

BRUL Iso. CT-1-SB-008/R.1
I.P.D. Iso. CT-1-SB-8 REV. 5
Data Point 256/PROB.# AB-1-32/R.0
Pipe Mat'l. SA-358-CL1 TP304
Insul. ~ Bldg. SB

SEE BRUL FOR IK.R. LOC.
LOCATION PLAN

THIRD PARTY INSPECTION
CODE CLASS: ASME III-2

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP.		PBS	L	CSS	PRIM.	SEC.	AISC.
3	SMA-10-BA SNUBBER (C-C = 5'-7")	2								
4	T.S. 3/8" x 4" x 4" x 2'-10" LG. A500GRB	1								
7	1" C.S. PL PER "DETAIL A" SA36 or SA515GR65	1								
8	1" C.S. PL PER "DETAIL B" SA36 or SA515GR65	1								
9	1 1/4" ϕ x 12" SUPER HILTI KWIK BOLT	8								
10	1 1/2" ϕ ROD B=16 3/4" H=5 1/2" (DEVELOPED LENGTH=4'-11") SA36	1								
11	3/4" C.S. PL 4"x4" W/1 9/16" ϕ HOLE @ CENTER SA36	2								

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	9/21/80	JTN	WAM		ISSUED FOR CONST. - REF. ITT, R.1 - BASE PLATE ONLY
1	11-20-80				ISSUED FOR CONST. REF FIELD MODIFIED HANGER SKETCH & REF ITT R-2 & DELETED NOTE 1-3 & ADDED SHT 2 OF 2
C	~	~	~	~	

MARK # CT-1-013-016-S32R
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ______ SHEET __ OF __

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS REV. 9
PIPE: MI-0604 R.14 ELECT: EI-060-01
STEEL: S1-0602 R.12 H.V.A.C.: MI-0651 R.2

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—		—	—	—	—
NORMAL & UPSET	—	±5977	—	—	—	—
EMERGENCY	—	±9254	—	—	—	—
FAULTED	—	—	—	—	—	—

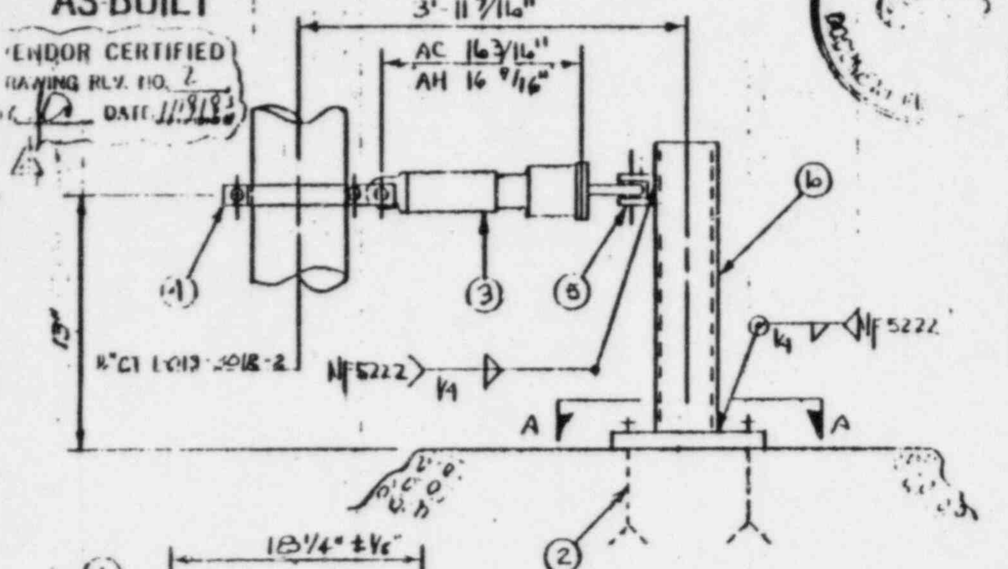
REV	DATE	DWN	CHK	APP	DESCRIPTION
2	3/30/83			Q	REV'D. AS NT'D. REF: CMC 4/409 R.7 DCA 7607 NT 4 ASBUILT VENDOR CERTIFICATION; REF; GTN 62786
C	~	~	~	~	

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-016-S32R
SKETCH NO. ~
SHEET 1 OF 2 REV. 2

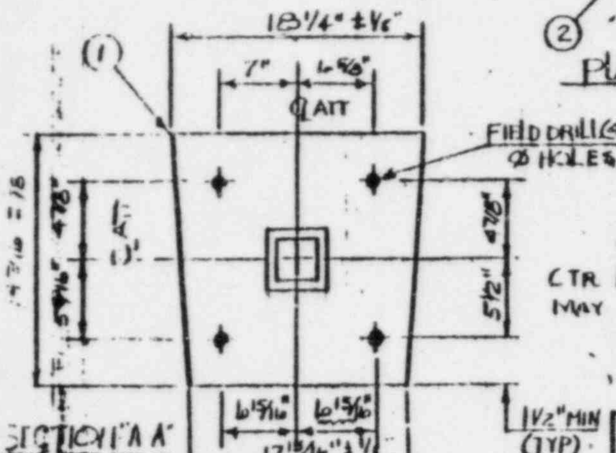
BLUELINE 12-18-81

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 2
DATE 11/9/83



PLAN VIEW @ EL 803'-10 5/16"



SECTION "A-A"

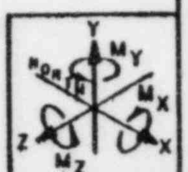
NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

CTR LINE OF ATT MAY VARY ± 1/4"

MOVEMENTS	
X	[illegible]
Y	[illegible]
Z	[illegible]
NORM OPER DISPL.	
DX	[illegible]
DY	[illegible]
DZ	[illegible]

BLDG / Iso. CT-1-SB-008 R.1
BRP / Iso. CT-1-SB-8 R-3
Data Point 1256/PROB. AB-1-32 R.0
Pipe Mat'l. SA 358 CL1 TP304
Insul. — Bldg. SP

TOT" 4902



LOCATION PLAN

THIRD PARTY INSPECTION
CODE CLASS: ASME III - 2

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
1	3/4" C.S. PL PER SECT "A-A" (SA36/SA516 GR 65)		
2	1"x9" HILTI KWIK BOLTS (6" MIN EMBED)	4	
3	SMF-3-50 SNUBBER C.C. 2'-3 3/16"	1	
4	SPC-16-160 PIPE CLAMP (SA-36)		
5	XRB-16 REAR BRACKET (A-668D/SA36)		
6	T.S. 6"x6"x1/2" x 18" LG (A-500 GR B)		

MARK # CT-1-013-015-S32R
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: [illegible] R14 ELECT: E1-0601-01
STEEL: S1-0602 R12 H.V.A.C.: H1-0651-R6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	±990					
EMERGENCY	±1545					
FAULTED						

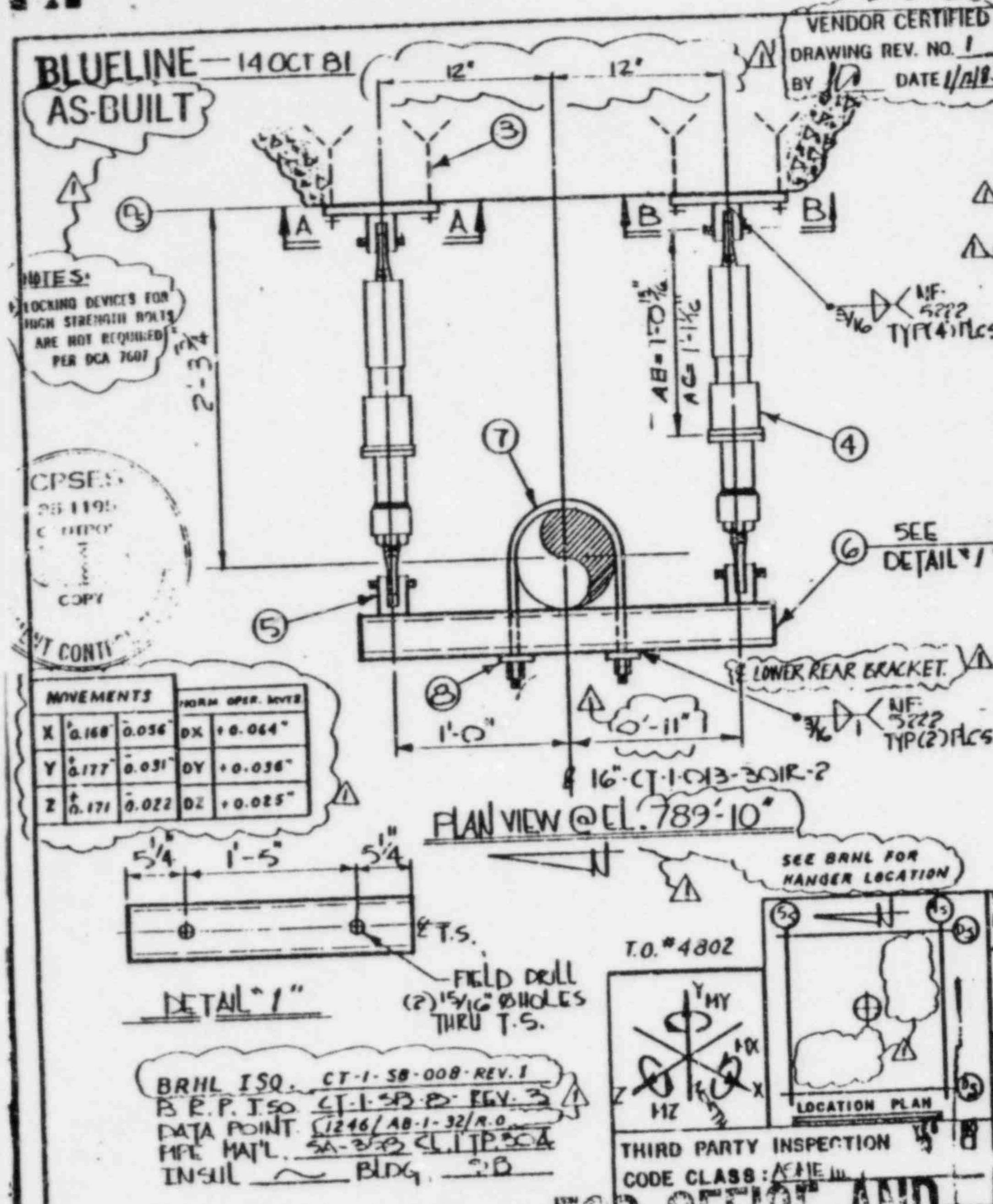
REV	DATE	DWN	CHK	APP	DESCRIPTION
0					ISSUE FOR CONSTRUCTION REF. IT REV-1
1					REV'D AS NOTED REF. [illegible] SEE NT. 1 (MC-[illegible]) AS-BUILT
2					VENDOR CERTIFICATION, REF. GTN # 63726

CUSTOMER Texas Utilities Services Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CT-1-013-015-S32R
SKETCH NO.
SHEET OF REV. 2

INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.

FOR ENGINEERING & OFFICE USE ONLY

FOR OFFICE AND ENGINEERING USE



VENDOR CERTIFIED
DRAWING REV. NO. 1
BY [illegible] DATE 1/11/83

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP.
1	1/2" C.S. PL PER SECTION "A-A" (SA-515 GR.65) SA-36	1	
2	1/2" C.S. PL PER SECTION "B-B" (SA-515 GR.65) SA-36	1	
3	1/2" x 5 1/2" HILTI KWIK CONC. ANCHOR (3 3/8" MIN. EMBED)	8	
4	SMA-1-50 SNUBBER SC-2'-1 1/8"	2	
5	XRB-03 REAR BRACKET (A-668-D/SA-36)	4	
6	T.S. 4"x4"x1/4" 2'-3 1/2" LG. PER DETAIL "1" (A500 GR.B) FIELD TRIM TO SUIT	1	
7	PUS-160 U-BOLT B: 1'-3"	1	
8	RWP-07 WASHER PLATE (SA-36)	2	

MARK: CT-1-013-012-322K
PAINT: CARBO ZINC 11

INFORMATION COPY

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ____ SHEET ___ OF ___

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: M1-0606 REV.15 ELECT: E1-0605
STEEL: S1-0600 REV.17 H.V.A.C.: M1-0600 R6

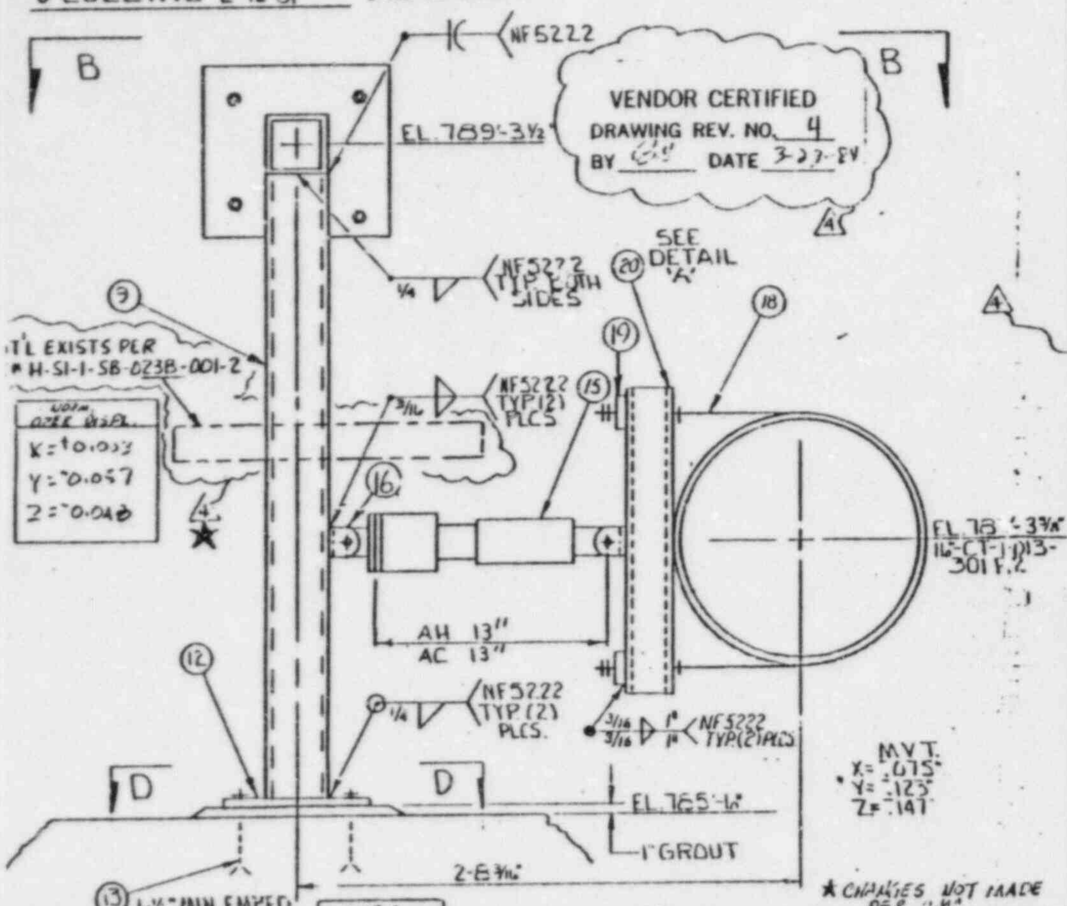
CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET			2848			
EMERGENCY			4210			
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	[illegible]	[illegible]	[illegible]	[illegible]	ISSUED FOR CONST. REF. IT REV. 1, E.M.H.S.
1	[illegible]	[illegible]	Q	[illegible]	REV. AS NOTED PER CMC 78276 & DCA 7607 (SEE NOTES) "AS-BUILT"
~	~	~	~	~	VENDOR CERTIFIED

CUSTOMER TEXAS UTILITIES SERVICE INC.
ORDER OR CONT. NO. CP-0046
JOB NAME COMANCHE PEAK 1-2
MARK NO. CT-1-013-012-322K
SKETCH NO.
SHEET 1 OF 2 REV.

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE 2-16-81 AS-BUILT



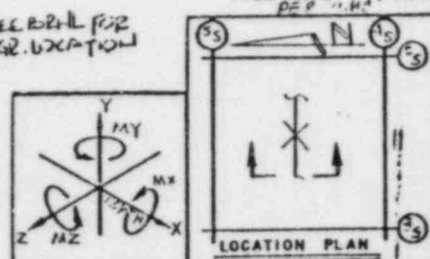
★ CHANGES NOT MADE

SEE BRHL FOR HGR. LOCATION

HVTS	
X	±0.003 / -0.054
Y	±0.050 / -0.243
Z	±0.043 / -0.196

NOTE
Locking devices for high strength bolts are not required per DCA 7607

BRHL Iso. CT-1-SB-008 R.1
B.R. Iso. CT-1-SP-B REV. 5
Data Point
Pipe Mat'l. SA-358-CL.1 TP304
Insul. ______ Bldg. SB



THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III-2

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	CSS	PRIM	SEC	AISC
	SEISMIC MECHANICAL SHOCK SUPPRESSOR ASSEMBLY CONSISTING OF:									
6	~~SMF 3-BA TOTAL TRAVEL~~ [illegible]	~~1~~								
7	~~PHS 110 U-BOLT~~ [illegible]	~~1~~								
8	~~SEE DETAIL~~ [illegible]	~~1~~								
9	T.S. 4"x4"x¼"x3'-5¼" LG (A-500 GR. B)	1								
10	T.S. 4"x4"x¼"x0'-6" LG. (A-500 GR. B)	1								
11	1" C.S.P. SEE SECTION "C-C" (SA-36/SA515 GR.65)	1								
12	1½" C.S.P. SEE SECTION D-D (SA-36/SA515 GR.65)	1			X			X		
13	¾"x10" HILTI-KWIK BOLTS	4					X			
14	⅝"x5½" HILTI-KWIK BOLTS	4					X			
15	SMF-1-50 SNUBBER	1					X			
16	XRB-08 REAR BRKT.	2					X			
18	PHS-160 U BOLT, B=14"	1					X			
19	RWP-07 WASHER PL	2					X			
20	T.S. 3½"x3½"x3/16" PER DETAIL A	1				X		X		

REV	DATE	DWN	CHK	APP	DESCRIPTION
3	11/83				VENDOR CERTIFICATION; REF GTN 62726
4	3-23-84				REVISED VENDOR CERTIFICATION

FOR OFFICE AND ENGINEERING USE ONLY

SEISMIC ASSEMBLY SKETCH AND ENGINEERING
BUNDLE AND TAG
MARK # CT-1-013-008-S22K

Apply Carbo Zinc #11 to above mat'l, except threads which shall be treated with a rust preventative

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ______ SHEET __ OF __

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: MI-0606 REV 13 ELECT: EI-0606 R12
STEEL: SI-0600 REV 17 H.V.A.C.: MI-0650 R6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET	±503					
EMERGENCY	±753					
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	11-21-80				ISSUE FOR CONST.
					REF FIELD MODIFIED HANGER SKETCH [illegible]
1	2-1-81	JTR			REV. AS NTD. REF FIELD MODIFIED HANGER SKETCH; R1
2	7-30-82	LN			[illegible]

CUSTOMER TEXAS UTILITIES SERVICE, INC.
ORDER OR CONT. NO. CP-0046
JOB NAME COMANCHE PEAK 1&2
MARK NO. CT-1-013-008-S22K
SKETCH NO. –
SHEET 1 OF 2 REV. 4

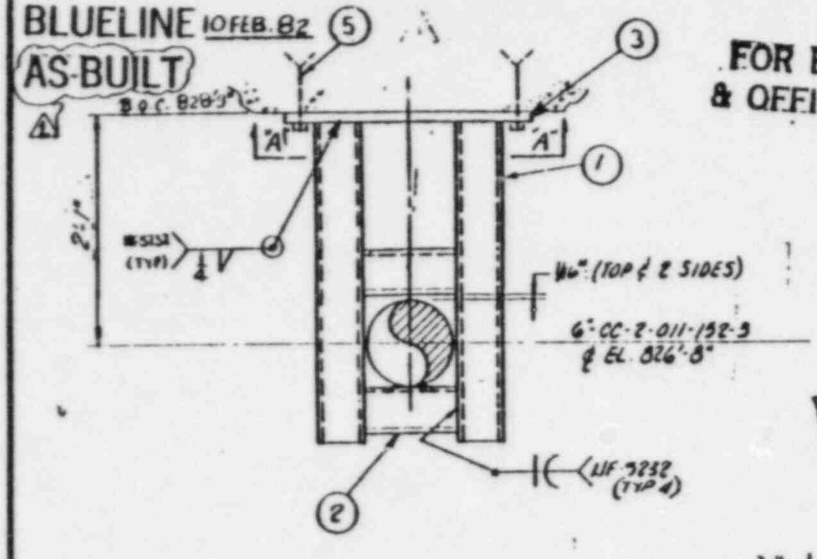
MP/PCC

FOR OFFICE AND ENGINEERING USE ONLY

BLUELINE 10 FEB. 82

AS-BUILT

FOR ENGINEERING & OFFICE USE ONLY



ELEVATION LOOKING EAST

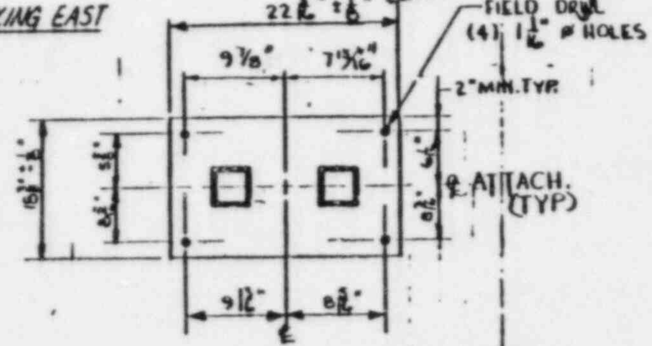
CPSES 35-1195 CONTROL COPY

DOCUMENT CONTROL CENTER

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	P.B.S.	L	CSS	PRIM	SEC.	AISC
1	2	3x3x1/4x ~~2'-7 1/4" TUBE~~ A500 GR.B.		X		X		
2	2	3x3x1/4x 6 3/4" TUBE A500 GR.B		X		X		
3	1	5/16" CSIR SEE SECTION A-A SA36/SA515GR65	X			X		
~~4~~	~~4~~	~~1"x9" HILTI KWIK CONCRETE ANCHORS~~			X			
5	4	1"x9" HILTI-KWIK CONCRETE ANCHORS MIN. EMB. 6"			X			

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
[illegible]	AS BUILT VENDOR CERTIFICATION [illegible]	[illegible]	[illegible]	[illegible]	[illegible]

PROBLEM # AB-1-660 REV. 0



SECTION "A-A"

℄ OF ATTACH. MAY VARY ± 1/4"

MVTS	
Z	±0.062 / .00

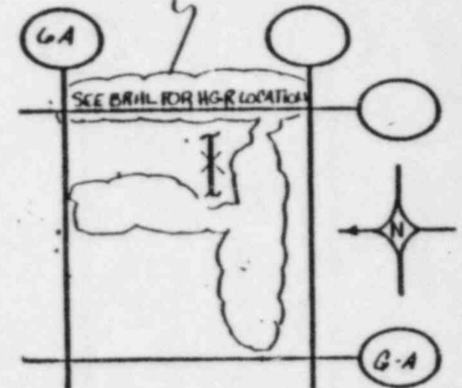
VENDOR CERTIFIED
DRAWING REV. NO. 2
BY BH DATE 12/7/82

NOTE:
1. Locking devices for high strength bolts are not required per DCA 7607

TO # 21101

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION



LOCATION PLAN

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS INCHES
2075	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	—	139	155	333	—	
N-S	—	±235	±315	±667	—	
E-W						

NOTE +N,E,UP −S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐

ASME CODE CLASS 3

REF. DWGS.	BRH. ISO	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-004	—	M1-0703	12	E1-0701-02	3
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-004	2	S-0718	3	M1-0753	6

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	REV'D AS NOTED REF: F.M.H.S.	[illegible]	APH	[illegible]	[illegible]
0	I.F.C.	12-27-79	C.A.T.		[illegible]

CPSES 35-1195

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

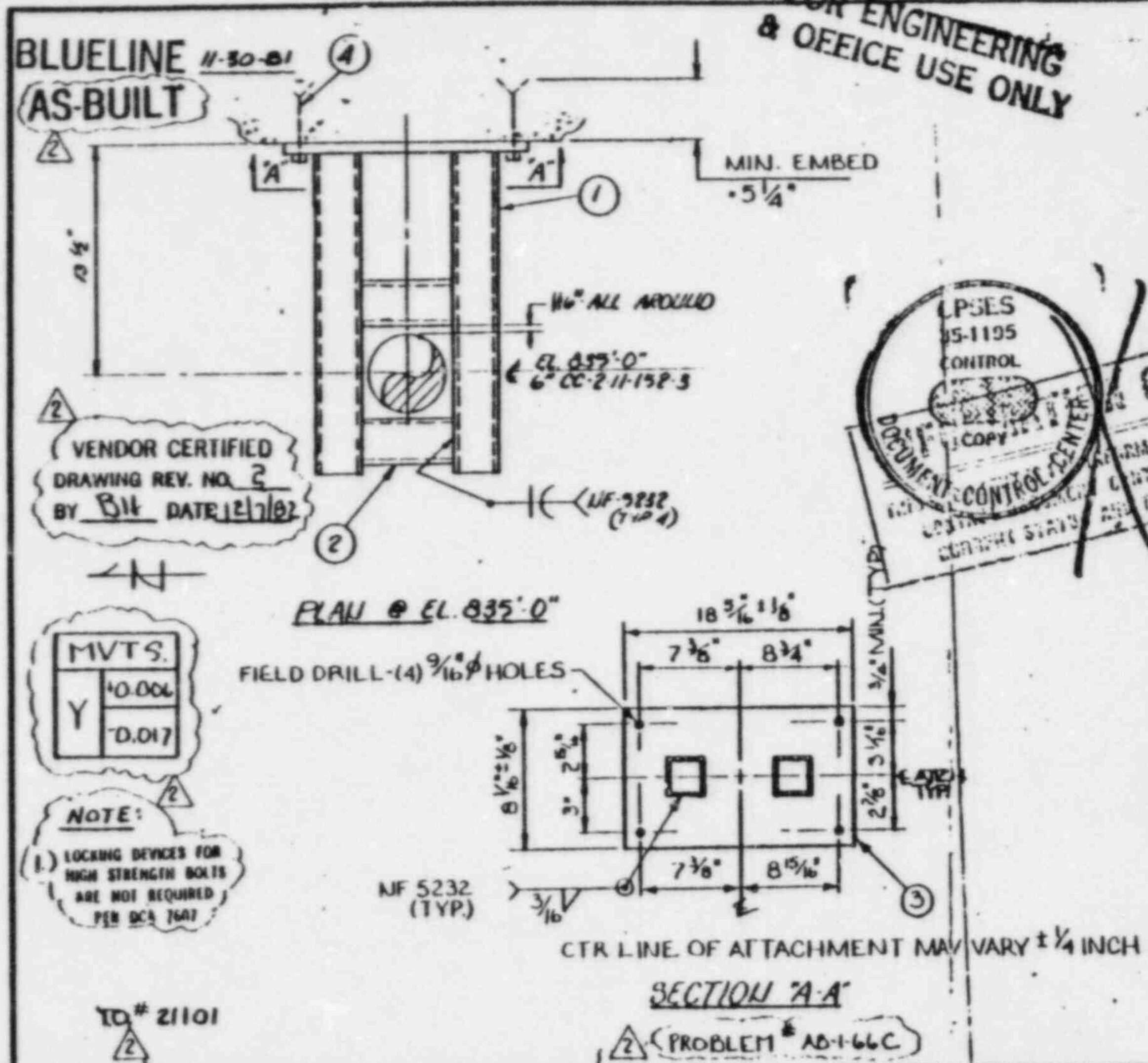
CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-721-A13R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND ENGINEERING USE ONLY

FOR ENGINEERING & OFFICE USE ONLY

BLUELINE 11-30-81 AS-BUILT



ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	P&S	L	P	PRIM	SEC	AISC
1	2	3x3x1/4x 20 1/2" TUBE, A500 GR.B.		X		X		
2	2	3x3x1/4x 6 1/4" TUBE A500 GR.B		X		X		
3	1	1/2" CSR PER SECT. "A-A" SA 36/SA515, GR. 65	X			X		
4	4	1/2 x 7" HILTI-KWIK CONCRETE ANCHORS			X	X		

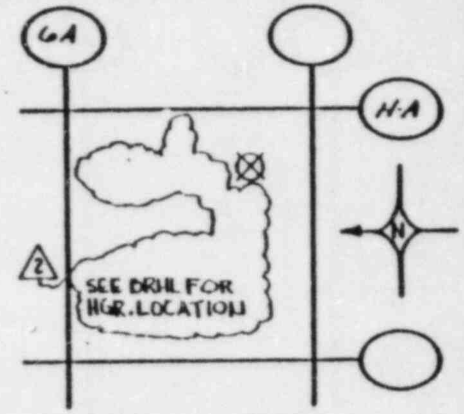
APPLY ONE COAT OF CARBO ZINC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE

CPSES 35-1195 CONTROL COPY — DOCUMENT CONTROL CENTER

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
	VENDOR CERTIFICATION REF. OTH # 59790	~	~	~	~

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION



LOCATION PLAN

DATA PT	DESIGN	SERVICE LEVEL A	B	C	D	PIPE MVTS INCHES
2080						
VERT.	—					
N-S	—					
E-W	—					

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS	BRIX. ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-031	—	M1-702	8	E1-701-02	3
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-031	0	8-718	3	M1-753	6

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	Rev As Req; Ref. DCA 7607 (NT. 1) As Built	12/7/82	CBH		
1	Rev'd AS NT'D, REF. FMNS	11-30-81			
0	I.F.C.	12-27-79			

CPSES 35-1195 — Brown & Root, Inc. — HOUSTON, TEXAS

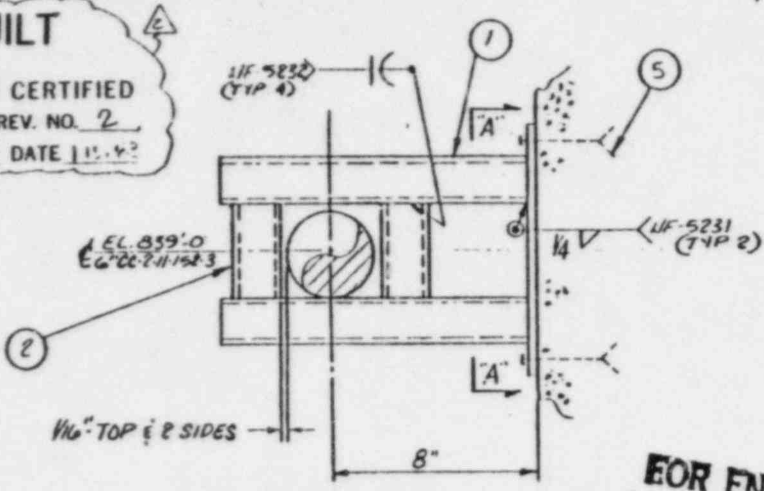
CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-720-A43R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND ENGINEERING USE ONLY

AS-BUILT △2

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY [illegible] DATE 11-5-83



ELEVATION LOOKING NORTH

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L	CCS	PRIM	SEC.	AISC
1	2	3x3x1/4x1'-2 1/4" TUBE, A500 GR.B.						
2	2	3x3x1/4x0'-6 11/16" TUBE A500 GR.B.						
3	1	~~PL 5/8" SA-36 SEE SECTION "A-A"~~	X					
4	4	~~3/4"x6" HILTI KWIK CONCRETE~~						
5	4	3/4"x7" HILTI KWIK CONC. ANCHOR						
6	1	C.S.R. 3/4"x20"x21"/SECT. A-A (SA 36/SA-515 GR 65)	X					

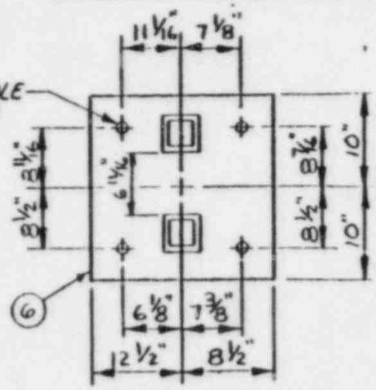
PAINT: CARBO ZINC #11 △2

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
△2	VENDOR CERTIFICATION, REF CPP. 8122	11/8/83	GLL	Q	CBD

FOR ENGINEERING & OFFICE USE ONLY

PROBLEM # AB-1-66c R,D △2

FIELD DRILL 13/16" ⌀ HOLE (TYP 4)



NOTE:
LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 3601.

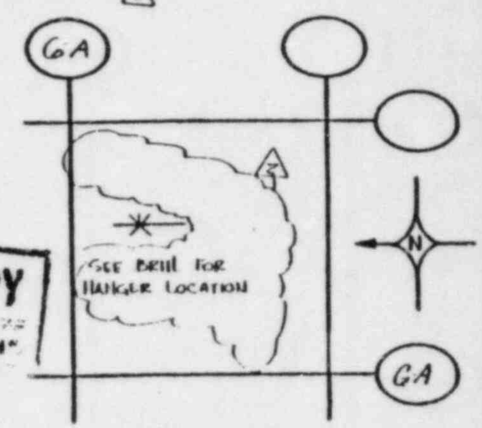
SECTION "A-A"

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION

CPSES 35-1195 CONTROL COPY DOCUMENT CONTROL CENTER

INFORMATION COPY



LOCATION PLAN

T.O. 21100

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS INCHES
208	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	—	-554	-643	-643		
N-S	—					
E-W	—	-60	-161	-161		

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS.	BRHL ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-031	0	M10102	0	E10102	8
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-031	0	S0113	3	M10155	6

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	REV AS NTD, REF. DCA 1607 (SEE NT. 1); WEMS,	6-11-81	DMH		RMD
	DECIDFUEL, CHC-32932; AS-BUILT				
0	I.F.C.	12-20-79	C.A.T.		

CPSES 35-1195

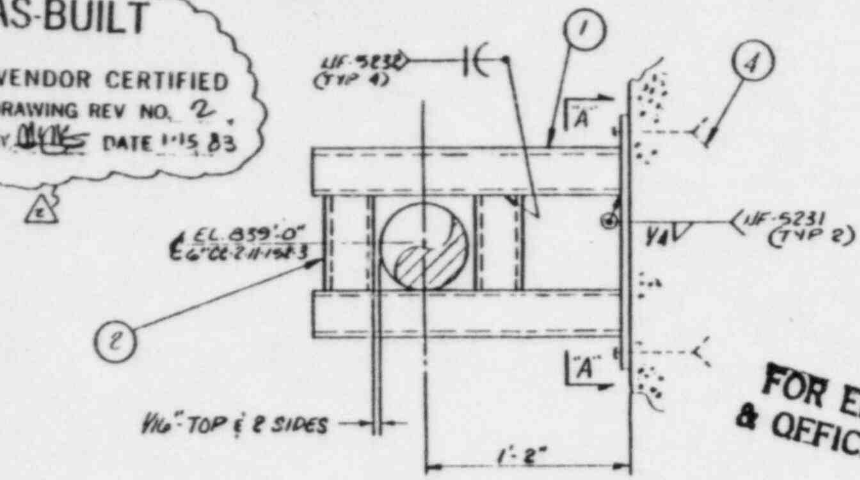
Brown & Root, Inc
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

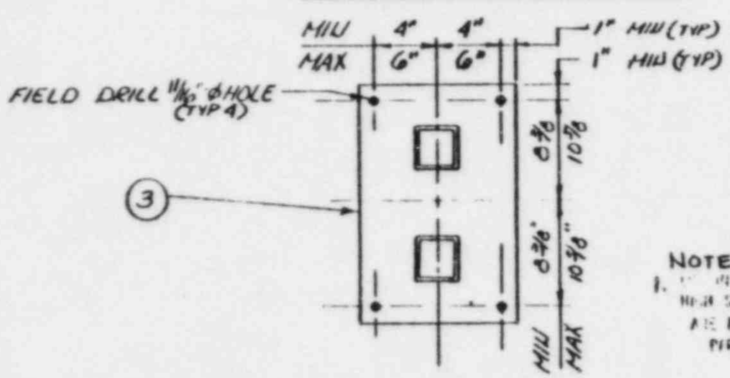
SUPPORT NO. CC-2-011-718-A53R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND ENGINEERING USE ONLY

AS-BUILT
VENDOR CERTIFIED
DRAWING REV NO. 2
BY [illegible] DATE 1-15-83



ELEVATION LOOKING NORTH



SECTION "A-A"

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	P.B.S	L	CSS	PRIM	SEC.	AISC
1	2	3X3X1/4 X 1'-8 1/4" TUBE A500 GR.B.		X		X		
2	2	3X3X1/4 X 6 11/16" TUBE A500 GR.B.		X		X		
3	1	PL 3/8" SA-36 SEE SECTION "A-A"	X			X		
4	4	5/8" X 6" HILTI-KWIK CONCRETE ANCHORS			X	X		

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	VENDOR CERTIFICATION; REF. GTN 59790	1/15/83	[illegible]	[illegible]	CBD

APPLY [illegible] COAT OF CARBO ZINC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE.

PROBLEM # AB-1-66C

FOR ENGINEERING & OFFICE USE ONLY

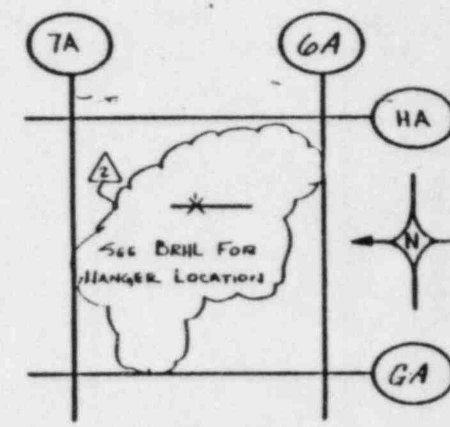
CPSES 35-1195 CONTROL COPY DOCUMENT CONTROL CENTER

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION

INFORMATION COPY
THIS DOCUMENT IS [illegible] INFORMATION ONLY. CONTACT [illegible]

NOTE:
1. [illegible] HIGH STRENGTH BOLTS ARE NOT PERMITTED PER [illegible]



LOCATION PLAN

T.O. 21100

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS (INCHES)
2086	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	—	-21 / 8	-247 / 1622	-764 / 2750	—	—
N-S	—	—	—	—	—	-.019 / +.031
E-W	—	310 / 312	-384 / 716	-1600 / 2183	—	—

NOTE +N,E,UP -S,W,DN
AUTHORIZED NUCL. INSP. YES [X] NO [ ]
ASME CODE CLASS 3

REF. DWGS	BRHL ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-031	0	M1-0702	8	E1-0702	8
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-031	0	S-0718	3	M1-0755	6

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	REV. AS NT'D; REF. DCA 7607 (SEE NT 1); WEMS 5-21-81; DELTD PM-6; CMC-32942; AS-BUILT	5-21-81	DMH	JW	[illegible]
0	I.F.C.	12-20-79	C.A.T.	[illegible]	[illegible]

CPSES 35-1195
Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-717-A53R
SHEET 1 OF 1 REV. 2

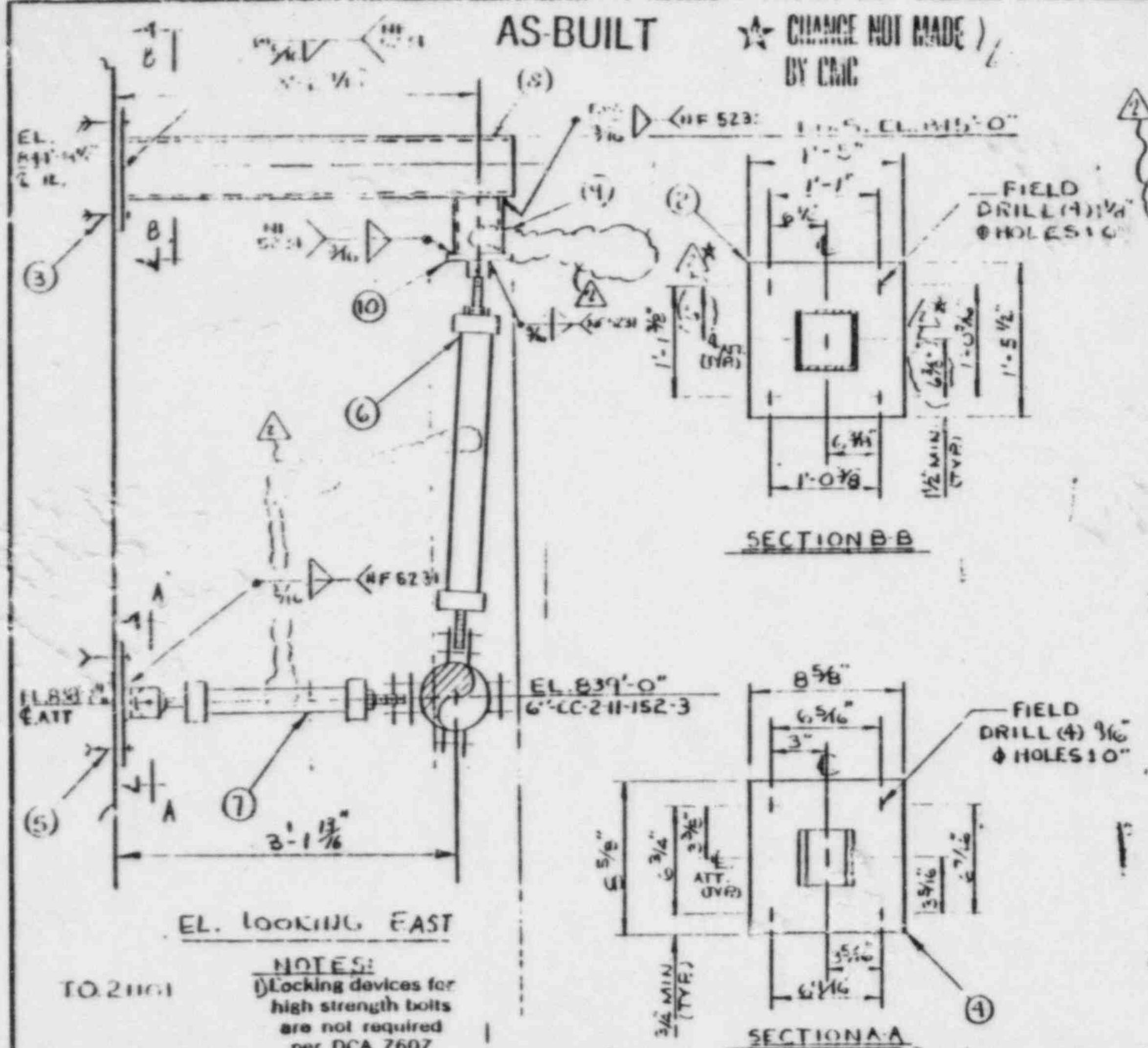
FOR OFFICE AND
ENGINEERING [illegible]

FOR OFFICE AND ENGINEERING USE ONLY

FOR ENGINEERING USE ONLY

AS-BUILT

☆ CHANGE NOT MADE BY CMC



TO.2161

NOTES:

1) Locking devices for high strength bolts are not required per DCA 7607

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION					
1	1	[illegible] 3/4 [illegible]					
2	1	PL 1 1/4" SA-36 - SEE SECTION "F"	X			X	
3	4	1" x [illegible] HILTI KWIK CONCRETE ANCHOR			X	X	
4	1	PL 1/2" SA-36 - SEE SECTION "F"	X			X	
5	4	1/2" x 3 3/4" HILTI KWIK CONCRETE ANCHOR			X	X	
6	1	SRS-08-PC; SPC-08-060			X	X	
7	1	SRS-08-PC; SPC-09-060			X	X	
8	1	[illegible] 3/8" [illegible] (ASTM A [illegible])		X			
9	1	[illegible] 3/8" [illegible] (ASTM A [illegible])					
10	1	[illegible] 1/2" x 7" x 7" ([illegible] SA 325 [illegible])					

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY [illegible] DATE 7-21-83

REV	DESCRIPTION	DATE	DWN	CHKD.	APVD.
[illegible]	VENDOR CERTIFICATION, GTN #59790	~	~	~	~
2	REVD. VENDOR CERTIFIED REF. [illegible]-M-9209	[illegible]	[illegible]	[illegible]	Q

PROB: AB-1 66C REV. [illegible]

ASME CODE EDITION: 1974

ADDENDA: WINTER

DESIGN SPEC: MS-46A

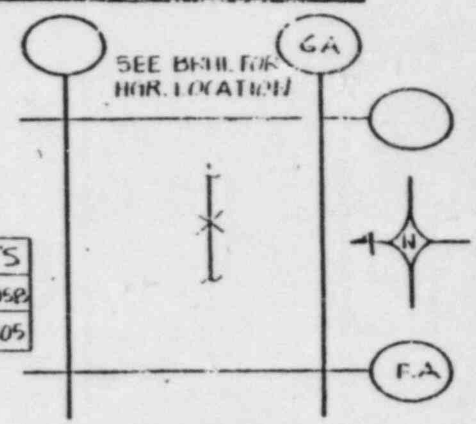
P.E. CERTIFICATION

N/A

CPSES 35-1195 CONTROL COPY

MVT'S

Z	+0.058 / -0.105



LOCATION PLAN

DATA PT	SUPPORT LOADS (LBS)				PIPE MVTS "CHECK"
2091	DESIGN	A	B	C	
VERT	—	[illegible]	[illegible]	[illegible]	
N-S	—	[illegible]	[illegible]	[illegible]	
E-W	—				

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES [✓] NO [ ]

ASME CODE CLASS 3

REF DWGS	STRESS ISO	REV	MECHANICAL	REV	ELECTRICAL	REV
	M2-3231-13	C	M1-0702	8	E1-0702	8
	BRHL ISO	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-031	0	S-0718	3	M1-0755	6

REV	DESCRIPTION	DATE	DWN	CHKD	APPVD
0	IFC	11-30-7[illegible]	[illegible]	[illegible]	[illegible]
1	REV AS NOTED, REF CMC 46181, 33422 [illegible] DCA 7607. SEE NT.1 AS BUILT	[illegible]	[illegible]	[illegible]	[illegible]

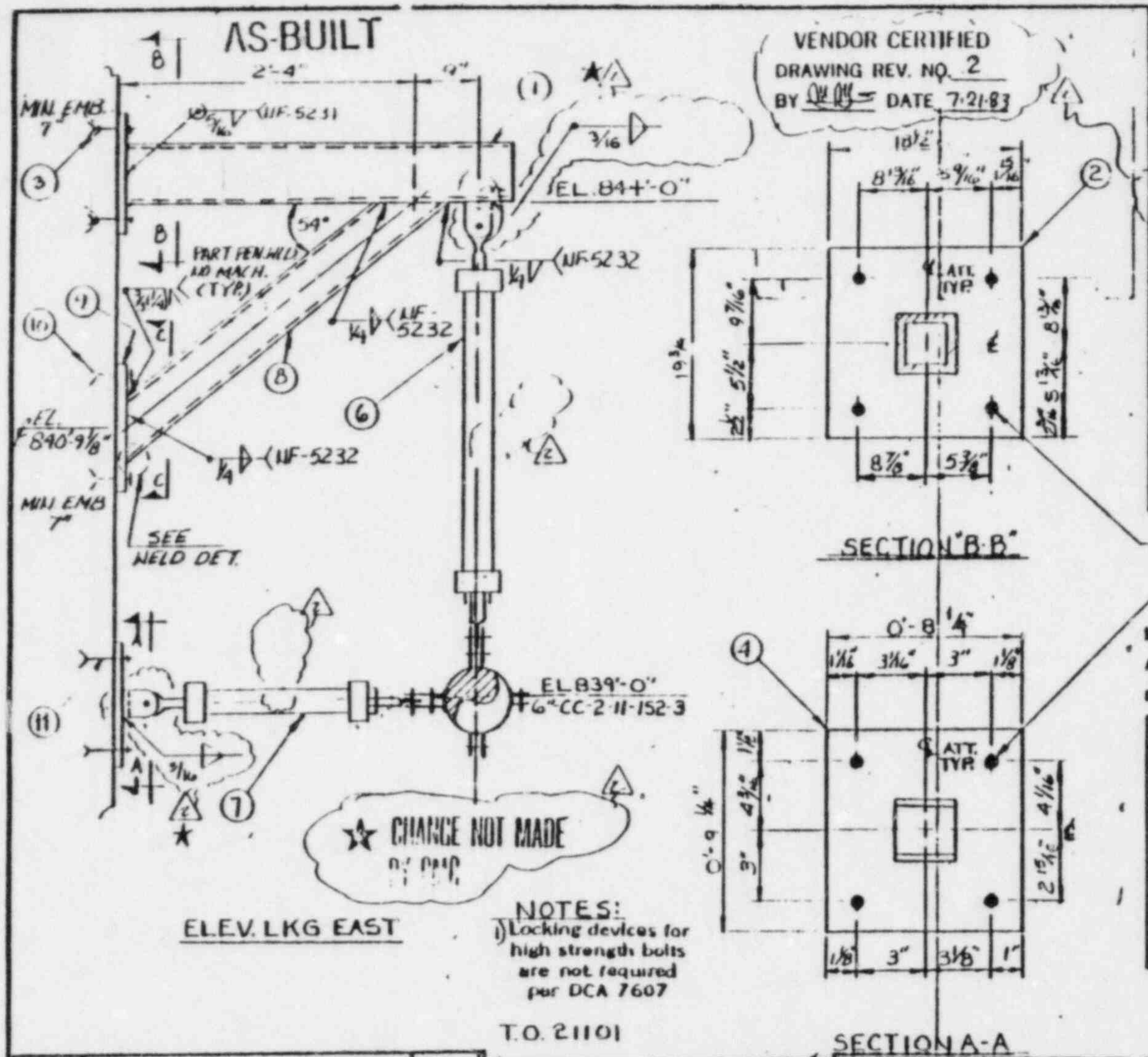
CPSES 35-1195

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-715-A53R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND ENGINEERING USE ONLY



NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

T.O. 21101

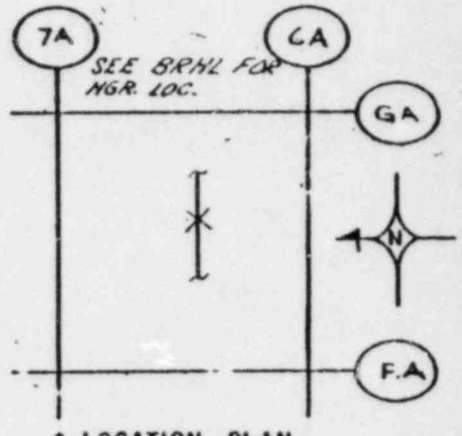
ITEM NO	QTY REQ'D	MATERIAL DESCRIPTION	PBB	L	CSS	PRIM	SEC	AISC
1	1	T.S 6×6×3/8 - 3'-3 3/4" A-500 GR B		X		X		
2	1	PL 1 1/4" SA-36, SEE SECTION "B-B"	X			X		
3	4	1"×12" SUPER HILTI KWIK CONCRETE ANCHOR			X	X		
4	1	PL 1" SA-36, SEE SECTION "AA"	X			X		
~~5~~	~~4~~	~~1/2"×3 1/4" HILTI KWIK CONCRETE ANCHOR~~			X	X		
6	1	SRS-08-PC ; SPC-08-060			X	X		
7	1	SRS-08-PC ; SPC-08-060			X	X		
~~2A~~	~~1~~	~~1 1/4" THK. C.S. PLATE PER SECT. B-B (SA 36 OR SA 516 GR. 65)~~	X			X		
~~4A~~	~~1~~	~~1" THK. C.S. PLATE PER SECT. A-A (SA 36 OR SA 515 GR. 65)~~	X			X		
8	1	TS 5"×5"×1/2"×4'-10" LG (A-500 GR B) FLD CUT TO SUIT		X		X		
9	1	PL 1" THK. PER SECT. "C-C" (SA-36 OR SA-515 GR 65)	X			X		
10	4	3/4"×10" HILTI KWIK BOLTS			X	X		
11	4	1/2"×5 1/2" HILTI KWIK BOLTS			X	X		
		PAUL F CARRED CHK # 11						

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	REVD VENDOR CERTIFIED PER IIR M-9288	7-21-83	GIL		

PROBLEM # AB-1-66C, R.O

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: M.S-46A

P.E. CERTIFICATION
N/A



LOCATION PLAN

DATA PT.	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	PIPE MVTS (INCHES)
2013						
VERT.	—	-339 / 323	-1068 / +405	-1149 / +487	—	—
N-S	—	-2064 / +1176	-2628 / +1741	-2776 / +1839	—	—
E-W	—	—	—	—	—	+0.028 / 0.05E

SUPPORT LOADS (lbs)

NOTE: + N.E. UP - S.W. DN — AUTHORIZED NUCL. INSP. YES ☒ NO ☐ ASME CODE CLASS 3

REF. DWGS	BRHL ISO	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-031	0	M1-0702	8	E1-0703	8
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-031	0	S-0718	3	M1-0755	6

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
0	IFC	10-14-79			
1	REV AS NTD. REF. CMC 77261 R1, DCA 7607 (SEE NOTE 1) "AS BUILT"				
	VENDOR CERTIFICATION				

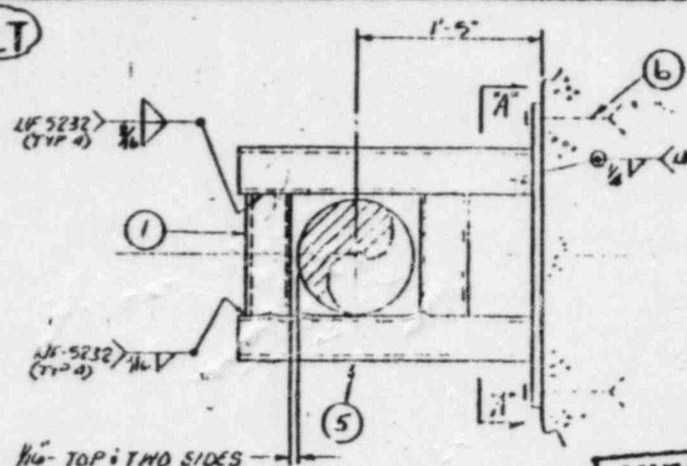
CPSES 35-1155

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT TUSI
PLANT COMANCHE PEAK
JOB NO. 2323

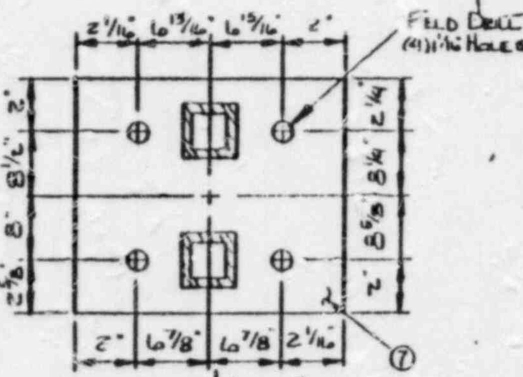
SUPPORT NO. CC-2-011-714-A53R
SHEET 1 OF 2 REV. 2

AS-BUILT



ELEVATION LOOKING NORTH

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY BH DATE 12-3-86



SECTION "A-A"

TQ # 2100

ITEM NO	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L			SEC	AISC
1	2	[illegible] TUBE A500 GR B		X				
2	2	[illegible]		X		X		
3	1	[illegible]	X					
4	4	[illegible]			X	X		
5	2	1/4"X4"X4" TUBE STEEL 1'-11" LG. (A500 GRB)		X		X		
6	4	1"X12" SUPER HILTIS CONCRETE ANCHORS			X			
7	1	1"X17 11/16"X21 1/8" CS. PLATE (SA515 GR 65 or SA36)	X			X		

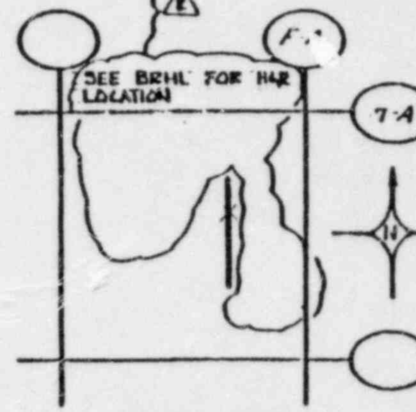
REV	DESCRIPTION	DATE	DWN.	CHKD.	APVD.
	VENDOR CERTIFICATION TUF CPPB112	12/4/86	BB		CBD

CPSES 35-1195 CONTROL

INFORMATION COPY

FOR INFORMATION ONLY. DOCUMENT SUBJECT TO CONTROL FOR CURRENT REVISION [illegible]

PROBLEM # AB-1-66C R-0



LOCATION PLAN

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION

FOR ENGINEERING & OFFICE USE ONLY

DATA PT	SUPPORT LOADS (LBS)				PIPE MVTS (INCHES)
1196	DESIGN	SERVICE LEVEL			
VERT.	—	[illegible]	[illegible]	[illegible]	
N-S	—	[illegible]	[illegible]	[illegible]	[illegible]
E-W	—	[illegible]	[illegible]	[illegible]	

NOTE +N,E,UP -S,W,DN

REF DWGS	BRHL / ISO	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-32	1	M1-0202	8	E1-0111	9
	FAB. ISO	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0751	4	M1-0756	5

REV	DESCRIPTION	DATE	L&N	CHKD.	APPD.
2	REV AS-BUILT REF DCA 7207 HIT NEMS	7-20-81	BMD	WIP	
1	REF CMC 46170 R.2 (AS BUILT)	~	~	~	
0	IFC	12-19-78	C.A.T.	MG	MPM

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 2

CPSES 35-1195

Brown & Root, Inc
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

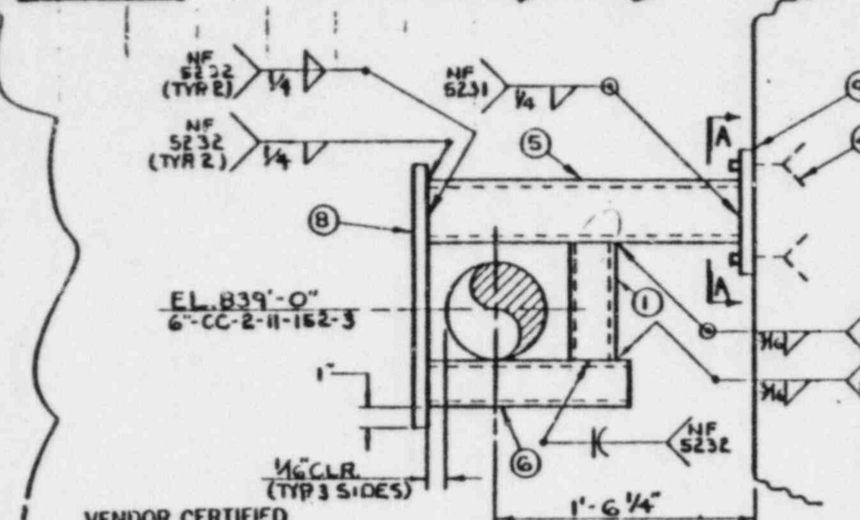
CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-713-A53R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND

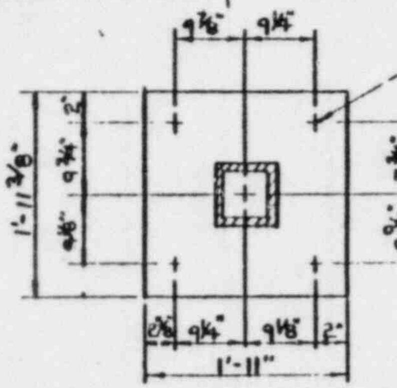
FOR ENGINEERING & OFFICE USE ONLY

AS BUILT



VENDOR CERTIFIED
DRAWING REV. NO. 1
BY. BH DATE 12/6/82

ELEV. VIEW LKG. NORTH



SECTION A-A

MVTS.	
X	+0.033 / -0.030

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

T.O. 21100

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION
1	1	T.S. 1/4" x 3" x 3" x 0'-6 1/16" (A-500, GR. B)
4	4	1" x 9" HILTI KWIK CONCRETE ANCHORS
5	1	T.S. 1/4" x 6" x 6" x 2'-0" LG. (A-500, GR. B) FIELD TRIM TO SUIT
6	1	T.S. 1/4" x 3" x 3" x 1'-2" LG. (A-500, GR. B) FIELD TRIM TO SUIT
8	1	PL. 1" x 8" x 1'-5 11/16" LG. (SA-516 GR. 65 OR SA-36)
9	1	PL. 1" x 1'-11" x 1'-11 3/8" LG. (SA-516 GR. 65 OR SA-36)

APPLY ONE COAT OF CARBO ZINC 11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE.

INFORMATION ONLY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.

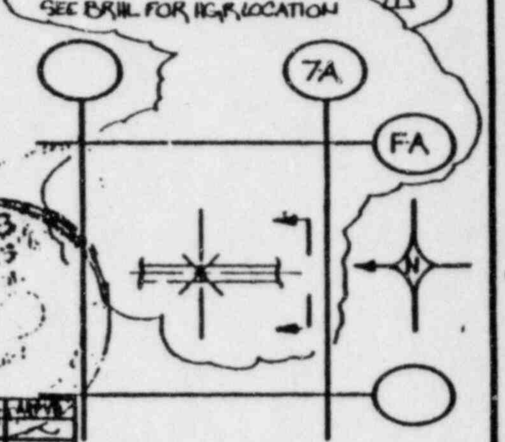
PROBLEM # 18-1-66C/90

SEE BRHL FOR HGR LOCATION

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

RE. CERTIFICATION

CPSES 35-1195



LOCATION PLAN

REV	DESCRIPTION	DATE	DWN	CHKD	APPVD
	GTN # 59790, AS BUILT	~	~		~

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS ANCHORS
2099	DESIGN	A	B	C	D	
VERT	—	510				
N-S						
E-W						

NOTE +N, E, UP / -S, W, DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS.	BRHL ISO	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-032	~	M1-0702	8	E1-0711	9
	FAB. ISO	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0721	4	M1-0756	5

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	REV AS NTD REF CMC 5294 R4 + DCA 7607 SEE NTD VENDOR CERTIFICATION (CHT ABOVE)	12/6/82			
0	IFC	12 19 79	C.A.T.		

CPSES 35-1195
Brown & Root, Inc
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

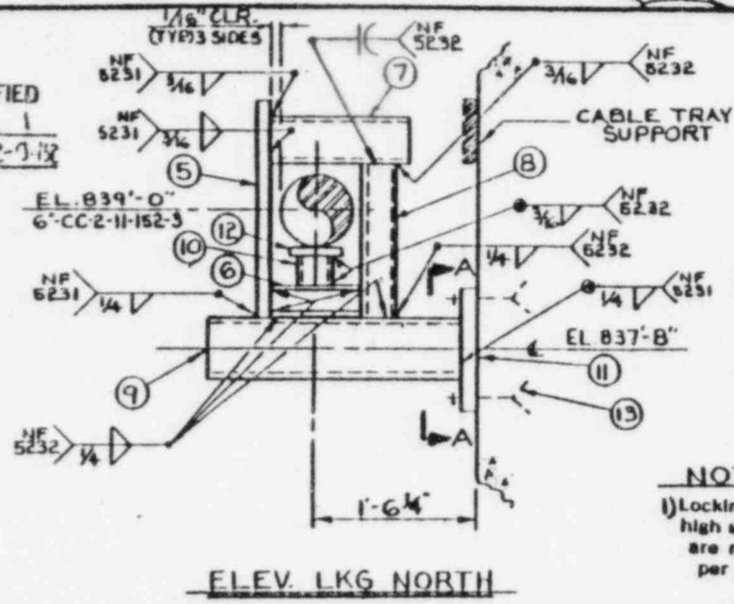
SUPPORT NO. CC-2-011-712-A53R
SHEET 1 OF 1 REV. 1

FOR OFFICE AND ENGINEERING USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY

AS BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 1
BY BJM DATE 12-9-82

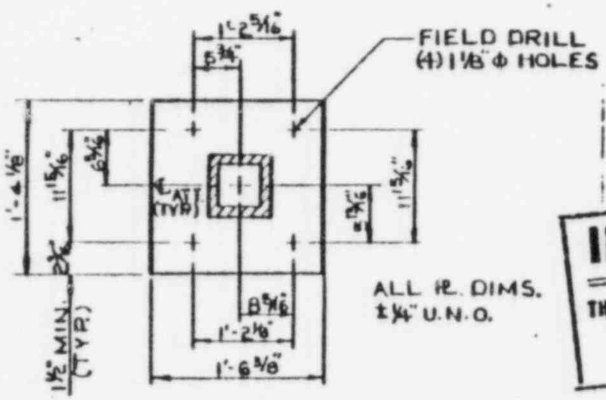


ELEV. LKG NORTH

NOTES

1) Locking devices for high strength bolts are not required per DCA 7607

T.O. 21100



ALL PL. DIMS. ±1/4" U.N.O.

SECTION A-A

ITEM NO	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L	BS	PRIM	SEC	AISC
5	1	1"x 4 1/2"x 1'-8 1/8" LG. C.S. PL. (SA-36 OR SA-515, GR. 65)	X			X		
6	1	W6x12x0'-6 3/4" LG. (SA-36)		X		X		
7	1	T.S. 1/4"x4"x4"x0'-11" LG. (A-500, GR. B)		X		X		
8	1	T.S. 1/4"x4"x4"x1'-4 1/8" LG. (A-500, GR. B)		X		X		
9	1	T.S. 1/4"x6"x6"x 2'-0 1/2" LG. (A-500, GR. B)		X		X		
10	1	T.S. 1/4"x3"x3"x0'-2 1/16" LG. (A-500, GR. B)		X		X		
11	1	1" THK. C.S. PL. /SECT. A-A (SA-36 OR SA-515, GR. 65)	X			X		
12	1	1"x4"x4" LG. C.S. PL. (SA-36 OR SA-515, GR. 65)	X			X		
13	4	1" Φ x 9" LG. HILTI KWIK CONCRETE ANCHORS			X			

APPLY ONE COAT OF CARBO ZINC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE.

REV	DESCRIPTION	DATE	DWN.	CHKD.	APVD.
	VENDOR CERT. REF. GTN. # 52790	~	~	~	~

(PROB. # AB-1-66C, R-0) ⚠1

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: HS-46A

P.E. CERTIFICATION

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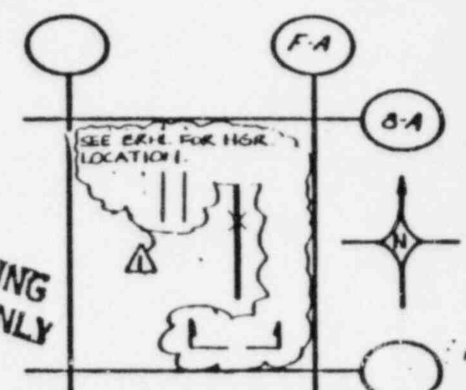
CPSES 35-1195 CONTROL



LOCATION PLAN ⚠1

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS (INCHES)
8101	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	—	[illegible]	[illegible]	[illegible]	—	—
N-S	—	—	—	—	—	[illegible]
E-W	—	[illegible]	[illegible]	[illegible]	—	—

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS	PENIL ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-032	1	M1-0702	8	E1-0711	9
	FAB. ISO	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0721	4	M1-0756	5

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
⚠1	REV. AS NOTED, REF. CMC-32943R5 & DCA-7607-SEE NT. (AS BUILT)	1/19/82	EWY	Q	CBD
0	I.F.C.	12-19-79	C.A.T.		

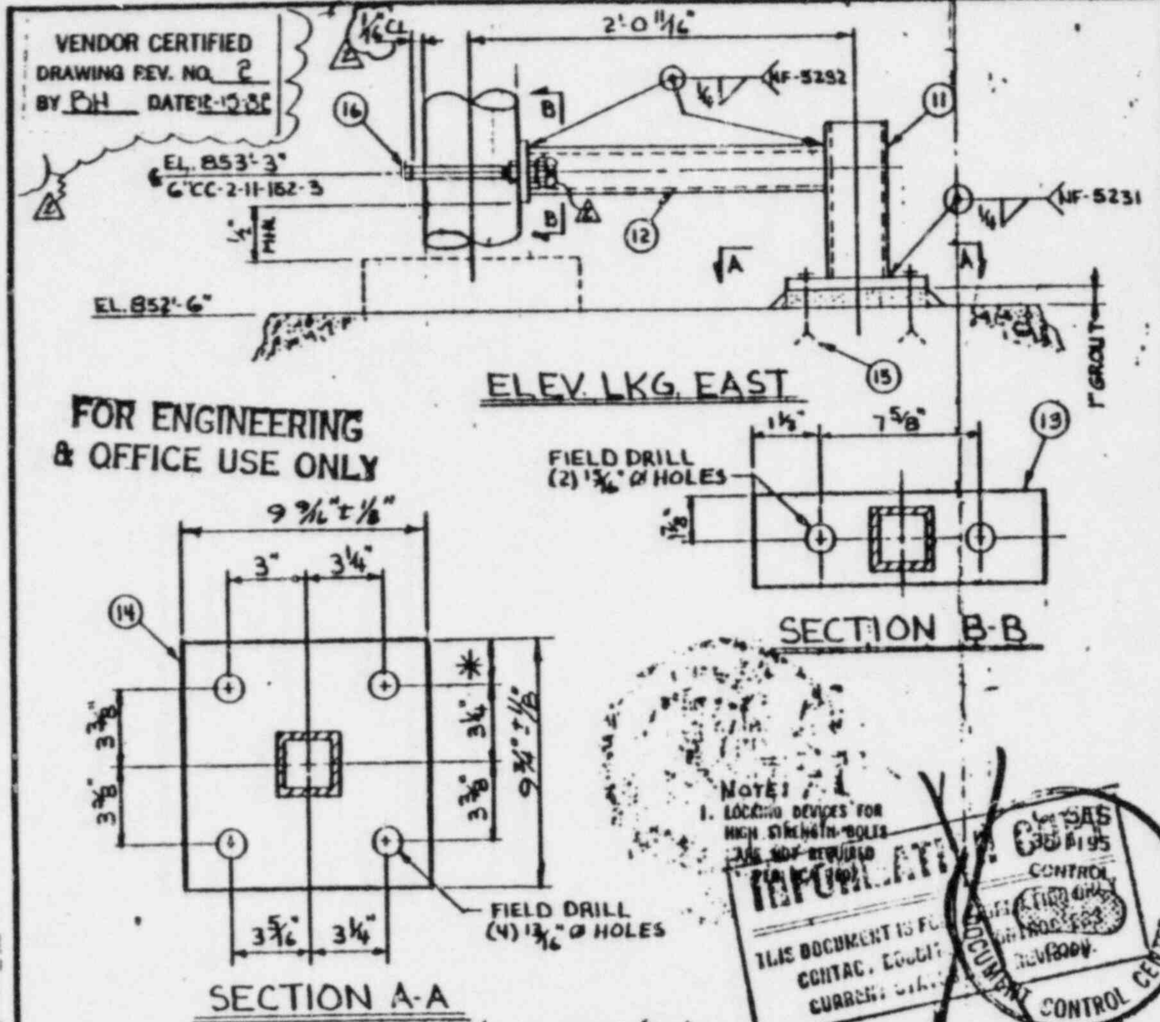
CPSES 35-1195

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-711-A33R
SHEET 1 OF 1 REV. 1

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY BH DATE 12-15-8?



FOR ENGINEERING & OFFICE USE ONLY

PK.# 11 * EDGE DISTANCE ≥ 1 1/2 x BOLT DIA. (TYP) T.O. 21100

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION
~~1~~	~~1~~	~~PUH 060~~
~~2~~	~~1~~	~~... ANGLE SA 36 - SEE DETAIL A~~
~~3~~	~~1~~	~~... ANGLE SA 36~~
~~4~~	~~1~~	~~... PL. SA 36 - SEE SECTION A-A~~
~~5~~	~~4~~	~~... HILTI KWIK CONCRETE ANCHOR~~
11	1	T.S. 4x4x1/4" x 10" (A500 GR.B) TRIM AS REQ'D
12	1	T.S. 3x3x1/4 x 1'-7 7/8" (A-500 GR.B)
13	1	C.S. PL 1/2" x 4" x 10 5/8" (SA-36 / SA-515 GR.65)
14	1	C.S. PL 1/2" x 9 3/4" x 9 9/16" (SA 36 / SA-515 GR.65)
15	4	3/4" x 7" HILTI KWIK CONC. ANCHOR
16	1	PUH-060 U-BOLT
		APPLY ONE COAT OF CARBO ZINC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE

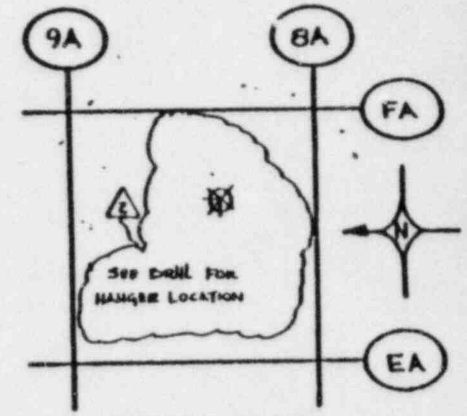
REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	VENDOR CERTIFICATION, RECERT BILL	11/...	...	Q	CBO

PROBLEM # AB-1-66C R,0 2

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: HS-46A

RE. CERTIFICATION

N/A



LOCATION PLAN

DATA PT 2107	SUPPORT LOADS (LBS) SERVICE LEVEL LIMITS					PIPE MVTS INCHES
	DESIGN	A	B	C	D	
VERT.	—	—	—	—	—	—
N-S	—	[illegible]	[illegible]	[illegible]	—	—
E-W	—	[illegible]	[illegible]	[illegible]	—	—

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES [✓] NO [ ]
ASME CODE CLASS 3

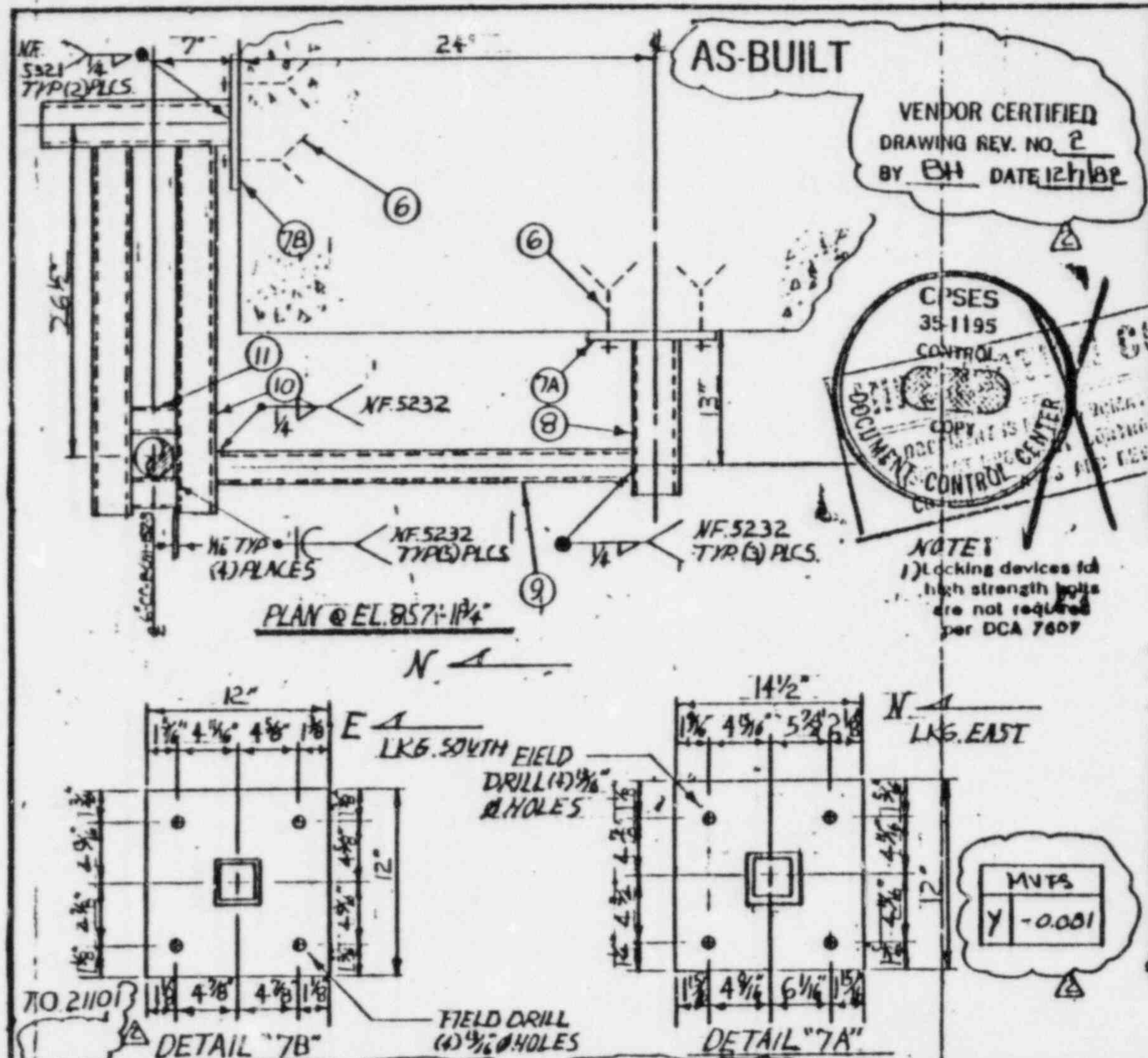
REF. DWGS.	BRHL ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-032	1	M1-0701	6	E1-0710-01	7
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0728	2	M1-0758	4

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
0	IFC	11/30/79	[illegible]	[illegible]	[illegible]
1	REV AS NTD; REF. CMC 43811 R. 2 4	6/11/81	DMH	RKR	[illegible]
2 NT	DCA 7607 (NT.1) "AS BUILT"				

CPSES 35-1195
Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-708-A63R
SHEET 1 OF 1 REV. 2



VENDOR CERTIFIED
DRAWING REV. NO. 2
BY BH DATE 12/7/82

CPSES 35-1195 CONTROL COPY
DOCUMENT CONTROL CENTER

NOTE:
1) Locking devices for high strength bolts are not required per DCA 7607

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L	CSS	PRIM	SEC.	AISC
~~1~~	~~2~~	~~[illegible]~~			X	X		
~~2~~	~~[illegible]~~	~~[illegible] CONCRETE ANCHOR~~			X	X		
~~3~~	~~1~~	~~[illegible] TUBE A-500 GR B~~		X		X		
~~4~~	~~[illegible]~~	~~[illegible] A-500 GR B~~		X		X		
~~5~~	~~[illegible]~~	~~[illegible] SEE SECTION "A-A"~~	X		X	X		
6	8	¾" Ø X 7" HILTI KWIK BOLT			X			
7A	1	¾" PL SEE DTL 7A (SA-36 OR SA515)	X			X		
7B	1	¾" PL SEE DTL 7B (SA-36 OR SA515)	X			X		
8	2	3"X3"X¼"X1'-3" LG. T.S (A-500 GR. B)		X		X		
9	1	2"X2"X¼"X2'-2⅛" LG. T.S (A500 GR. B)		X		X		
10	2	2"X2"X¼"X2'-9⅞" LG. T.S (A500 GR B)		X		X		
11	2	2"X2"X¼"X6¼" LG. T.S (A500 GR B)		X		X		

APPLY ONE COAT OF CARGO ZINC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	VENDOR CERTIFICATION, REF: GDI # 59790	[illegible]	[illegible]	[illegible]	[illegible]

PROBLEM #AB-1-66C

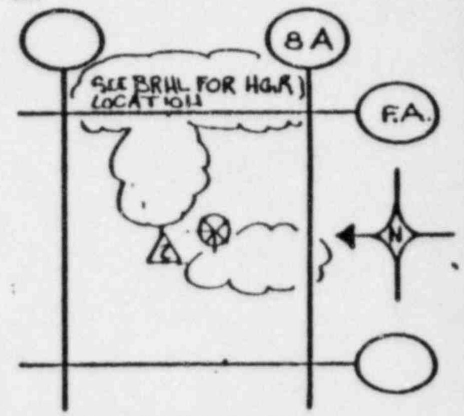
ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

MVTS	
Y	-0.081

P.E. CERTIFICATION

N/A

FOR ENGINEERING & OFFICE USE ONLY



LOCATION PLAN

DATA PT 2108	SUPPORT - LOADS (LBS) DESIGN	SERVICE LEVEL LIMITS A	B	C	D	PIPE MVTS INCHES
VERT.	—					
N-S	—	-47	[illegible]	[illegible]	—	—
E-W	—	+462	[illegible]	[illegible]	—	—

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF DWGS	BRHL. ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-032	0	M1-0701	6	E1-0710-01	7
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0728	2	M1-0758	4

REV	DESCRIPTION	DWN.	CHKD.	APPVD.
0	IFC 11/30/79	[illegible]	[illegible]	[illegible]
1	REV. DASN'T D REF CMC 33446 R1 (NBPS 20/7/82)	S.W.L	RB	[illegible]
2	(DCA-7607 (SEC. NT. 1)) WEMS AS BUILT	[illegible]	~	[illegible]

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS
CPSES 35-1195

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

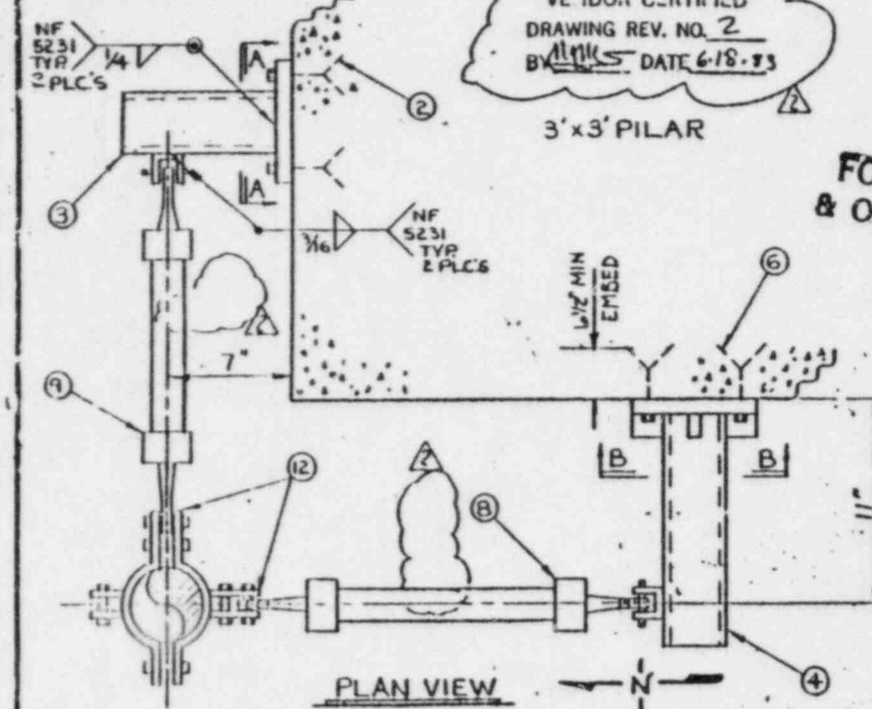
SUPPORT NO. CC-2-011-707-A63R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND
ENGINEERING USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY

AS-BUILT

VENDOR CERTIFIED DRAWING REV. NO. 2 BY [illegible] DATE 6-18-83



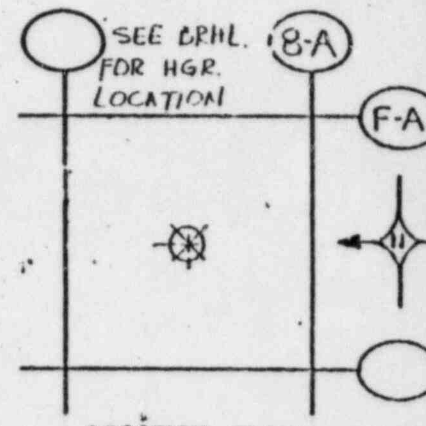
FOR ENGINEERING & OFFICE USE ONLY

ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L	CSS	PRIM	SEC
2	4	3/4"x7" HILTI KWIK CONCRETE ANCHORS			X		
3	1	T.S. 1/4"x3"x3" x 8 1/4" LG.(A-500-74a, GR.B)		X		X	
4	1	T.S. 1/4"x3"x3"x1'-2 1/4" LG.(A-500-74a, GR.B)		X		X	
6	4	5/8"x8 1/2" HILTI KWIK CONCRETE ANCHORS			X		
7	4	1/2"x4"x3 1/4" LG. STIFFENER PLATE (SA-36 OR SA-515 GR.65)	X			X	
8	1	SRF-08-RO SWAY STRUT			X		
9	1	SRF-08-RO SWAY STRUT			X		
10	1	3/4" C.S. PLATE PER SECT. A-A (SA-36 OR SA-515 GR.65)	X			X	
11	1	3/4" C.S. PLATE PER SECT. B-B (SA-36 OR SA-515 GR.65)	X			X	
12	2	SPC-08-060 C.S. PIPE CLAMP (SA-36			X		
		PAINT: CARBO ZINC 11					

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	REVD VENDOR CERTIFICATION REF. VER-11-8042	[illegible]	SL	[illegible]	[illegible]

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION: N/A



NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

T.O. 21101

CPSES 36-1195 CONTROL COPY DOCUMENT CONTROL CENTER

INFORMATION COPY
THIS DOCUMENT IS [illegible] ONLY. [illegible] FOR [illegible]

PROJ# AB1-66CRO

DATA PT	SUPPORT LOADS (LBS)					PIPE MVTS (INCHES)
2109	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	—	—	—	—	—	.005 / .006
N-S	—	-381/±..	648/381	1079/655	—	—
E-W	—	—	—	—	—	—

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES ☑ NO ☐
ASME CODE CLASS 3

REF. DWGS.	BRHL. ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-032	1	M1-0701	6	E1-0710-01	7
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	2	S-0728	2	M1-0758	4

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
0	I.F.C.	11-30-??	[illegible]	[illegible]	[illegible]
1	REVD AS NOTED REF CMC [illegible]	12/4/??	[illegible]	[illegible]	[illegible]
CONT	[illegible] ADDED SHT 2 AS BUILT VENDOR CERTIFICATION REF. [illegible]				

CPSES 36-1195

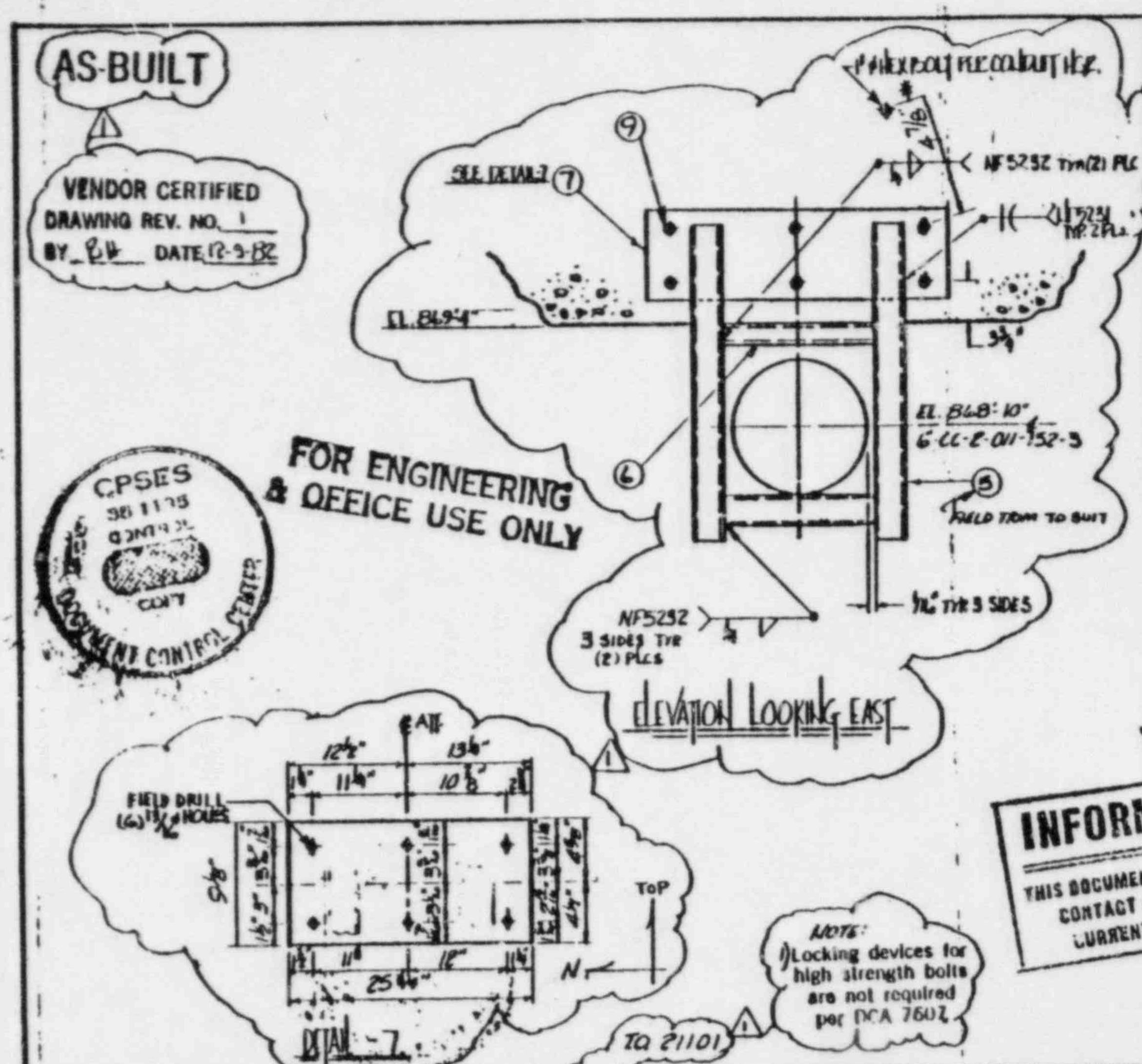
Brown & Root, Inc. ENGINEERS AND CONSTRUCTORS HOUSTON, TEXAS

CLIENT T.U.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-706-A63R
SHEET 1 OF 2 REV. 2

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 1
BY RH DATE 12-3-82



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ITEM NO.	QTY. REQ'D.	MATERIAL DESCRIPTION						
5	2	TS 4"x4"x1/4"x44"Lg A-500 GRB		X		X		
6	2	TS 3"x3"x1/4"x64 1/4"Lg A500 GRB		X		X		
7	1	C.S. PL 3/4" (SEE DET. 7) SA-515 GR. 65/SA-36	X			X		
9	6	HILTI KWIK BOLTS 3/4"x7"			X			

PAINT: CARBO ZINC #11

REV	DESCRIPTION	DATE	DSGN.	CHKD.	APVD.
1	VENDOR CERTIFICATION PER CPP 8122	—	—	—	—

Hilti Violation

PROJ# AB-1-66C R-0

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

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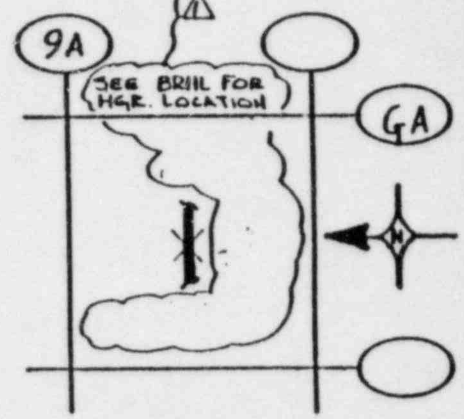
NOTE:
1) Locking devices for high strength bolts are not required per DCA 7607.

TO 21101



LOCATION PLAN

DATA PT.	SUPPORT LOADS (lbs)					PIPE MVTS (INCHES)
2120	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.	—					—
N-S	—					—
E-W	—					.174

NOTE +N, E, UP -S, W, DN

AUTHORIZED NUCL. INSP. YES [X] NO [ ]
ASME CODE CLASS 3

REF. DWGS.	BRHL ISO.	REV.	MECHANICAL	REV.	ELECTRICAL	REV.
	CC-2-AB-32	1	M1-0707	6	E1-0703	6
	FAB. ISO.	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CC-2-AB-032	1	S-0795	2	M1-0757	4

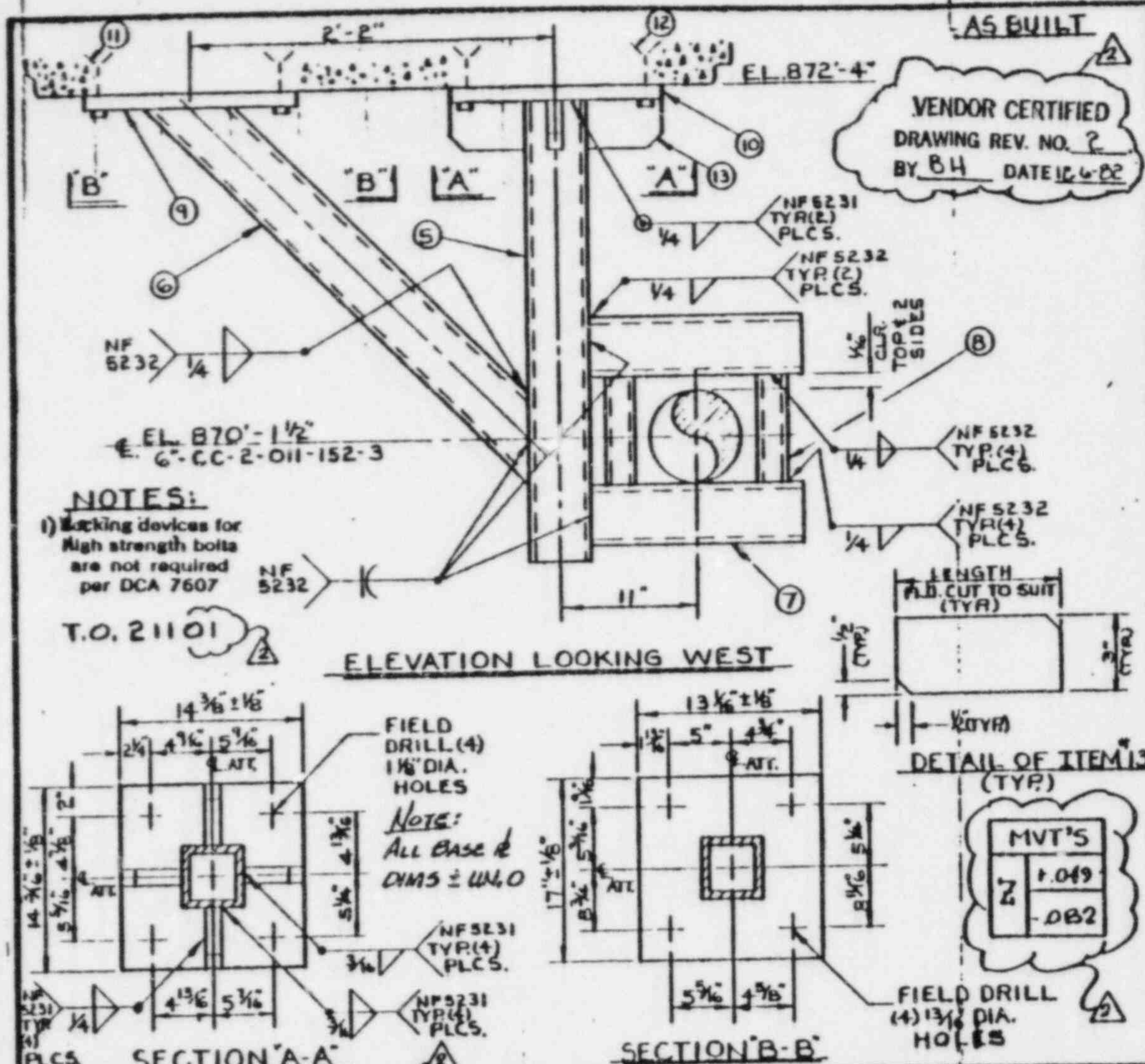
REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
0	IPE	9-28-79	MMJ	MG	
1	REV. AS NTD REF. CMC # 40609 R-9	12/4/82	RB	G	
4	DCR 7607 NTL AS-BUILT cont.	—	—	—	—

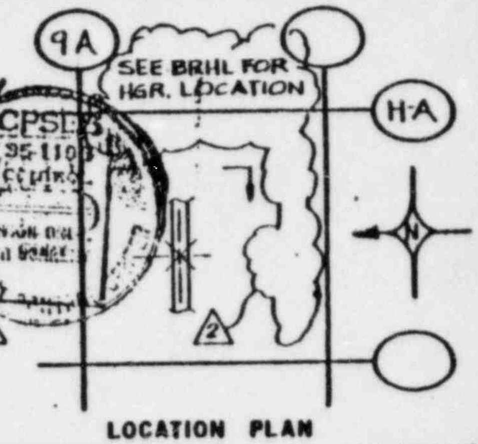
Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-11-702-A63R
SHEET 1 OF 1 REV. 1

FOR OFFICE AND





ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	PBS					AISC
5	1	T.S. ¼"x4"x4"x2'-9¾" LG. (A-500, GR.B)		X		X		
6	1	T.S. ¼"x4"x4"x3'-8" LG. (A-500, GR.B) FIELD CUT TO SUIT		X		X		
7	2	T.S. ¼"x4"x4"x1'-2½" LG. (A-500, GR.B)		X		X		
8	2	T.S. ¼"x2"x2"x0'-6 11/16" LG. (A-500 GR.B)		X		X		
9	1	¾" THK. C.S. PLATE PER SECT. B-B (SA-515 GR.65 OR SA-36)	X			X		
10	1	¾" THK. C.S. PLATE PER SECT. A-A (SA-515 GR.65 OR SA-36)	X			X		
11	4	¾" φ X 10" LG. HILTI KWIK CONCRETE ANCHORS			X			
12	4	1" φ X 12" LG. HILTI KWIK CONCRETE ANCHORS			X			
13	4	½" THK. C.S. PLATE (SA-36 OR SA-515 GR.65) x 0'-3" WIDE x LENGTH TO BE FURNISHED BY FIELD	X			X		

[redacted]

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	VENDOR CERTIFICATION (REF GIN# 39790)				

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-40A

P.B. CERTIFICATION

PROB# AB-1-66C-R-0

DATA PT	SUPPORT LOADS (LBS)				PIPE MVTS INCHES
2122	DESIGN				
VERT.	-462				

REF. DWGS	STRESS ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	M2-3231-36	A	MI-0701	6	EI-0703	6
	BRHL ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0735	2	MI-0757	4

[redacted]

AUTHORIZED NUCL. INSP. YES ☒ NO ☐
ASME CODE CLASS 3

Brown & Root, Inc.
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

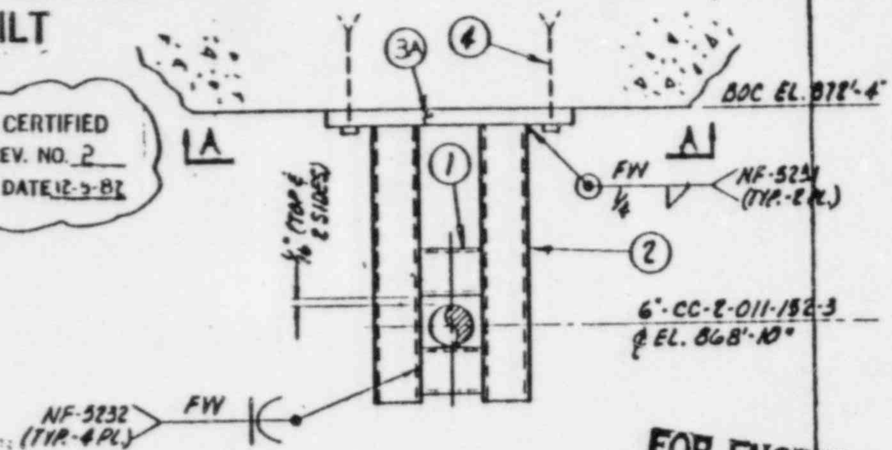
SUPPORT NO. CC-2-11-701-A63R
SHEET 1 OF 1 REV. 2

FOR ENGINEERING & OFFICE USE ONLY

FOR OFFICE AND ENGINEERING USE ONLY

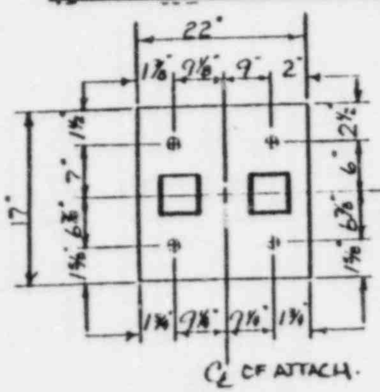
AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY. DH DATE 12-3-82



ELEVATION LOOKING EAST

FOR ENGINEERING & OFFICE USE ONLY



SECTION A-A

NOTES:
1) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7607

T.O. 2/100

ITEM NO	QTY REQ'D	MATERIAL DESCRIPTION	PBS	L	CS	PRIM	SEC	AISC
1	2	4" x 4" x 1/4" x 6 3/4" TUBE A-500-GR B		X		X		
2	2	4" x 4" x 1/4" x 4'-1" TUBE A-500-GR B		X		X		
3A	1	1 1/4" C.S. PL. PER SECTION A-A (SA-36 or SA-515 GR 65)	X			X		
4	4	1" x 9" HILTI KWIK CONCRETE ANCHOR			X			

APPLY ONE COAT OF CARCO ZINC #11 TO ABOVE MAT'L EXCEPT THREADS WHICH SHALL BE TREATED WITH A RUST PREVENTATIVE.

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPD.
2	VENDOR CERTIFICATION REF GTN# 39790	12-6-82	JMD	Q	CBD

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION

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CPSES
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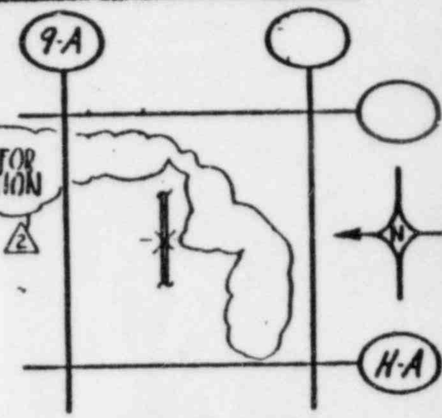
SEE BRHL FOR HGR LOCATION



LOCATION PLAN

PROBLEM # AB-1-66C-RO

DATA PT	SUPPORT LOADS (LBS) DESIGN	SERVICE LEVEL LIMITS A	B	C	D	PIPE MVTS INCHES
1124						
VERT.		-514	-971	-1253	-1612	
N-S		83	205	1348	1442	
E-W						

NOTE +N, E, UP / -S, W, DN

AUTHORIZED NUCL. INSP. YES ☒ NO ☐
ASME CODE CLASS 3

REF. DWGS	BRHL ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-032	1	M1-0701	6	E1-0703	6
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0735	2	M1-0757	4

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPD.
0	I.F.C.	9-28-79	HH/KG		
1	REV AS NTD REF CMC 45450 R 2	6-10-82	BT		
2	DLT EWS 1-6, DCA 7607 (AS NOTED)		ONT		

CPSES 35-1195

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

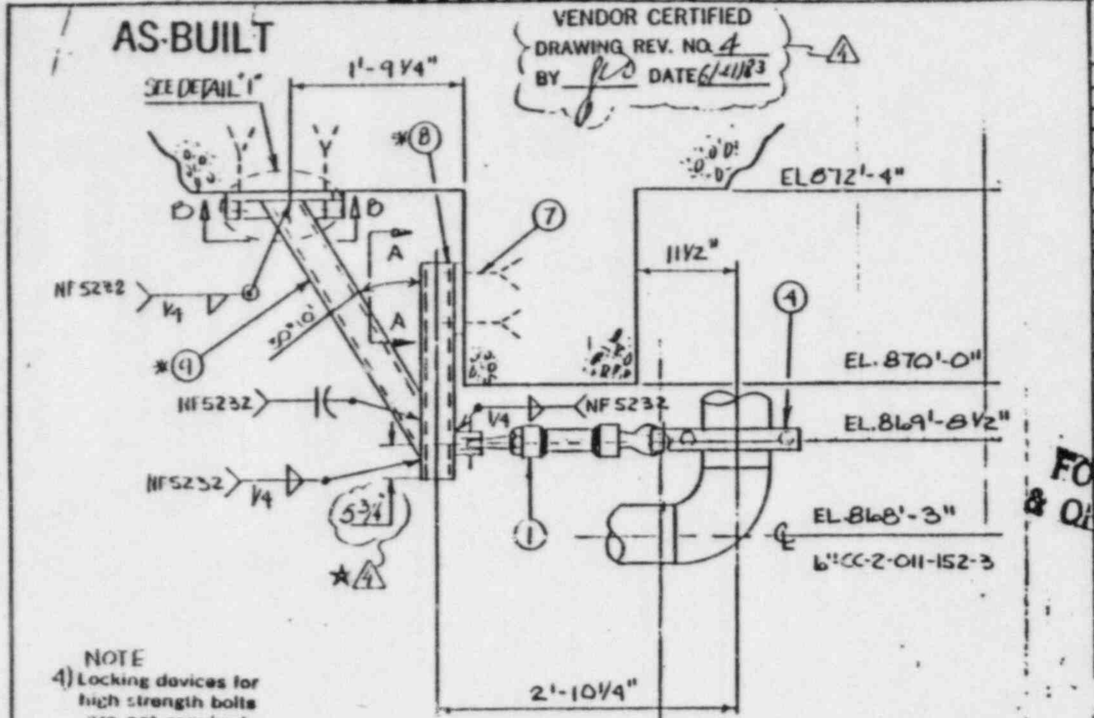
CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-11-700-A63R
SHEET 1 OF 1 REV. 2

FOR OFFICE AND ENGINEERING USE ONLY

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 4
BY [signature] DATE 6/21/83



NOTE
4) Locking devices for high strength bolts are not required per DCA 7607

☆ CHANGE NOT MADE BY CMC

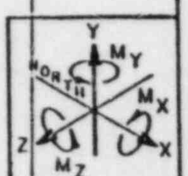
* FIELD TRIM TO SUIT

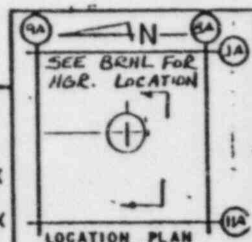
REROUTE 2"-CH-X-40-152-5 DUE TO INTERFERENCE

OBTUSE OR ACUTE ANGLE WELD NOT USED FOR ENGR. EVALUATION

TO # 21101

BRNL Iso. CC-2-AB-50 R-1
I.P.D. Iso. CC-2-AB-50-R-0
Data Point 2127/AB1660
Pipe Mat'l. SA106GR.B
Insul. 1/2 Bldg. A





THIRD PARTY INSPECTION YES NO
CODE CLASS: ASME III-3

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP.		PBS	L	CSS	PRIM.	SEC.
1	SRS-10-RO SWAY STRUT C-C=1'-8 1/4"	1					X		
4	SPC-10-060 PIPE CLAMP SA36	1					X		
6	3/4" CS PL PER SECT. A-A SA36/SA515GR65	1			X			X	
7	3/4" Ø X 10" LG HILTI KWIK CONCRETE ANCHORS	8					X		
8	T.S. 3/8"X4"X4"X2'-8 1/2" LG A-500GR-B	1				X		X	
9	T.S. 3/8"X4"X4"X4'-0" LG A500GR.B	1				X		X	
10	3/4" CS. PL PER SECT "B-B" SA36/SA515GR65	1			X			X	
11	3/4" CS PL PER DETAIL "1" SA36	1			X			X	
12	3/4" CS PL PER DETAIL "3" SA36				X			X	

REV	DATE	DWN	CHK	APP	DESCRIPTION
4	6/83				ADDED SHT 2 AS BUILT VENDOR CERTIFICATION, REF: NCR-M-8064 REV'D VENDOR CERTIFICATION REF NCR-M-8064

MARK # CC-2-011-002-A63R
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: MI-0701-R7 ELECT: E10703-R5
STEEL: S-0735-R2 HV.A.C.: MI-0757-R4

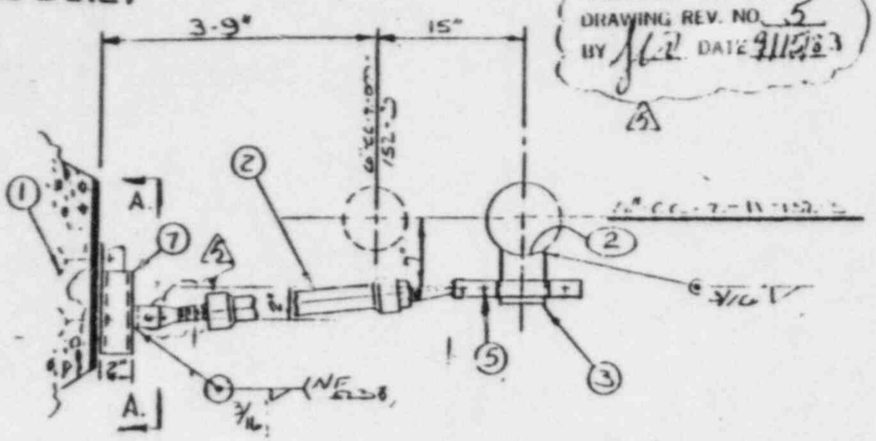
CONDITIONS	Fx	Fy	Fz	Mx	My	M
DESIGN	—	—	—	—	—	
NORMAL & UPSET	—	—	+5072 -5069	—	—	
EMERGENCY	—	—	+5731 -3750	—	—	
FAULTED	—	—	—	—	—	

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	6-5-79	JW			ISSUE FOR CONST. FW 1
1		ERy			REV PER NPSI REV OA
2	4-81				REV. PER PHBP # 326.
3	3/24/83				REV AS NOTED & REF. CMC 40518 ... SEE NT #4 CONT.

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-2-011-002-A63R
SKETCH NO. —
SHEET 1 OF 2 REV. 4

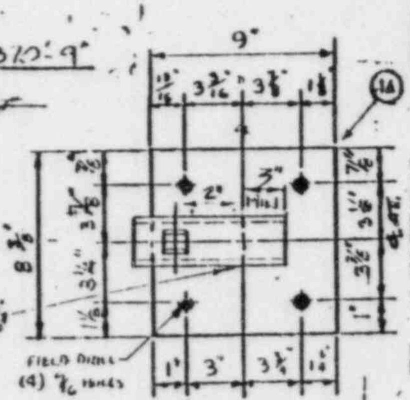
AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 5
BY [illegible] DATE 9/12/83



PLAN VIEW @ EL. 810'-9"

NORTH



FIELD DRILL (4) 7/8 HOLES

SECTION "A-A"

NOTES:
4) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7687

ITEM NO.	NO REQ'D	PART CALL-OUT	DESCRIPTION	MATERIAL	MIC. NO.	WT.	PBS	L	CSS	PRIM	SEC	AISC
1	4	BSA 12 CD	COIL ANCHORS		—							
2	1	SRS-0... KO	SWAY STRUT		67P	20			X			
3	1	1" SCH 40 x 5 3/16"	STANCHION	A106 GB	D	3		X		X		
4	1	1 3/8" XH XTP	C.S. PLATE	SA36	D	7	x			X		
5	1	SR DL-030	PIPE CLAMP	SA36	D	7						
6	1	DWG 2012A	ASME III PLATE									
7A	1	P 1/2 x 8 3/4 x 9" LG	CS PLATE	SA36			X			x		
7	1	TS 2 x 2 x 1/4	TUBE STEEL	A500 GR.B								

SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG
MARK # CC-2-011-001-A63R

Apply Carbo-Zinc #11 to above mat'l except th'ds which shall be treated with a rust preventative

NO MAT'L BY GRINNELL

REV	DATE	DWN	CHK	APP	DESCRIPTION
					ISSUE CERTIFICATION CERT 91140
1	7-1 81	NC			REV VENDOR CERTIFICATION. CERT CHC 91466
5					REV'D VENDOR CERT.

Approved By: CEC
Date: 4-23-79

QUAN | SHIP | PBS | L | CSS

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ______ SHEET ___ OF

SEE BRNL FOR HGR LOCATION

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: 2111-0701 - Rev 1 ELECT: 2111-0313
STEEL: S-0528 - Rev 2 H.V.A.C.: 2111-0157 R

CONDITIONS	Fx	Fy	Fz	Mx	My	M
DESIGN						
NORMAL & UPSET	+384 -414					
EMERGENCY	1246					
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	6-5-79	JW			ISSUE FOR CONST FW 1-2
1	2-22-8_	R		JW	REV PER NPSI REV OA
2					REV AS PER CMC-31042 PHBB-0260
3					REV AS PER CMC-31042 R2 (SEE NO.4) AS BUILT

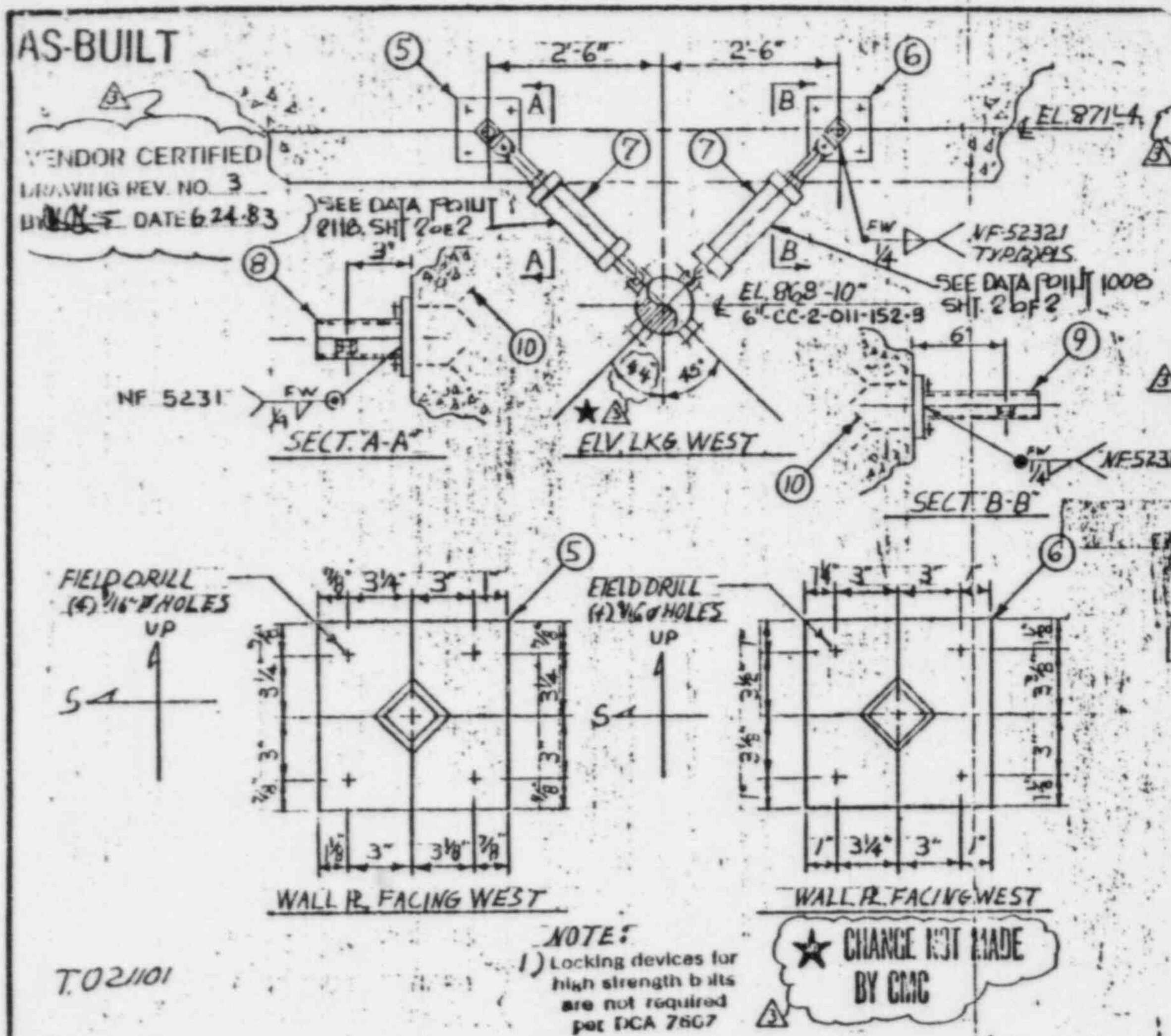
CUSTOMER Texas Utilities Service,
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-2-011-001 A63R
SKETCH NO.
SHEET 1 OF 1 REV. 5

THIRD PARTY INSPECTION YES ☒ NO ☐
CODE CLASS: ASME III-3

BRNL Iso CC-2-AB-50 R.1
I.P.D. Iso. CC-2-AB-50 K.0
Data Point: 1217/1800 NS1/UC RO
Pipe Mat'l. SA106 GR.B
Insul. 1/2 Bldg. A

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 3
BY ___ DATE 6-24-83



ITEM No.	QTY REQ'D	MATERIAL DESCRIPTION
5	1	1/2" PL C.S. (SA-515 OR SA-36)
6	1	1/2" PL C.S. (SA-515 OR SA-36)
7	2	3S-OB TYPE PC
8	1	TS 3 1/2" x 1/4" x 3 1/2" LG. A500-74A-GR.B
9	1	TS 4" x 4" x 1/4" x 8 1/4" LG. A500-74A-GR.B
10	8	HILTI KWIK BOLTS 1/2" x 5 1/2"

PAINT: CARBO ZINC 11

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
1	VENDOR CERTIFICATION, REF. GIL# 59790				
CONT	ADDED SH. 2, CMC 76965	~	~	~	
3	REV'D VENDOR CERT., REF. NCR# M-8041				

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

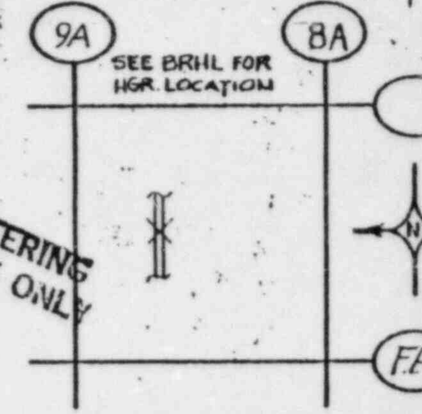
P.E. CERTIFICATION

FOR ENGINEERING & OFFICE USE ONLY

NOTE:
1) Locking devices for high strength bolts are not required per DCA 7607

★ CHANGE NOT MADE BY CMC

PROBLEM # AB-1-66C



LOCATION PLAN

DATA PT	SUPPORT LOADS (LBS) DESIGN	SERVICE LEVEL A B C D	LIMITS	PIPE MVTS (INCHES)
VERT.	SEE SHEET 2 OF 2			
N-S				
E-W				

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES [X] NO [ ]
ASME CODE CLASS 3

REF. DWGS	STRESS ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	M2-3237-36	A	M1-0701	6	E1-0703	6
	ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	7	S-0735	2	M1-0757	4

CPSES

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-703-A63R
SHEET 1 OF 2 REV. 3

FOR OFFICE AND ENGINEERING USE ONLY

AS-BUILT

VENDOR CERTIFIED
DRAWING NO. 3
BY W.M. DATE 6-24-83

DATA PT.	SUPPORT LOADS (lbs)					PIPE MVTS (INCHES)
2118	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.		-197	226 ±329	769 ±955		
N-S		+215	-356 ±740	419 ±1231		
E-W						

NOTE +N,E,UP -S,W,DN — AUTHORIZED NUCL. INSP. YES ☒ NO ☐ — ASME CODE CLASS 3

DATA PT.	SUPPORT LOADS (lbs)					PIPE MVTS (INCHES)
1008	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.		-270	347 ±147	591 ±176		
N-S		-270	542 ±147	591 ±176		
E-W						

NOTE +N,E,UP -S,W,DN — AUTHORIZED NUCL. INSP. YES ☒ NO ☐ — ASME CODE CLASS 3

MVT'S	
Z	+.104
	-.185

MVT'S	
Z	+.103
	-.184

FOR ENGINEERING & OFFICE USE ONLY

CPSES CONTROLLED COPY

10 # 2101 -A

DATA PT.	SUPPORT LOADS (lbs)					PIPE MVTS (INCHES)
	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.						
N-S						
E-W						

NOTE +N,E,UP -S,W,DN — AUTHORIZED NUCL. INSP. YES ☒ NO ☐ — ASME CODE CLASS 3

REF. DWGS.	STRESS ISO.	REV.	MECHANICAL	REV.	ELECTRICAL	REV.
	M2-3231-36	A				
	BRHL ISO.	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CC-2-AB-032	1				

REV	DESCRIPTION	DATE	DWN.	CHKD.
2	VENDOR CERTIFICATION REF. CII# 59190	[illegible]	[illegible]	[illegible]
[illegible]	CMC 76965			
3	REV'D VENDOR CERTIFICATION REF. IKE II 8041	[illegible]	RM	[illegible]

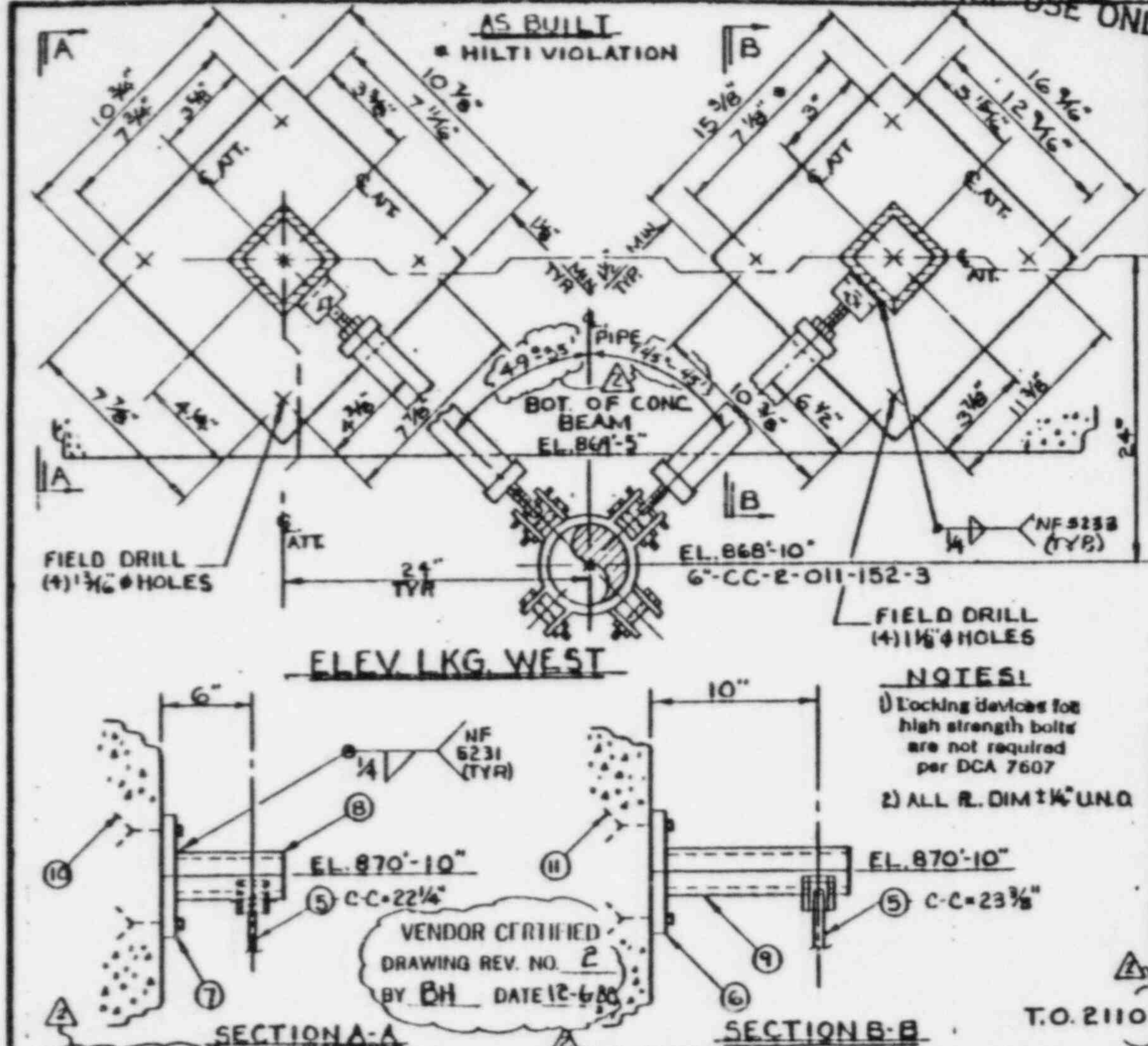
CPSES 35-1186

Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

SUPPORT NO. CC-2-011-703-A63R
SHEET 2 OF 2 REV. 3

FOR OFFICE AND
[illegible]



NOTES:

1) Locking devices for high strength bolts are not required per DCA 7607
2) ALL PL. DIM ± 1/4" U.N.O.

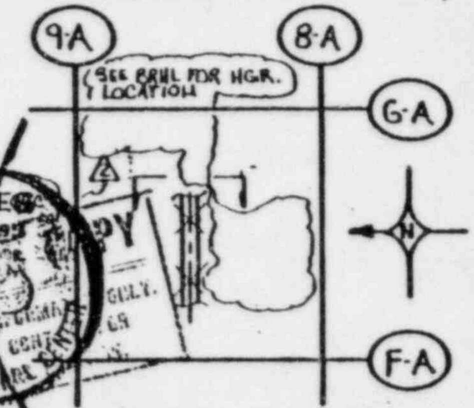
ITEM NO.	QTY REQ'D	MATERIAL DESCRIPTION	PBS		ES	PRIM	SEC	AISC
5	2	SRS-08-PC SWAY STRUT, W/ SPC-08-060 PIPE CLAMP			X			
6	1	3/4" THK. C.S. PLATE, (SA-36 OR SA-515 GR. 65)	X			X		
7	1	3/4" THK. C.S. PLATE, (SA-36 OR SA-515 GR. 65)	X			X		
8	1	T.S. 3/8"×4"×4"×0'-7" LG. (A-500 GR. B)		X		X		
9	1	T.S. 3/8"×4"×4"×0'-11" LG. (A-500 GR. B)		X		X		
10	4	3/4" ϕ X 10" LG. HILTI KWIK CONCRETE ANCHORS			X			
11	4	1" ϕ X 9" LG. HILTI KWIK CONCRETE ANCHORS			X			

[redacted]

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPVD.
2	VENDOR CERTIFICATION, REF: GTN 59790 & CMC 76969 ADDED SHT 2 OF 2	12/6/86	JB	Q	BF

ASME CODE EDITION: 1974
ADDENDA: WINTER
DESIGN SPEC: MS-46A

P.E. CERTIFICATION



LOCATION PLAN

REF DWGS	BRHL ISO.	REV	MECHANICAL	REV	ELECTRICAL	REV
	CC-2-AB-032	0	MI-0701	6	EI-0703	6
	FAB. ISO.	REV	STRUCTURAL	REV	H.V.A.C.	REV
	CC-2-AB-032	1	S-0735	2	MI-0757	4

[redacted]

DATA PT.	SUPPORT LOADS (LBS) DESIGN	SERVICE LEVEL A	B	C	D	PIPE MVTS INCHES
VERT.						
N-S						
E-W						

AUTHORIZED NUCL. INSP. YES ☒ NO ☐
ASME CODE CLASS 3

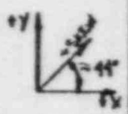
CPSES 35-1195
Brown & Root, Inc
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

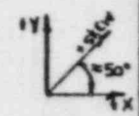
SUPPORT NO. CC-2-11-704-A63R
SHEET 1 OF 2 REV. 2

AS-BUILT

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY BH DATE 12-6-82



DATA PT.	SUPPORT LOADS (lbs)					MVTS.	
1006	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	X	0
							0
VERT.		[illegible]	[illegible]	[illegible]	0	Y	0
N-S		[illegible]	[illegible]	[illegible]	0		0
E-W		0	0	0	0	Z	+.123 / -.216



DATA PT.	SUPPORT LOADS (lbs)					MVTS	
2116	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	X	0
							0
VERT		-192	-327	-352 / +[illegible]	0	Y	0
N-S		+225	+384	-20 / +[illegible]14	0		0
E-W		0	0	0	0	Z	+.125 / -.219

FOR ENGINEERING
& OFFICE USE ONLY

CPSES
INFORMATION [illegible]
THIS DOCUMENT IS [illegible] CONTROL FOR
CONTACT [illegible] REVISION.
CURRENT STATUS [illegible] CONTROL [illegible]

TO# 21101

DATA PT.	SUPPORT LOADS (lbs)					PIPE MVTS (INCHES)
	DESIGN	SERVICE LEVEL LIMITS A	B	C	D	
VERT.						
N-S						
E-W						

NOTE +N,E,UP -S,W,DN

AUTHORIZED NUCL. INSP. YES [X] NO [ ]
ASME CODE CLASS 3

REF. DWGS.	BRHL ISO.	REV.	MECHANICAL	REV.	ELECTRICAL	REV.
	CC-2-AB-032	0	MI-0701	6	EI-0703	6
	FAB. ISO.	REV.	STRUCTURAL	REV.	H.V.A.C.	REV.
	CC-2-AB-032	1	S-0735	2	MI-0757	4

REV	DESCRIPTION	DATE	DWN.	CHKD.	APPV
2	VENDOR CERTIFICATION, REF; GTN59710 & CMC 76964	11/6/82	[illegible]	[illegible]	[illegible]

CPSES
88-1106
Brown & Root, Inc.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

CLIENT T.U.S.I.
PLANT COMANCHE PEAK
JOB NO. 2323

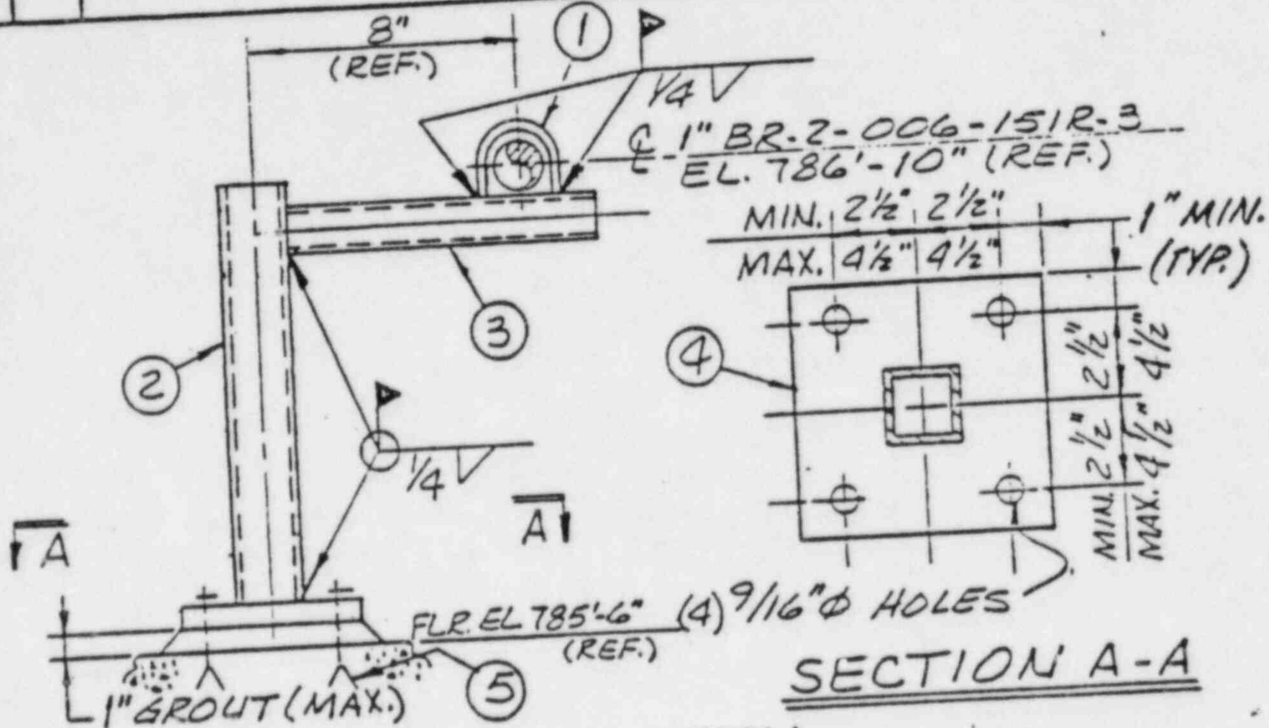
SUPPORT NO. CC-2-011-704-A63R
SHEET 2 OF 2 REV. 2

FOR OFFICE AND
[illegible]

ATTACHMENT C

ITEM NO.	QTY REQD	MATERIAL DESCRIPTION	MATERIAL DESIG.
1	1	WELDED U-GUIDE - PUG - 010	SA-36
2	1	TS. 3 x 3 x .250 x 1'-4½" LG. (CUT TO SUIT)	A500, GR.B
3	1	TS. 2 x 2 x .250 x 1'-1½" LG. (CUT TO SUIT)	A500, GR.B
4	1	PL. 5 3/4" THK. (SEE SECTION A-A)	SA-36
5	4	½" x 9" HILTI-KWIK BOLT (5½" MIN. EMB.)	

FOR OFFICE AND ENGINEERING USE ONLY



ELEVATION LKG NORTH

MAX. MVMTS. (IN.)
Δx = -.11
Δy = .00
Δz = .00

NOTE!
FOR GEN. NOTES, SEE CP-AA-001.

REV	DATE	DWN	CHKD	APPR	DESCRIPTION
0	11-16-83	E.C.	[illegible]	[illegible]	RELEASED FOR CONSTRUCTION

PROB. #	DATA PT.	DESIGN LOADS (LBS) SERVICE LEVEL LIMITS A	B	C	PIPE MVMT (INCHES)
	VERT.	21	34	47	0
+N, E, UP	N - S	—	—	—	-.10
-S, W, DN	E - W	5	11	17	0

TEXAS UTILITIES SERVICES INC.
COMANCHE PEAK STEAM ELECTRIC STATION
PIPE SUPPORT ENGINEERING

DRAWING NO. H-BR-2-SB-001-009-3 | REV. 0 | SHT 1 OF 1

H BR-2-SB-D01-009-3
Hanger Number

MATERIAL IDENTIFICATION LOG

	Mat'l Spec	Material Description	Quantity	Heat/ID Number	Salvaged Hanger Number (where applicable)	QC Verification & Date	Notes
#1	SA-36	U-Guide A1G-010	1				
5D #2	A500GRB	T.S. 3"x3"x1/4"x1'-4 1/2"	1	W73541		J. Reed 6-6-84	
5D #3	A500GRB	T.S. 2"x2"x1/4"x1'-1 1/2"	1	Y52430		6-6-84 J. Reed	
9/21 #4	SA-36	PL 3/4"x10 1/4"x9"	1	450882	N/A	J. Reed 6-6-84	

QTQ-652

RELATED CORRESPONDENCE

ATTACHMENT D

TEXAS UTILITIES GENERATING COMPANY

OFFICE MEMORANDUM

To: DOCKETED USNRC Distribution

Dallas, Texas: March 9, 1984

Subject: Resolution of QAI-0001

'84 AGO 15 P12:15

OFFICE OF SECRETARY DOCKETING & SERVICE BRANCH

The Quality Assurance Investigation listed above has been resolved to the satisfaction of the Manager, Quality Assurance. No further action is necessary at this time. Please contact the undersigned at 214-979-8890 if there are any questions on this matter.

Thank you.

Jerry C. Walker

Jerry C. Walker

JCW:ln

Distribution: D. N. Chapman/QE File
D. L. Andrews/Corporate Security
Boyce Grier/CPSES QA
Initiator (A. Vega)

CONFIDENTIAL

TEXAS UTILITIES GENERATING COMPANY

OFFICE MEMORANDUM

To A. Vega Glen Rose, Texas February 22, 1984

Subject Investigation of Allegations
QAI #0001

In response to your request of 12/20/83 I have investigated the allegations forwarded with QAI #0001. This is the report of my findings.

I interviewed the alleger, [redacted], at his home to obtain additional information on the matters alleged in his letter to Doug Frankum. A copy of this letter is attached (Attachment A). My report of the interview is contained in Attachment B. During the interview I was given additional allegations as indicated in the interview report. These additional matters have also been investigated where practicable.

In the investigation, I interviewed two persons named by [redacted] in his allegations--a QC inspector, [redacted], and a General Foreman, [redacted] My reports of these interviews are contained in Attachment C and Attachment D. I also reviewed various procedures, records and documentation as appropriate. I have summarized the results of these activities and have developed my evaluation and conclusion for each allegation. These are discussed below.

1. Improper Marking of Hilti Bolts

The information regarding improper marking of Hilti bolts provided by [redacted] in the interview was essentially the same as that contained in his letter to Frankum. It should be noted that [redacted] had no first hand knowledge of this matter but was reporting what he was told. I interviewed [redacted] the QC inspector named by [redacted] as having received the star stamp found by the laborer, and she told me essentially the same story. She did state that the star stamp found and given to her was different from that used by QC to mark Super Hilti's and she felt if the stamp had been used the different marking would have been noticed on the Hilti. She had never noticed any evidence that the stamp was used by the craft. I interviewed [redacted], the General Foreman named by [redacted] who knew that a star stamp had been found and turned in to QC but he had not seen the stamp. [redacted] stated that he had no knowledge of the star stamp being used by craft personnel under his supervision.

The allegation of a star stamp being found and turned in to QC was confirmed. The allegation of it being used for improper marking of Hilti bolts was not confirmed.

2. Improper Welding

Based on additional information provided by [redacted] during the interview, I visited the area and identified the pipe support in question to be

BR-X-056-726-A53A. A copy of the as-built drawing for this support is attached (Attachment D). I reviewed the weld records for the saddle weld in question and found everything in order. This information was reviewed during my interview with [redacted] It should be noted that the welding procedure specified in this case was WPS-18010 which provides for using "heliarc" procedure for the root and hot pass. After these first two passes it is optional whether "heliarc" or "stick" welding is used to complete the weld. Thus completing the entire weld in question using "heliarc" procedure as alleged by [redacted] is not improper. This is what was done according to the welding records. The records show the welding was done by [redacted] There is no indication of any involvement by a welder named [redacted]

The allegation that the saddle for the pipe hanger in question was welded by heliarc procedure was confirmed and the procedure used was found to be proper. The allegation that the weld was improperly made by [redacted] [redacted] was not confirmed.

3. Oversize Holes for Hilti Bolts

During the interview [redacted] made an allegation regarding an oversize hole (1½") being drilled in the floor for a 1¼" Hilti bolt in a hanger base plate. Based on information provided I visited the area and identified the support in question as CC-2-070-002-A33R. A copy of the as-built drawing for this support is attached (Attachment F). There is nothing in the documentation package for this pipe support to indicate a requirement for or the approval of an oversize hole. I reviewed the reports of the QC inspections for the Hilti installation for this support. These are contained in the following:

IRMH-19682, dated 7/1/81
IRMH-53200, dated 2/15/83
IRMH-53257, dated 2/22/83

These reports do not indicate any nonconforming or unsatisfactory conditions. [redacted] stated during his interview that he had no knowledge of oversize holes ever being drilled for Hilti bolts.

I made inquiry of pipe support engineering (Jay Ryan) as to whether an oversize hole for a Hilti bolt in the support in question would be of concern. I was told that it would not be a problem.

The allegation that an oversize hole had been drilled for a Hilti bolt could neither be confirmed or dismissed. It appears that physical inspection of the holes for the support in question would be the only way to resolve this matter. In view of the response from Engineering regarding the significance of this matter, it does not appear necessary to pursue the matter further.

A. Vega
Page 3
February 22, 1984

4. Torqueing of Hilti Bolts in Ceiling

It is my understanding that the allegation regarding QC inspectors relying on craft personnel to check the torqueing of Hilti bolts in places where access is limited has been investigated previously. This matter has been discussed in the Licensing Hearings before the ASLB and is recorded in the transcript for September 14, 1982, on pages 4537-4539 (Attachment G). In view of this, no further investigation of this matter was made.

5. Damaged Threads on 1/2" Hilti Bolt

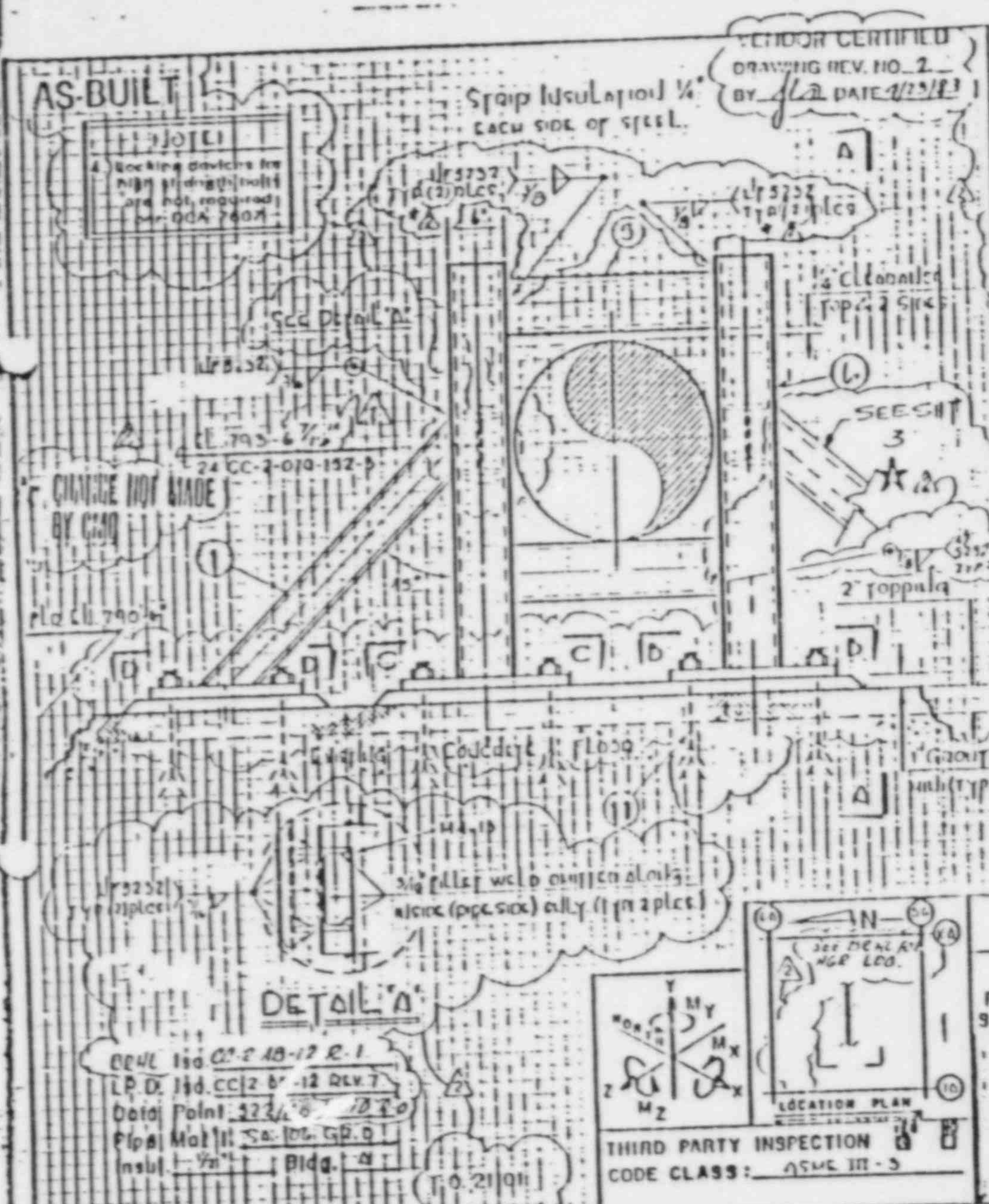
[redacted] did not provide sufficient information on the location of this problem to enable the matter to be investigated. Since it was described as an isolated case, it does not appear that further action is warranted at this time to resolve safety concerns. Of more concern is the alleged deliberate act for fraudulent purposes.

If you have questions or comments regarding any of the above matters or if you wish me to pursue anything further, please let me know.

Boyce H. Grier

BHG/bll
Attachments: A - Letter to Frankum from [redacted]
B - Interview with [redacted]
C - Interview with [redacted]
D - Interview with [redacted]
E - Drawing BR-X-056-726-A53A
F - Drawing CC-2-070-002-A33R
G - Hearing Transcript pp. 4537-4539

cc: D. N. Chapman
D. L. Andrews
R. G. Tolson



ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP

MARK NO. CC-2-070-002-A55Q
PAINT: CARBO ZINC # 11

FOR OFFICE AND ENGINEERING USE ONLY

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ______ SHEET ____ OF ____

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

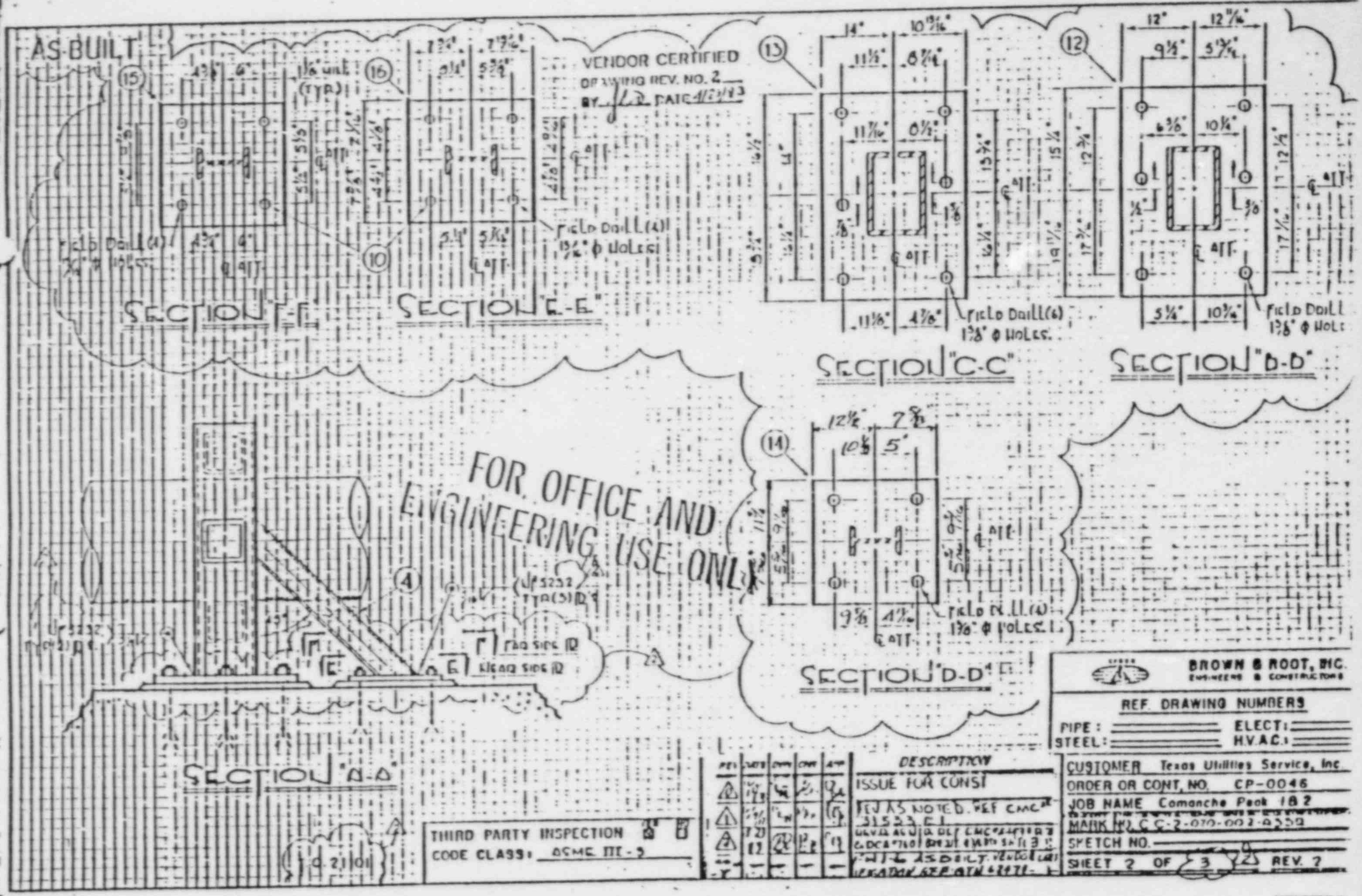
REF. DRAWING NUMBERS
PIPE: M1-0704 REV 11 ELECT: [illegible]
STEEL: S-0700 REV 11 HV.A.C.: [illegible]

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL						
EMERGENCY						
FAULTED						

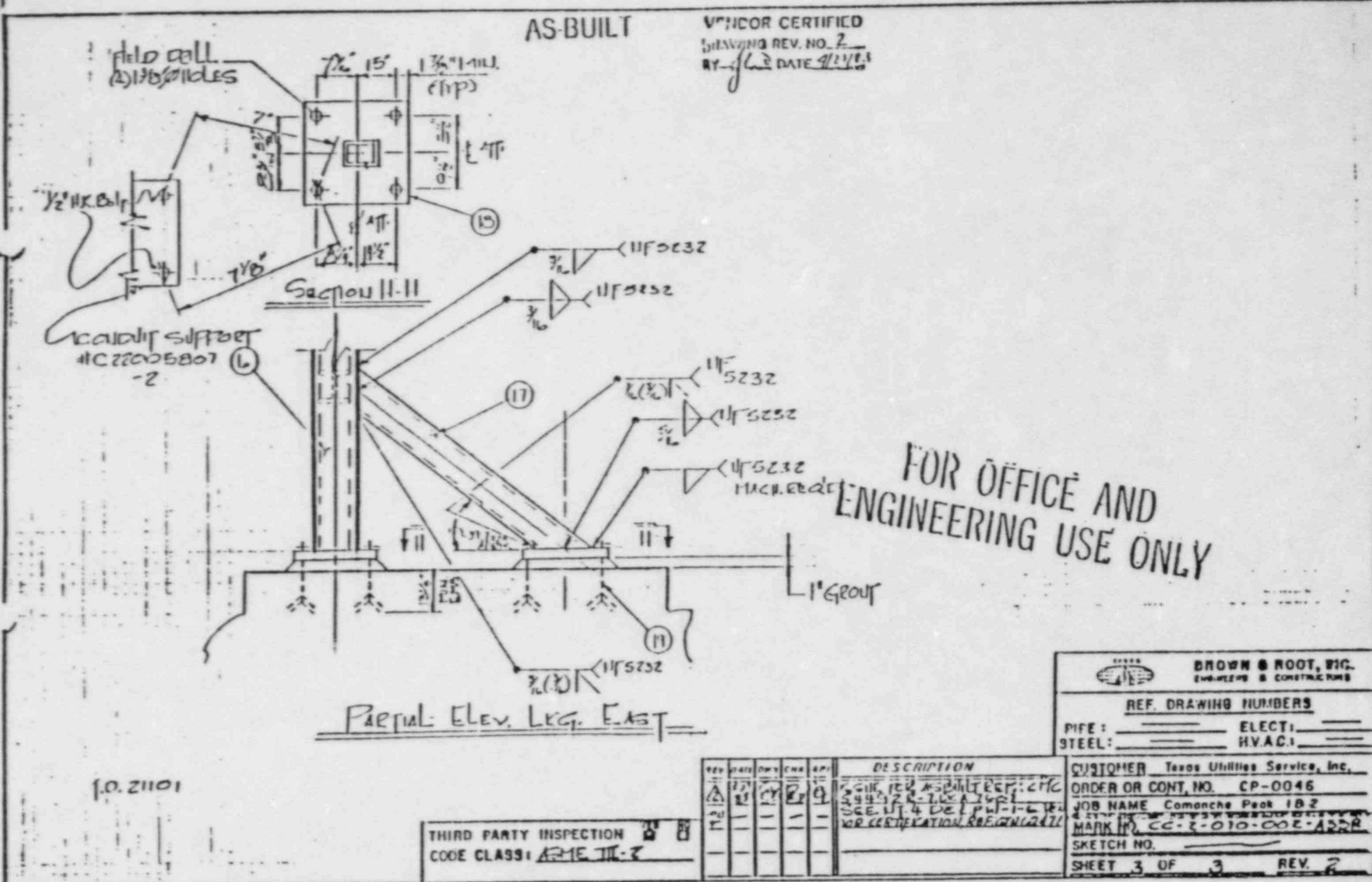
REV	DESCRIPTION
0	ISSUE FOR CONST
1	REV. AS NOTED
2	[illegible]

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-2-070-002-A55Q
SKETCH NO.
SHEET 1 OF 3 REV. 2

ATTACHMENT E



ATTACHMENT F - 2



THIRD PARTY INSPECTION
CODE CLASS: ASME III-2

BROWN & ROOT, INC. ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS

PIPE: ____ ELECT: ____
STEEL: ____ H.V.A.C.: ____

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1&2
MARK NO. CC-2-010-002-A35R
SKETCH NO.
SHEET 3 OF 3 REV. 2

TEXAS UTILITIES SERVICES INC.	COVER SHEET FOR GUIDELINE REVISIONS	REV.	ISSUE DATE	PAGE
ENGINEERING GUIDELINE TITLE		0	1-8-82	1 OF 1
SECTION V HILTI CONCRETE ANCHOR BOLTS		APPROVED: John C. Finneran Jr.		
		PSE PROJ. ENGR.		

I. INSTRUCTIONS FOR FILING GUIDELINE PAGES

1. Remove Section V in it's entirety from the engineering manual and replace with the enclosed pages 1 thru 10.

2. Place this cover sheet directly in front of page 1, Rev. 4.

II. STATUS OF GUIDELINE PAGES

PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV
1	4	8	3								
2	5	9	3								
3	3	10	2								
4	3										
5	3										
6	4										
7	3										

SECTION V

FIGURE 6

TEXAS UTILITIES SERVICES INC.
Agent For
DALLAS POWER & LIGHT COMPANY
TEXAS ELECTRIC SERVICE COMPANY
COMANCHE PEAK S.E.S.

ALLOWABLE LOADS FOR HILTI-KWIK AND SUPER HILTI KWIK BOLTS USING 4000 PSI CONCRETE, 5:1 SAFETY FACTOR, A.A. HANKS TESTING LAB REPORT NO. 873R AND HILTI LETTER DATED OCT. 27, 1980 W/ CPPA-7419 COVER LETTER

HILTIS

BOLT DIA	EMB LENGTH	TENSION	SHEAR
1/2"	2 1/4"	1102	1663
	2 3/4"	1440	↓
	3 1/2"	1890	↓
	4 1/2"	2245	2046
	5 1/2"	2410	↓
	6"	2460	↓
5/8"	2 3/4"	1320	2312
	3 1/2"	1820	↓
	4 1/2"	2400	↓
	5 1/2"	2860	3087
	6 1/2"	3200	↓
	7 1/2"	3400	↓
3/4"	3 1/4"	2030	3427
	4"	2680	↓
	5"	3300	↓
	6"	3600	3693
	7"	4200	↓
	8"	4600	↓
	9"	4700	↓
1"	4 1/2"	3200	5375
	5"	3780	↓
	6"	4688	↓
	7"	↓	↓
	8"	↓	6898
	9"	↓	↓
	10"	↓	↓
1 1/4"	5 1/2"	4600	7136
	6 1/2"	5420	↓
	7 1/2"	6220	↓
	8 1/2"	6920	↓
	9 1/2"	7560	↓
	10 1/2"	8180	↓

SUPER HILTIS

BOLT DIA.	EMB. LENGTH	TENSION	SHEAR
1/2"	3 1/4"	1997	2288
	4 1/4"	2956	↓
	5 1/4"	2956	↓
	6 1/4"	3029	↓
1"	6 1/2"	6993	5507
	8 1/2"	9951	↓
	10 1/2"	9951	↓
1 1/4"	8 1/8"	8540	8296
	10 5/8"	10736	↓
	13 1/8"	12984	↓

RELATED CORRESPONDENCE ATTACHMENT F

TEXAS UTILITIES GENERATING COMPANY
P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

PROJECT FILE

April 19, 1984

DOCKETED USNRC

'84 AGO 15 P12:15

CYGNA	
JOB NO.:	84042
DATE LOGGED:	5/14/84
LOG NO.:	#9
FILE:	2.1.1 Inc. CR
CROSS REF. FILE	2.1 Inc. CR Log

Cygna Energy Services
101 California Street
Suite 1000
San Francisco, California 94111

Attention: Ms. Nancy Williams
Project Manager

COMANCHE PEAK STEAM ELECTRIC STATION

Gentlemen:

In response to your handwritten questions provided to TUGCO on March 16, 19, 20, 21 and 22, enclosed is a copy of the questions followed by TUGCO's response. Several questions are still under review and will be answered shortly. In addition, questions asked via telephone to Dave Rencher on March 30, 1984, are presently being reviewed and responses will be forwarded by April 27th.

If there are any further questions or comments, please contact me or George Grace (Site Ext. 500).

Very truly yours,

TEXAS UTILITIES GENERATING COMPANY
ENGINEERING DIVISION

L. M. Popplewell

L. M. Popplewell
Project Engineering Manager

LMP/cp

Distribution
NH Williams
J. C. Minichiello
L. Weingart
C. Wang
M. Shulman
84042 Project File (T. Acuna)

working range (generally near mid-travel); a minimum ¼" travel exists beyond working range limits to reach a fully extended or retracted position. For most springs, more than ¼" is available. This is sufficient to account for the small seismic displacements. For box frames, the seismic movements for the supports listed were checked against the designs. In all cases, adequate clearance existed to allow combined thermal and seismic displacements.

CYGNA COMMENT:

3. In reviewing certain MS supports, CYGNA has noted instances where beams with small gaps are used to provide stability, instead of tightening U-bolts (supports MS-1-004-003-S72R, for example). In these cases, no analysis is done on the "stability bumpers." CYGNA has performed calculations which show that the load on these "supports" could be quite high, assuming one accepts the instability of this structure during dynamic loading. Has TUSI used this design for any supports with static compressive loads? Also, where is the documentation for the integrity of this support arrangement in general?

TUGCO RESPONSE:

3. The "bumpers" supplied on MS-1-004-003-S72R (in lieu of a snug U-bolt) for stability are designed to take an oscillating, momentary load (for a system at 20Hz, the applied load onto the bumpers will act less than 0.05 seconds). Hence, the nature of the cyclic load assures stability in that there is not sufficient time for a constant applied force to push the bumpers back and allow the pipe to lift up. The calculations which consider a static upward load are therefore erroneous. The stress in the bumper steel stays within its elastic limit under the impact load and hence will return to its original position when the load reverses and pushes down. This design has not been used on any supports which would experience a static compressive load. Structural acceptability of the bumpers is based on the momentary load of less than 0.05 second duration. Size of the members, welds, were judged adequate by inspection.

March 21, 1984

CYGNA COMMENT:

1. In reviewing MS-1-004-001-C72S, CYGNA had the following questions:

   a) There appears to be a 7/16" flare bevel weld between items 15 and 22. This does not seem possible due to Item 34. Does TUSI have documentation conforming the size and configuration of this weld? Likewise, the weld (5/16") between 26 and 15?

b) The model uses a fixed point at the embed plates (3, 6, 12, 15 joints). Spec. 2323-SS-30, Rev. 1, requires these to be treated as pin joints, unless the embedment is stiffened. Where is the stiffener in this calc, and has structural accepted this configuration?

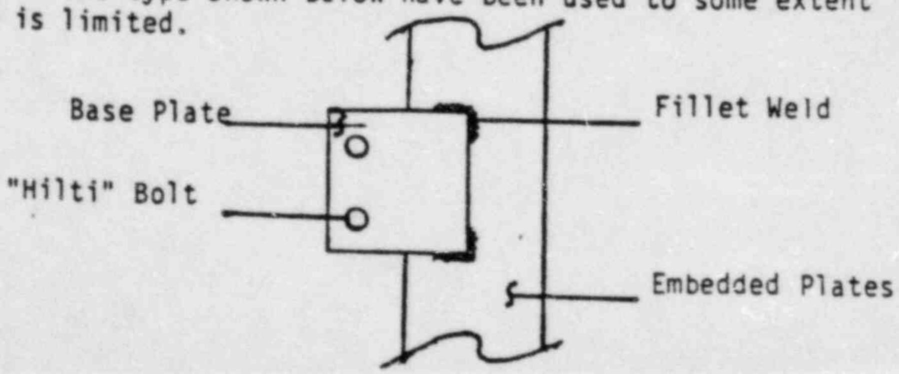
c) Per ASME Appendix XVII, Para. 2442, shear loads on connections with both welds and bolts must be taken by the welds alone. Item 16 is attached to Beam #21 with both welds and Hilti's. The weld sizing calculations done use the bolts to share the shear load. What is TUSI's standard practice in this type of connection? Is this weld acceptable?

d) The weight of the constant support itself is not included in the support design load for the frame. A #53 constant weighs - 600 lb, or 5% of the design load.

What is TUSI's standard practice for spring anchorage design?

TUGCO RESPONSE:

1. (a) In the NPSI original design, ½" wall tube steel was used and the 7/16" flare bevel weld was possible. Modifications made at the site changed most of the steel members to 3/8" wall tube. The weld between items 15 and 22 is a flare bevel weld such that the groove is filled and ground flush to facilitate installation of Item 34. CYGNA is correct in their observation that a 7/16" flare bevel weld does not exist, the size was inadvertantly not removed during the revision process. The stiffening effect of Item 34 on this joint assures structural acceptability. The 5/16" flare bevel weld between items 26 and 15 is an acceptable weld since the tube steel thickness is 3/8" (greater than 5/16"). Documentation confirming the size of these welds is on file with QC in their inspection package. (b) See comments dated 3/22, response 1. (c) (Editorial: Items 15 and 19 are connected to beam 21, not item 16.) The connection to the beam via embedded plate (i.e., by welding) and via baseplate (i.e., by bolting) is at separate locations. As such, each is capable of resisting shear. It should be noted that Hilti joints are designed using bolt shear allowables based on ultimate test loads divided by 5. This is not the standard engineering approach to design a bearing or friction joint using code allowables for the bearing or friction condition. Using our design approach, the Hilti joints, since they are pre-torqued, would perform as a friction joint within their working loads. At ultimate loads all joints (bearing or friction) would act as bearing joints (i.e., slip would occur in the friction connection). (Following comments, in response to CYGNA's comment on TUSI's standard practice are provided here for information only). Connections of the type shown below have been used to some extent where space is limited.



UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	}{	
	}{	
TEXAS UTILITIES ELECTRIC COMPANY, et al.	}{	Docket Nos. 50-445-1 and 50-446-1
(Comanche Peak Steam Electric Station, Units 1 and 2)	}{	

CERTIFICATE OF SERVICE

By my signature below, I hereby certify that true and correct copies of

CASE's 8/13/84 Answer to Applicants' Motion for Summary Disposition Regarding the Effects of Gaps on Structural Behavior Under Seismic Loading Conditions

have been sent to the names listed below this 13th day of August, 1984, by: Express Mail where indicated by * and First Class Mail elsewhere.

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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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Juanita Ellis

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