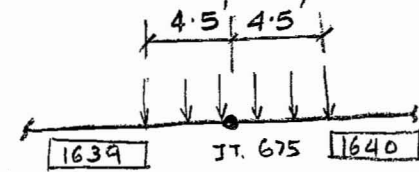


**ATTACHMENT C****CRANE POSITIONS AND LOADING FOR 7 ANALYSIS CASES**

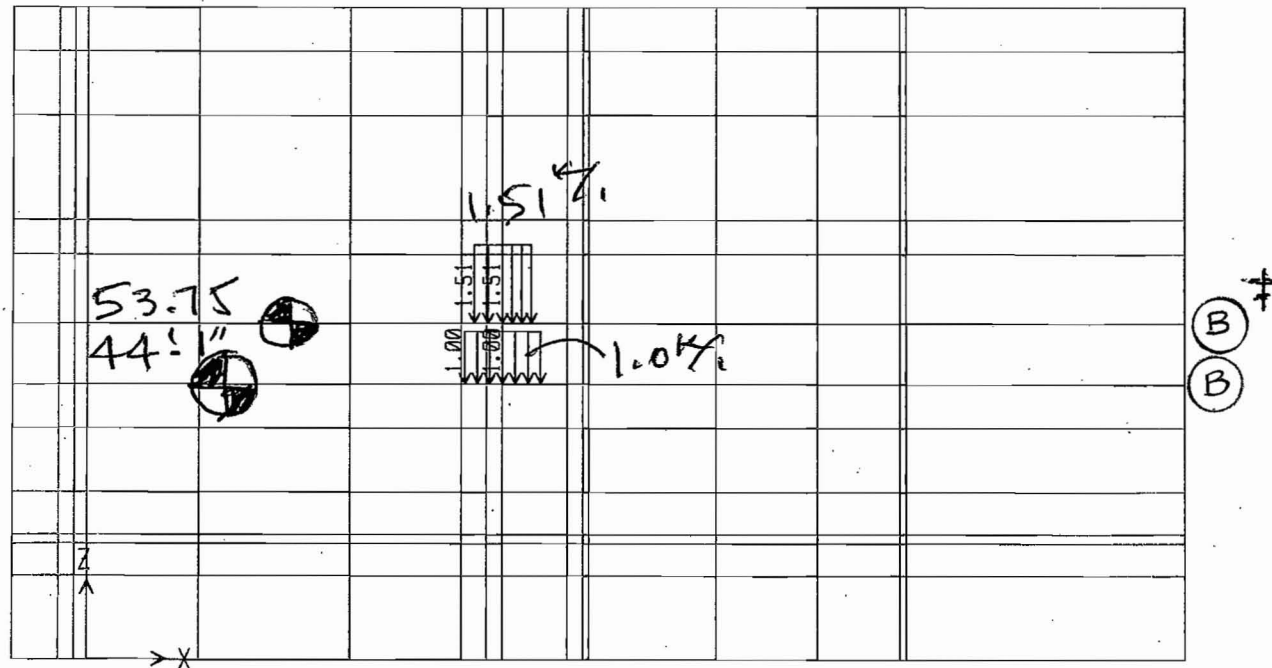
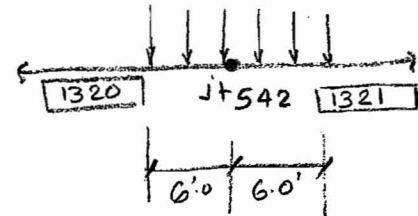
	<b>Pages</b>
Crane Analysis Case 1 SAP2000 Crane Loading	C-2 to C-20
Crane Analysis Case 2 SAP2000 Crane Loading	C-21 to C-40
Crane Analysis Case 3 SAP2000 Crane Loading	C-41 to C-60
Crane Analysis Case 4 SAP2000 Crane Loading	C-61 to C-80
Crane Analysis Case 5 SAP2000 Crane Loading	C-81 to C-100
Crane Analysis Case 6 SAP2000 Crane Loading	C-101 to C-120
Crane Analysis Case 7 SAP2000 Crane Loading	C-121 to C-140

Note: For the bases of establishing wheel loadings, it is assumed that the bridge weight may be distributed so that the primary point 'A' support would have 60% of the bridge weight and the secondary point 'B' support would have the remaining 40% weight of the bridge. See Ref. 2.2.5 for further description.

@ 53.75'



@ 44'-1"



x=00 @ 53.75 WP closure Rm. Crane.

@ 44'-1" Remote handling crane.

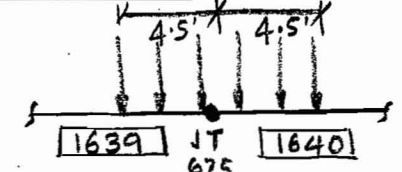
‡ FOR DEFINITION OF CRANE SUPPORT POINTS (A) & (B), SEE PAGE 16 OF CALC 51A-SYC-IH00-00700-000-00A

(A) = CRANE SUPPORT POINT 'A'

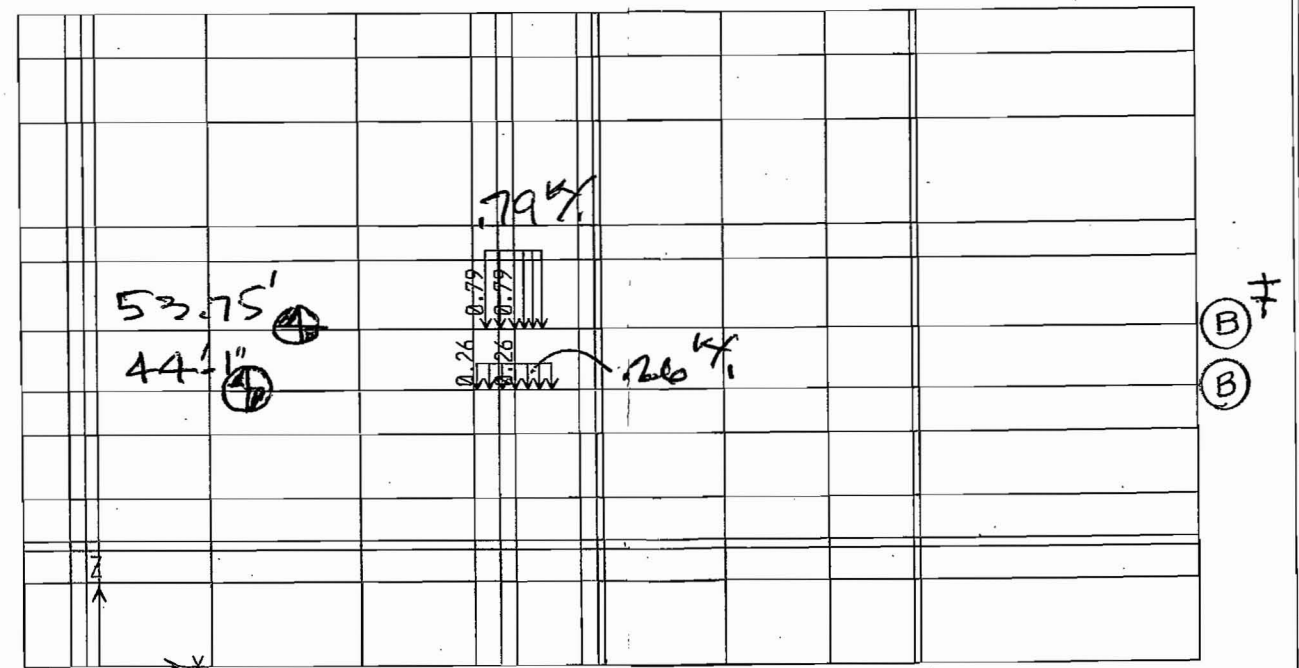
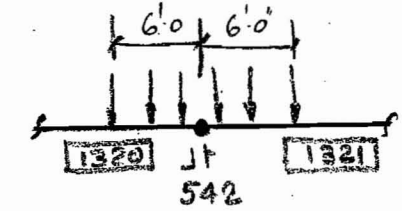
(B) = CRANE SUPPORT POINT 'B'

Y=155.50'

@ 53.75'



@ 44'-1"

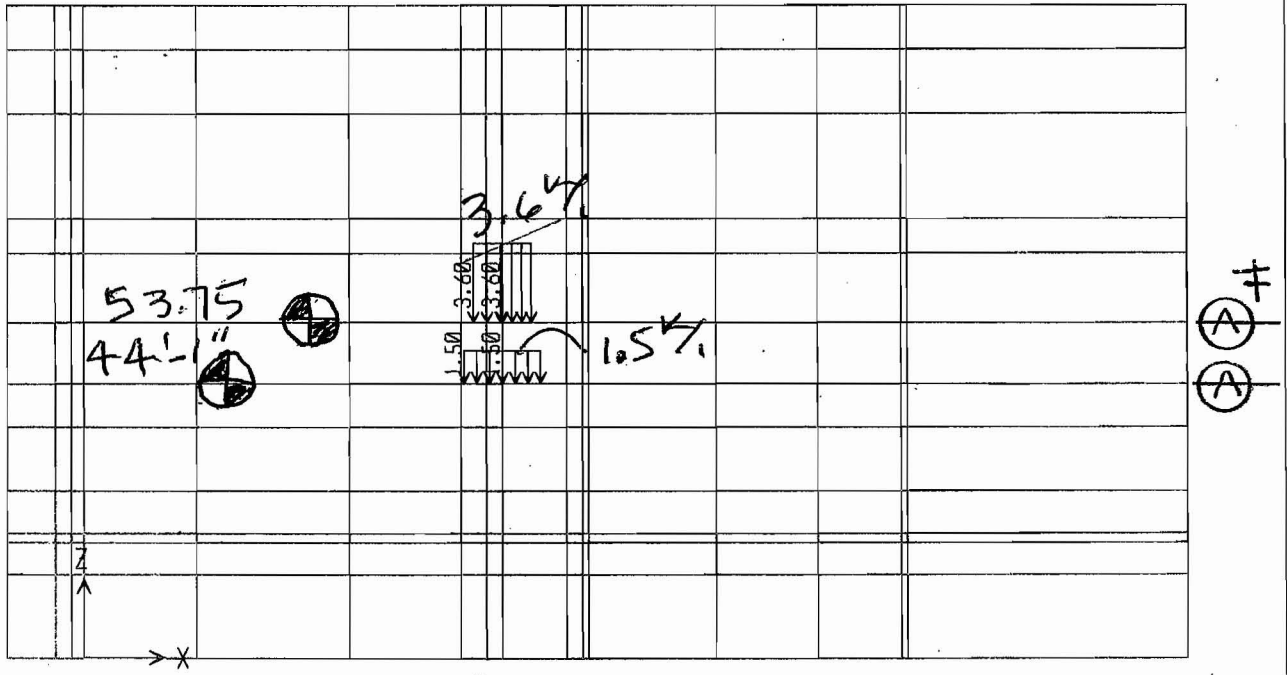
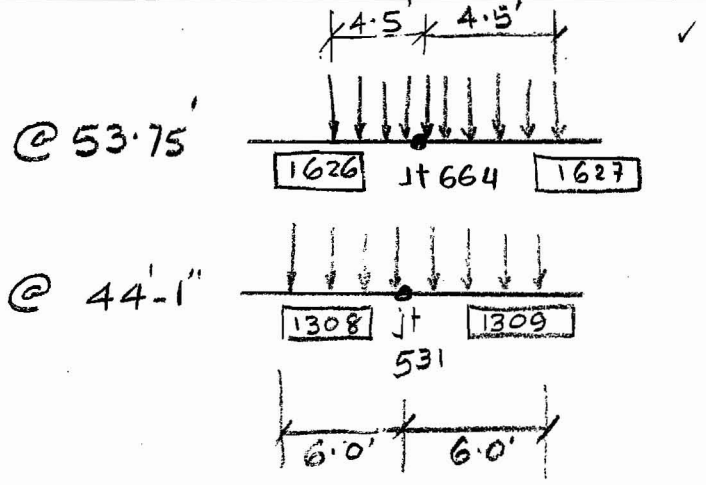


x=00 @ 53.75' WP closure Room Crane.  
@ 44'-1" Remote handling crane.

Y=155.50'



● JT  
MEMBER  
FOR ALL LOAD CASES ON ALL PAGES.



X = 66'

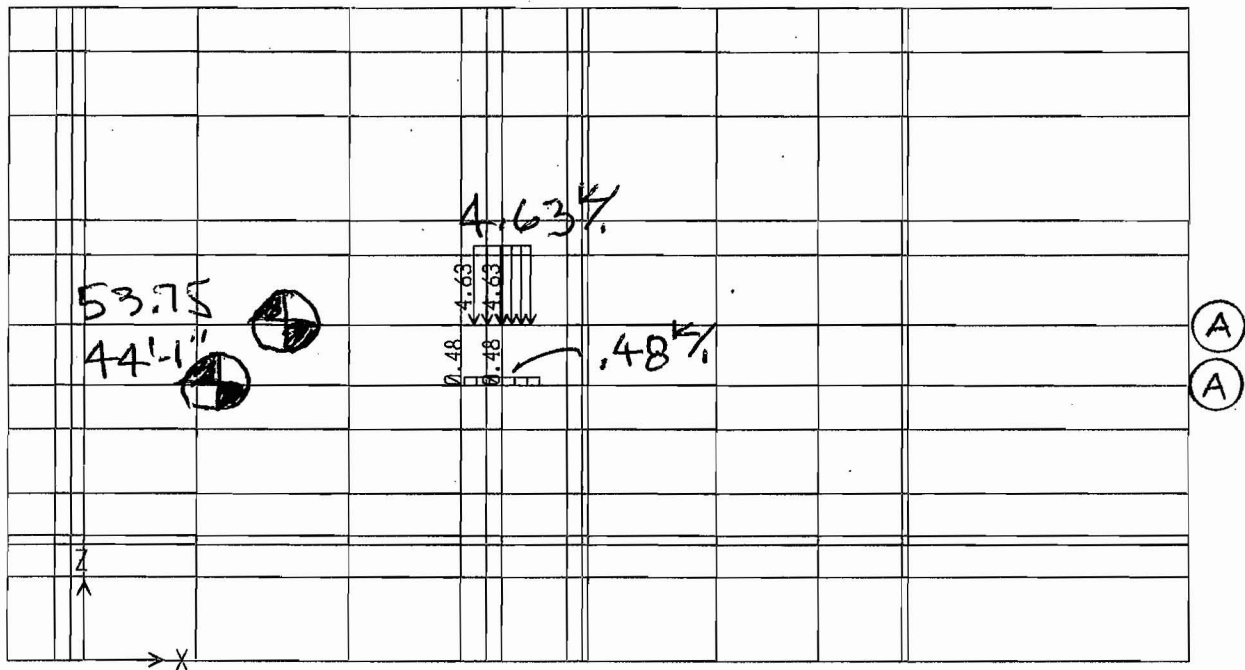
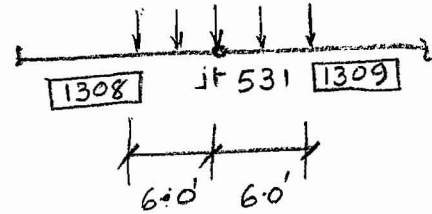
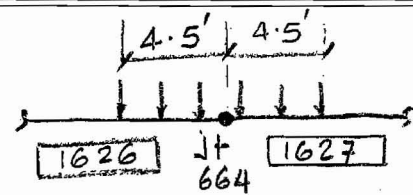
@ 53.75' WP closure Rm crane.

@ 44'-0 1/2" - Remote handling crane.

‡ FOR DEFINITION OF CRANE SUPPORT POINTS (A) & (B), SEE PAGE 16 OF CALC 51A-SYC-IH00-00700-000-00A

- (A) = CRANE SUPPORT POINT 'A'
- (B) = CRANE SUPPORT POINT 'B'

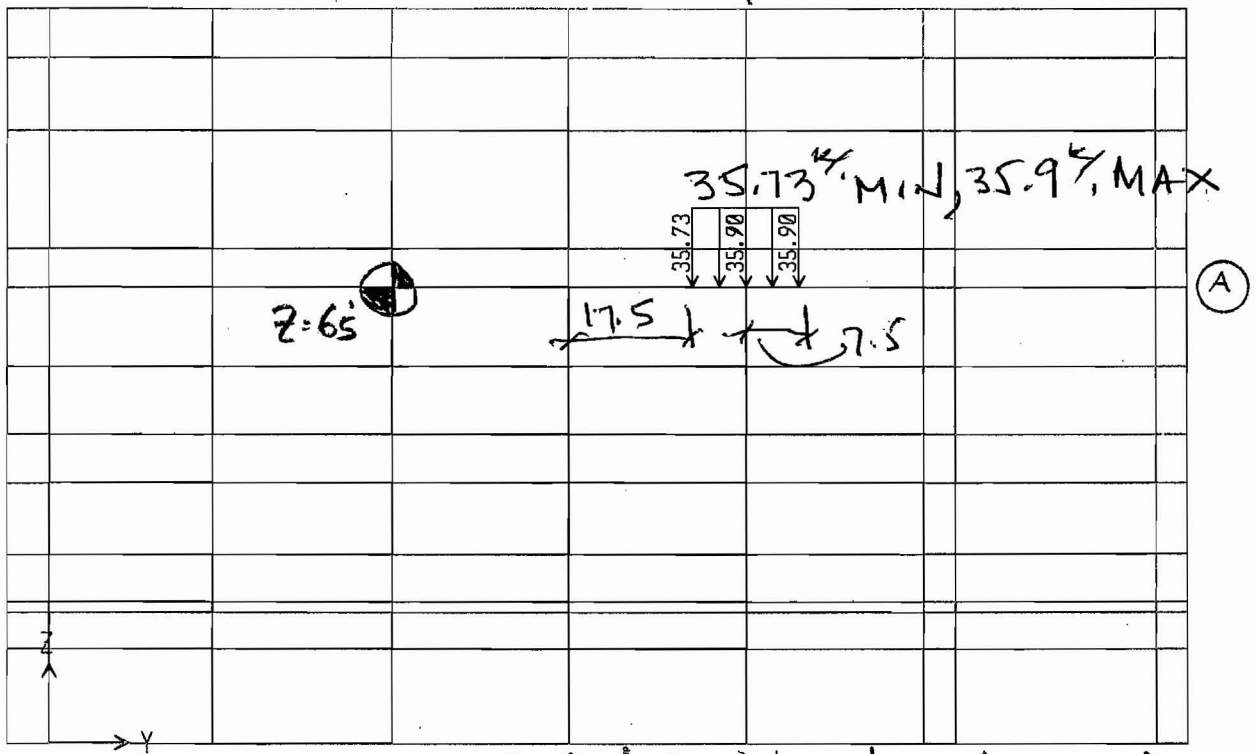
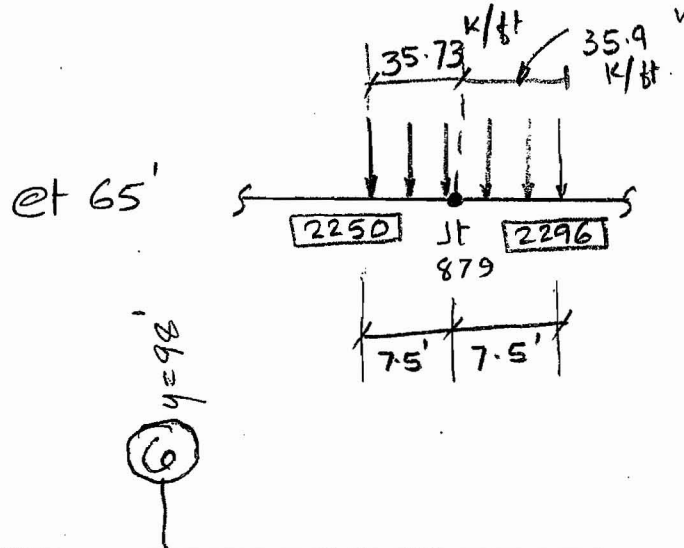
Y = 127.50'



@ 53.75 WP closure room crane.

@ 44'-1" Remote handling crane.

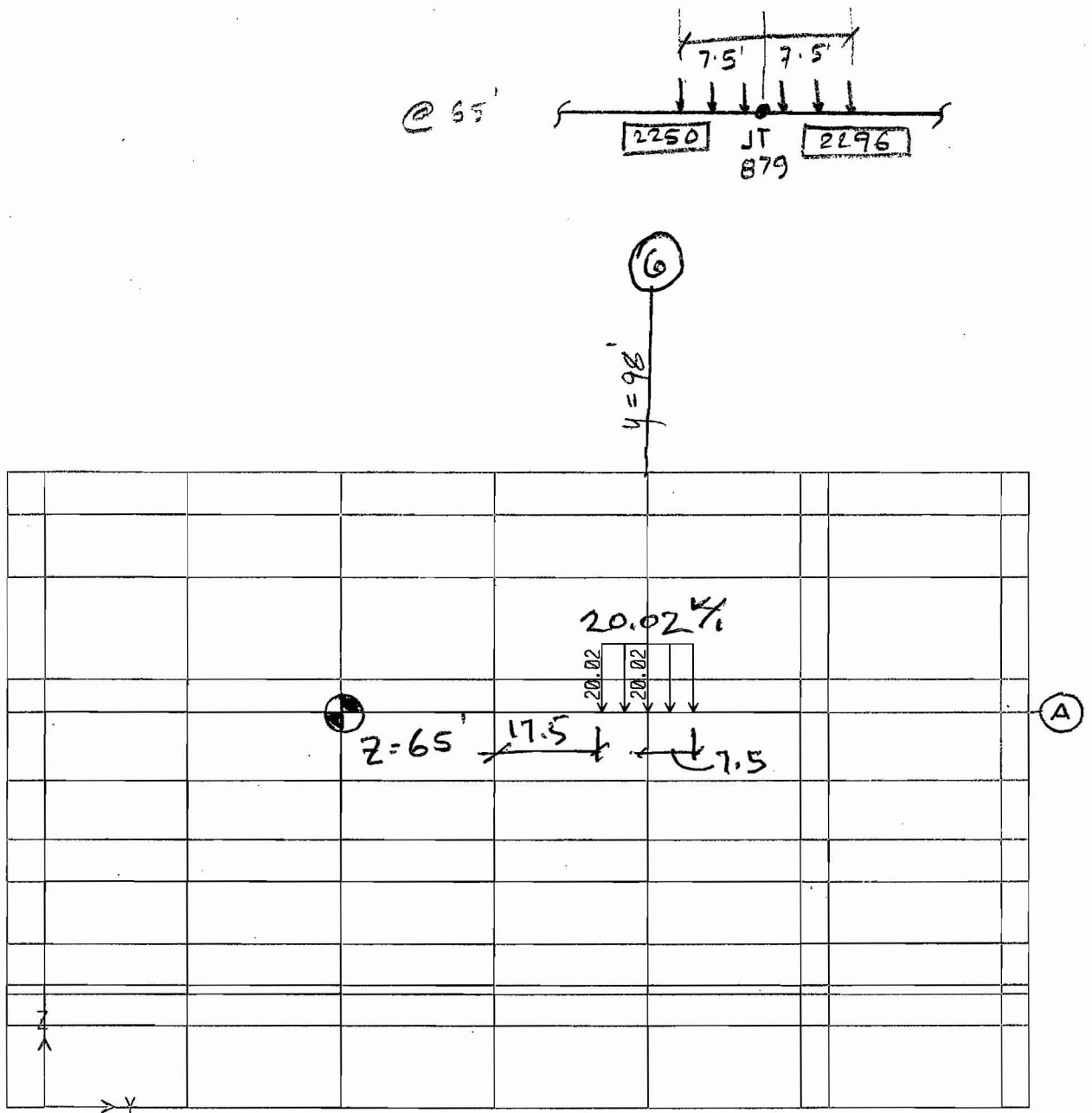
127.50', et 12/03/07  
Y = ~~127.50~~



@ 65' canister transfer machine crane.

GRID "F.6"

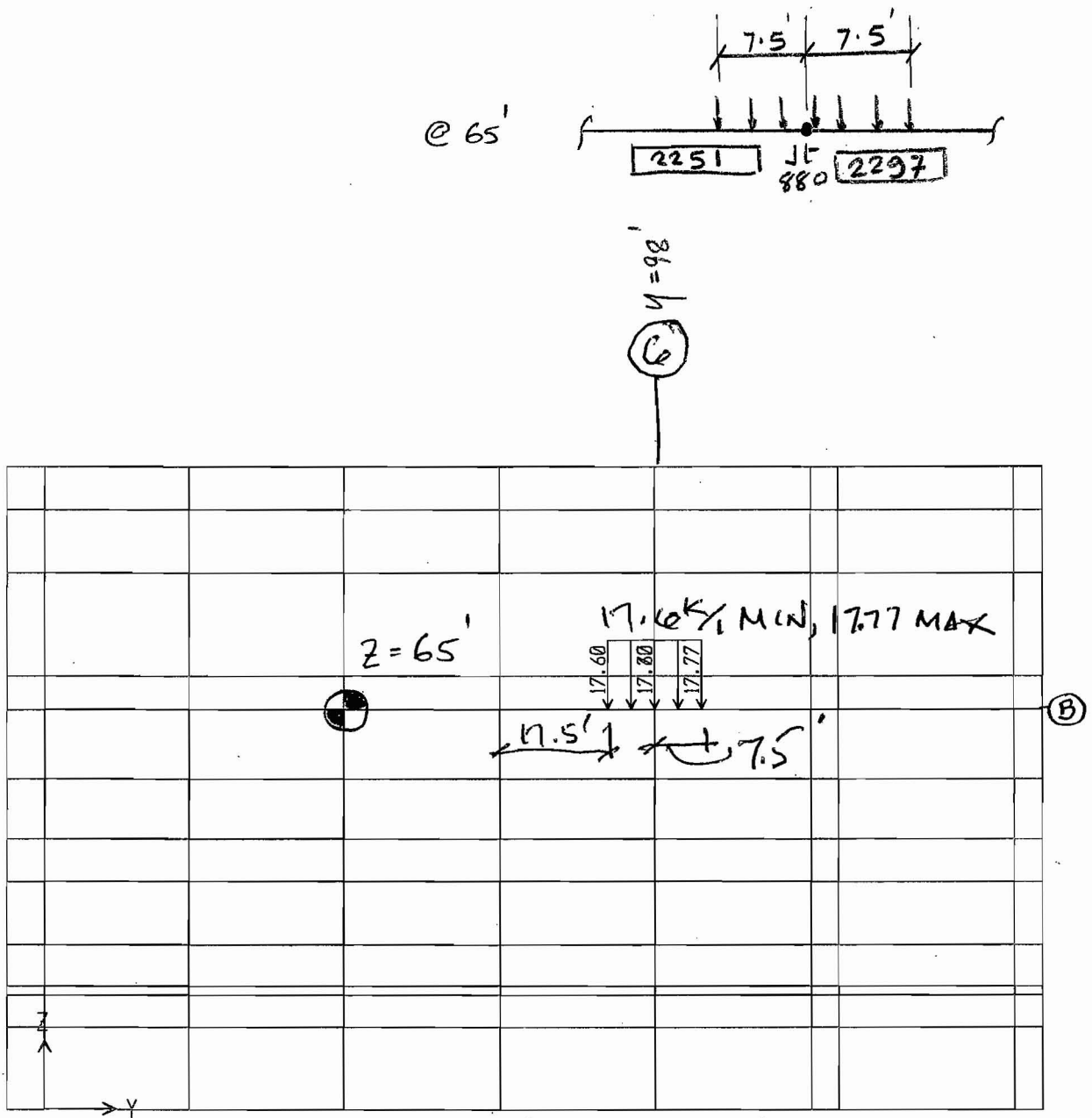
x = 79.75



@ 65' Conister transfer machine crane.

GRID "F.6"

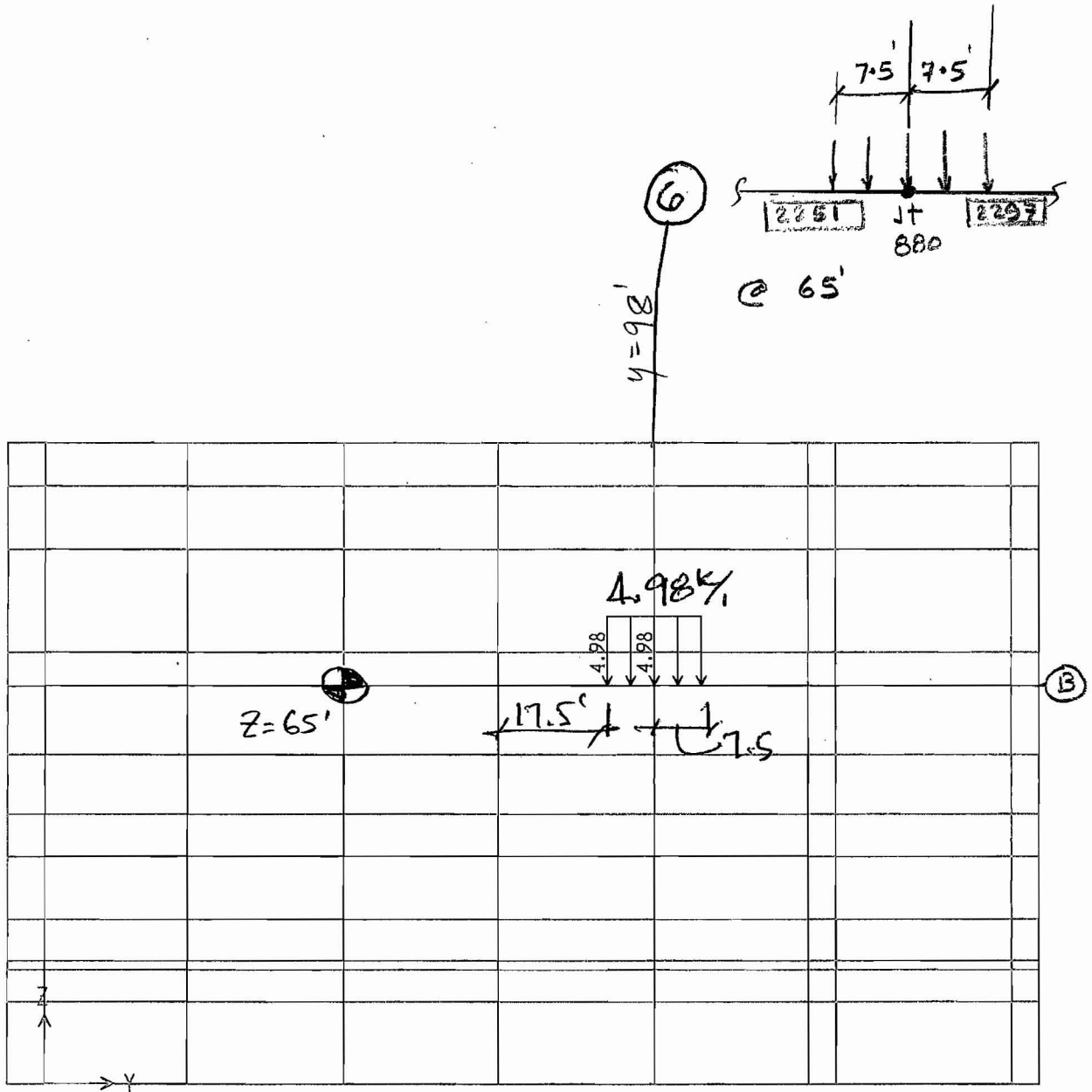
X = 79.75



@ 65' canister transfer machine crane.

GRID "D.3"

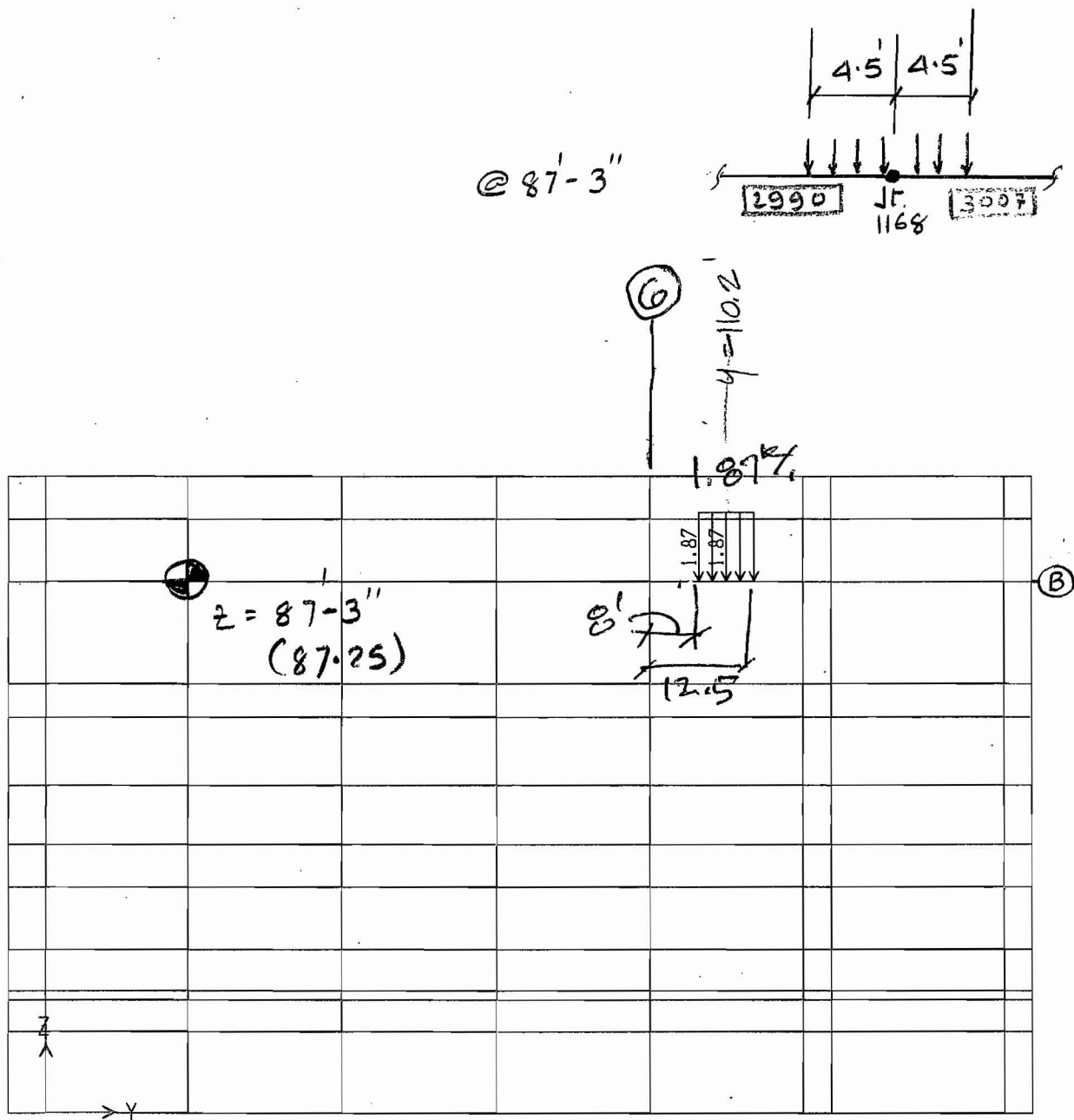
X = 129.25



@ 65' canister transfer machine crane.

GRID "D.3"

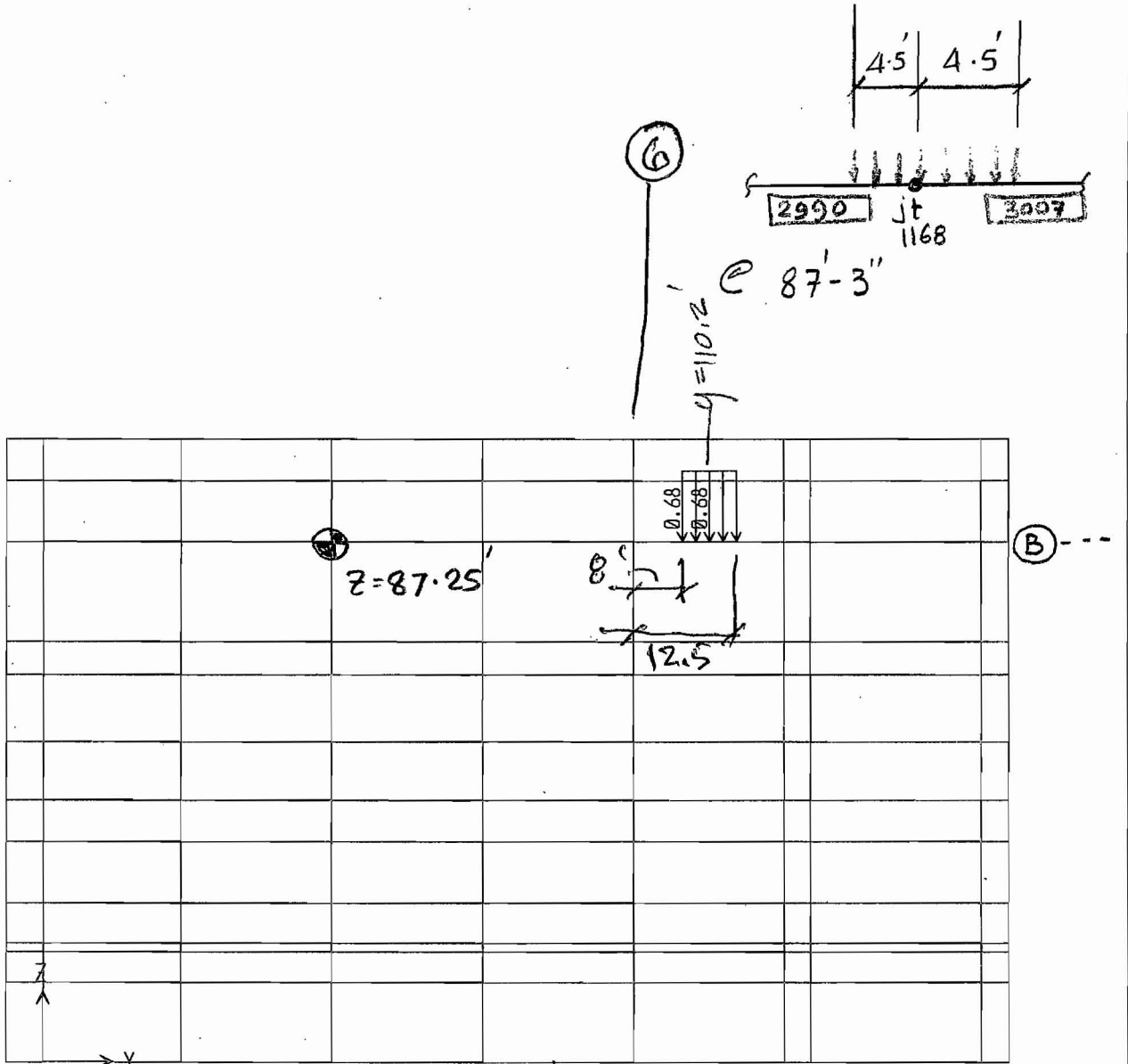
$$X = 129.25'$$



$@ 87-3''$  CTM maintenance crane.

GRID "D"

$X = 130.25$



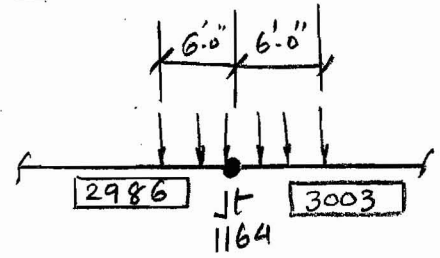
@ 87'-3" JM Maintenance crane.

GRID "D"

x = 130.25



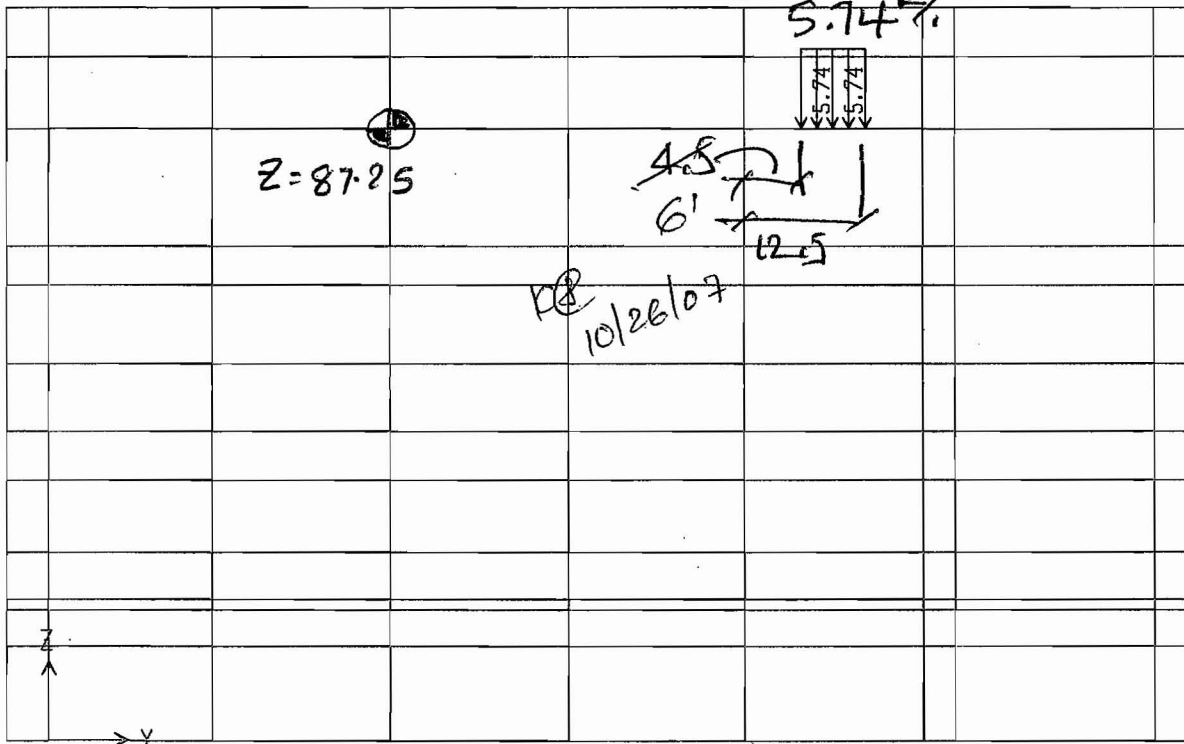
@ 87'-3"



6

X=10.2'

5.74%

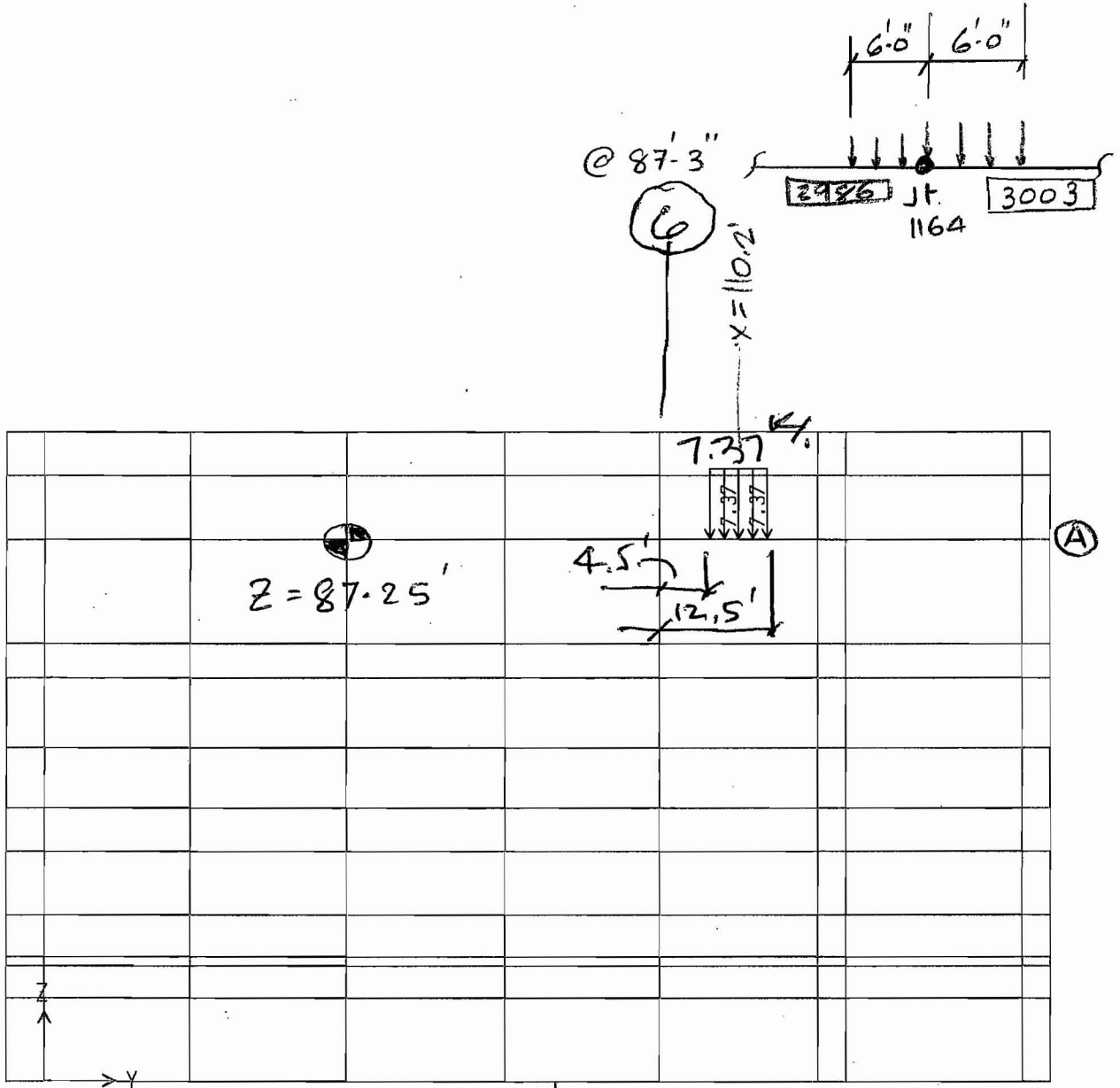


A

@ 87'-3" ~~ETM Maintenance crane~~  
Cask preparation crane. 10/26/07 9-11-07

GRID 'H'

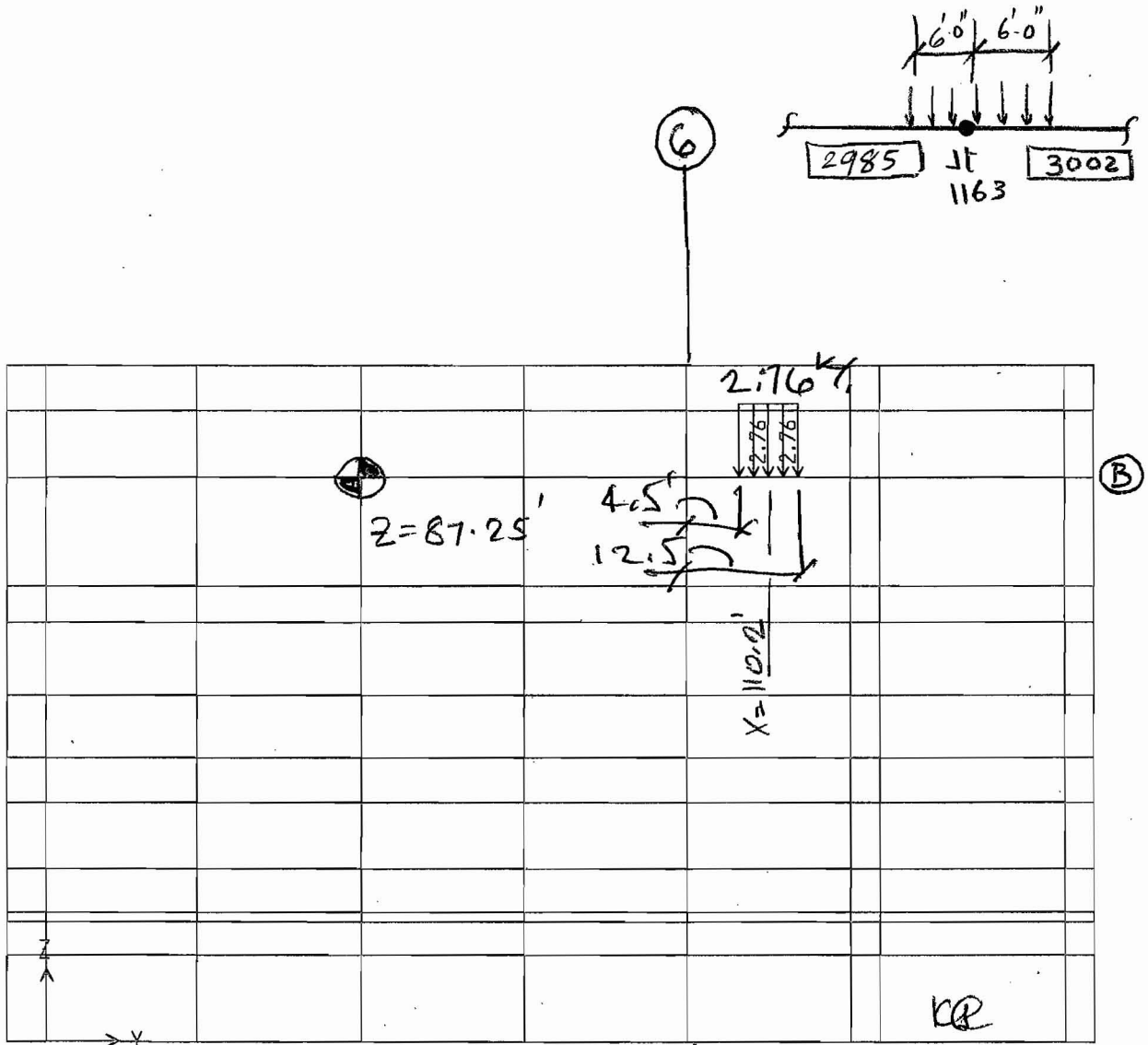
X=63.50



@ 87'-3" ~~ETM Maintenance Crane~~  
CASK Preparation Crane.  
KIP  
9-11-07.

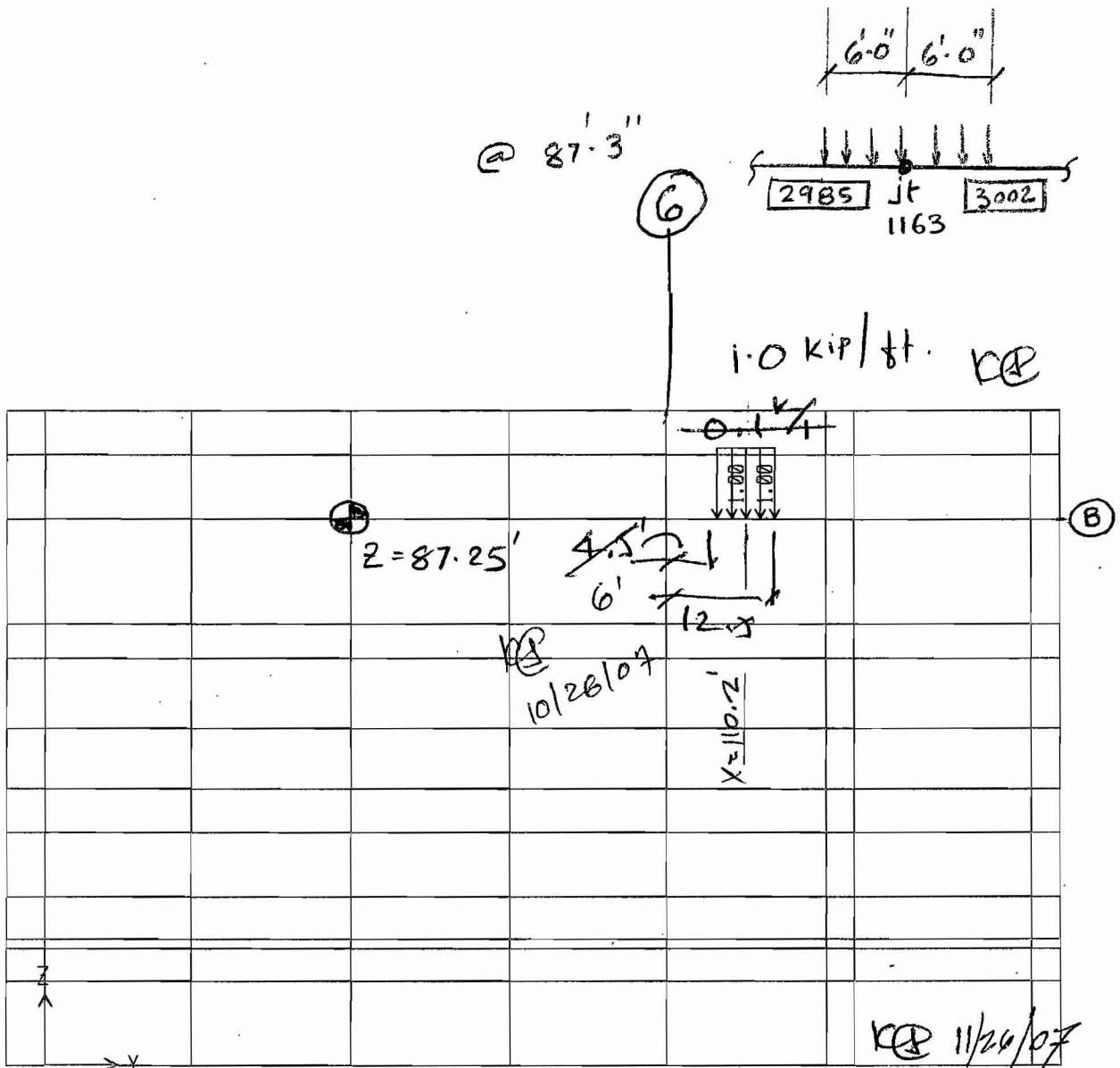
GRID 'H'

$X = 63.50$



GRID "L"  
@ 87'-3" ~~ETM Maintenance~~ CASK Preparation Crane.  
KQ 10-26-07

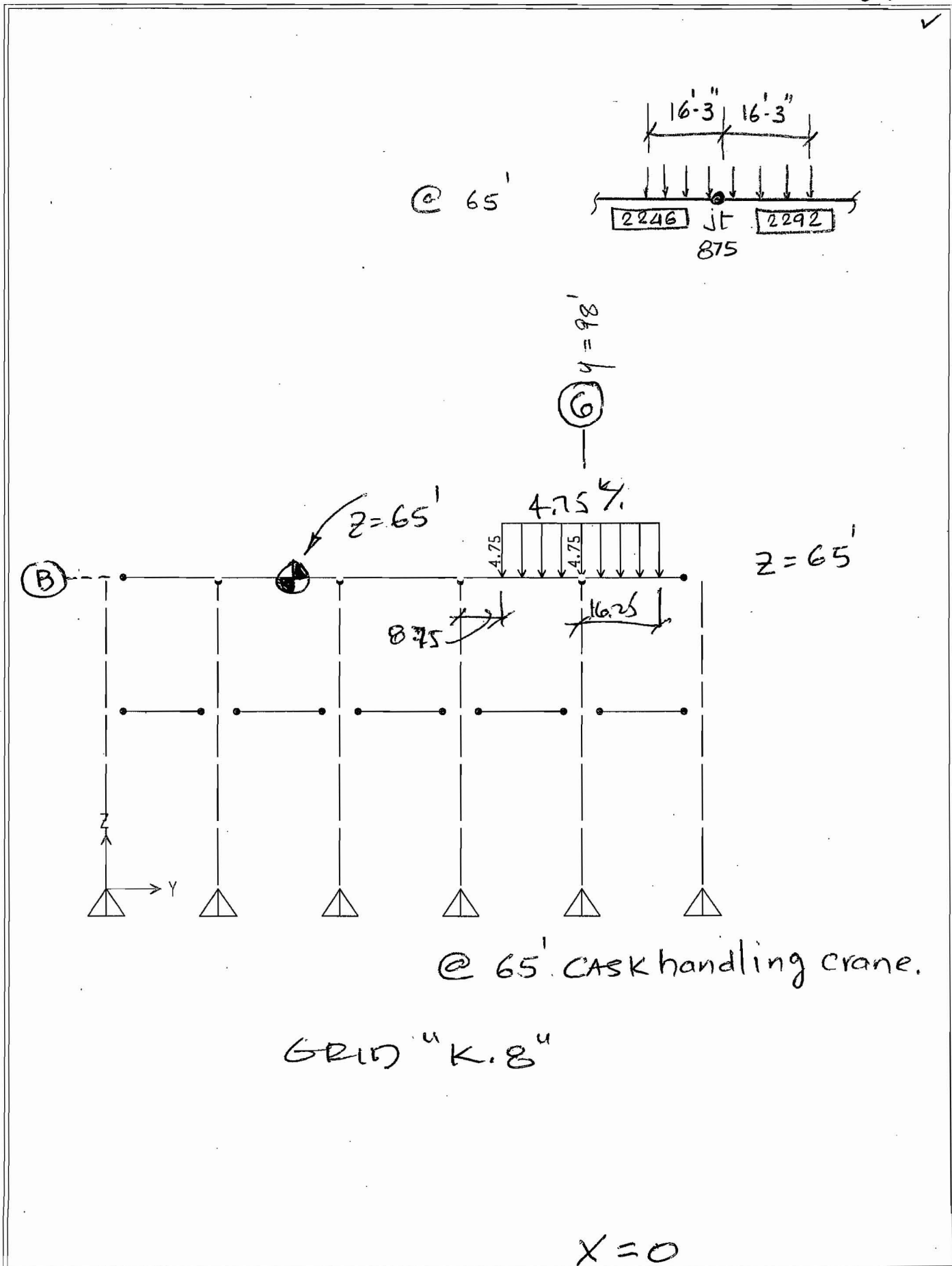
X = -2.0

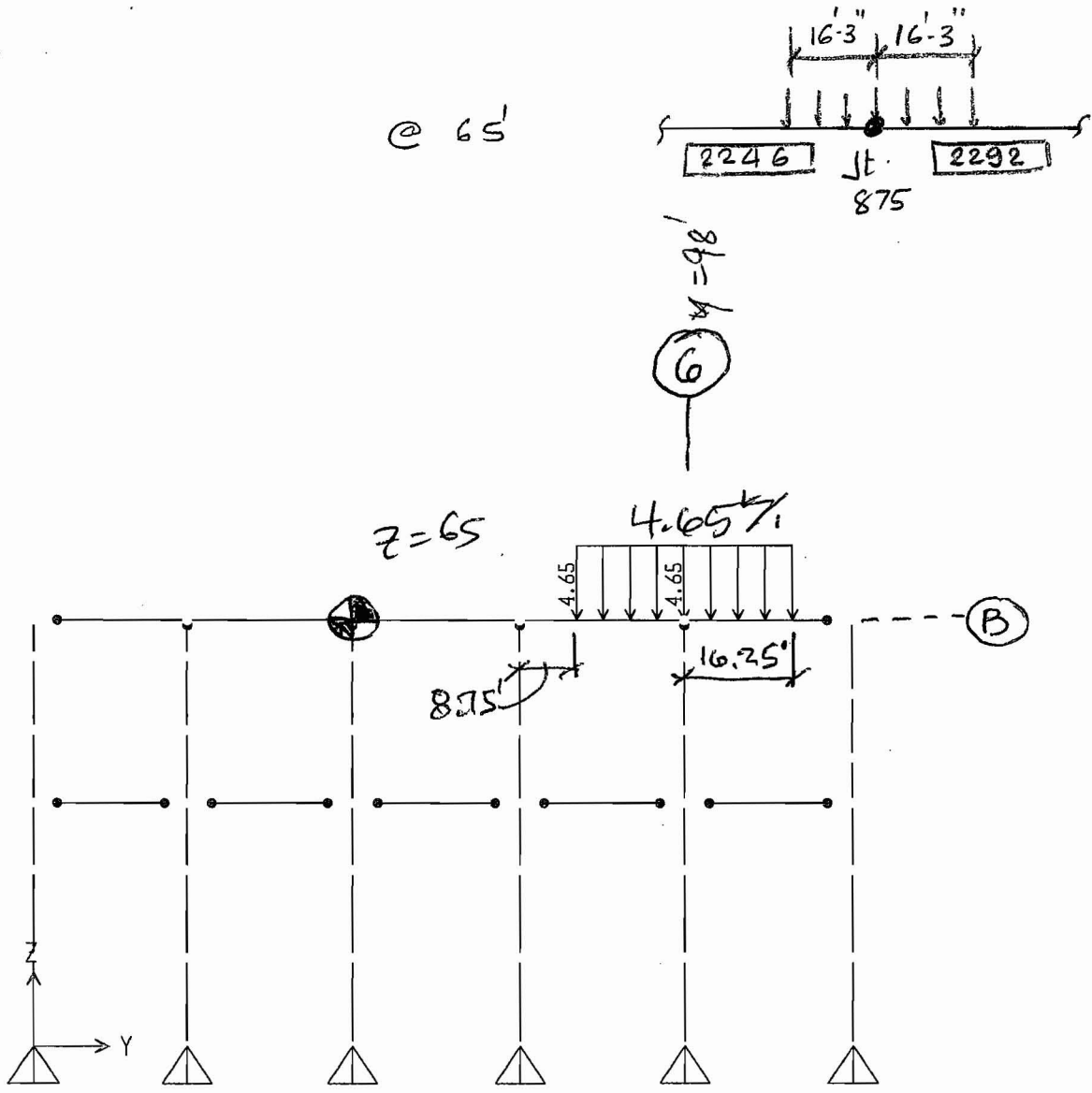


@ 87'-3" ~~CTM Maintenance Crane.~~  
CASK preparation

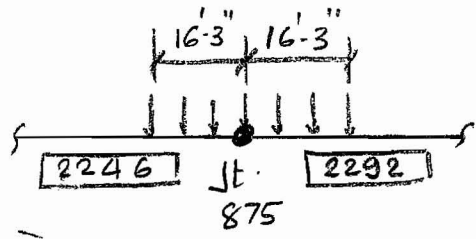
GRID "L"

$X = -2.0$





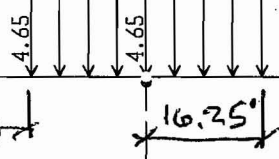
@ 65'



Z = 65

4.65'

8.75'



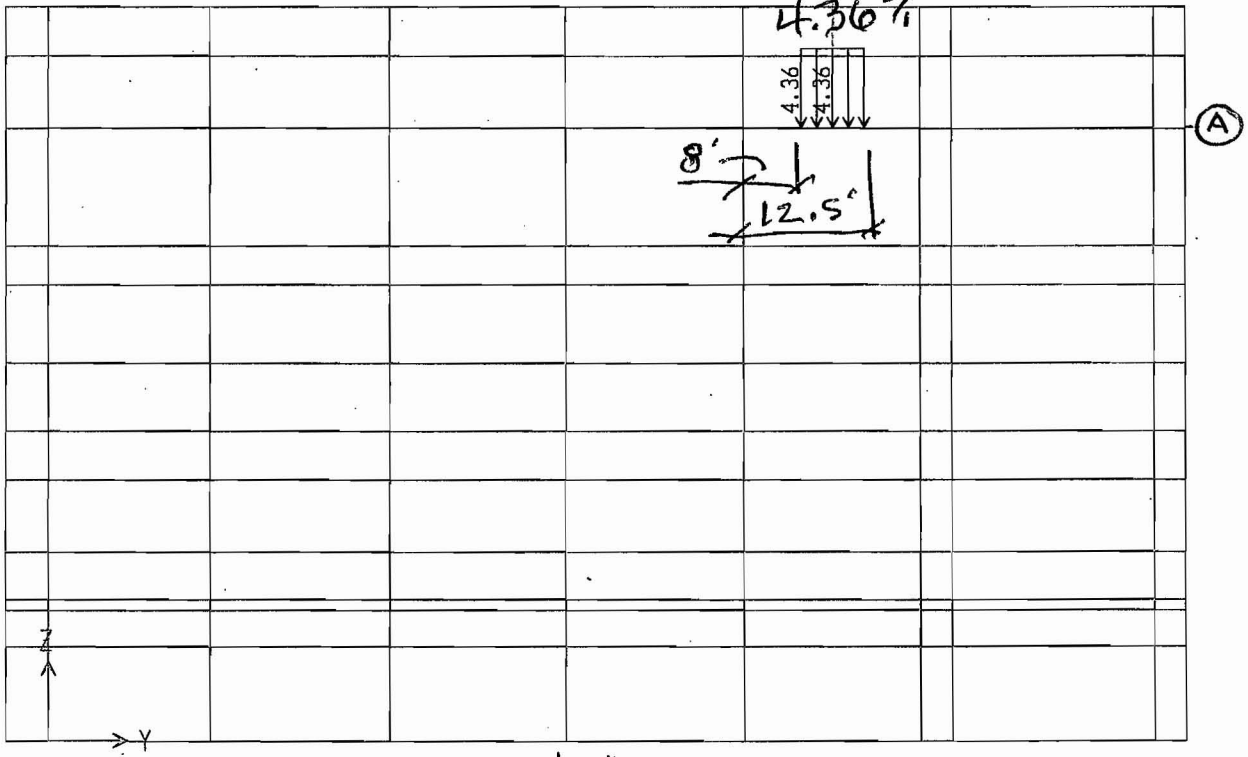
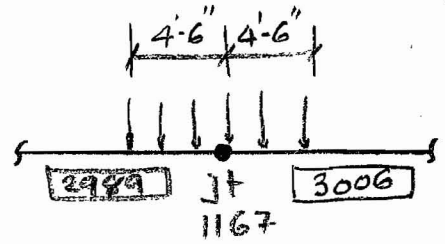
(B)

@ 65' cask handling crane.

GRID "K.8"

X = 0

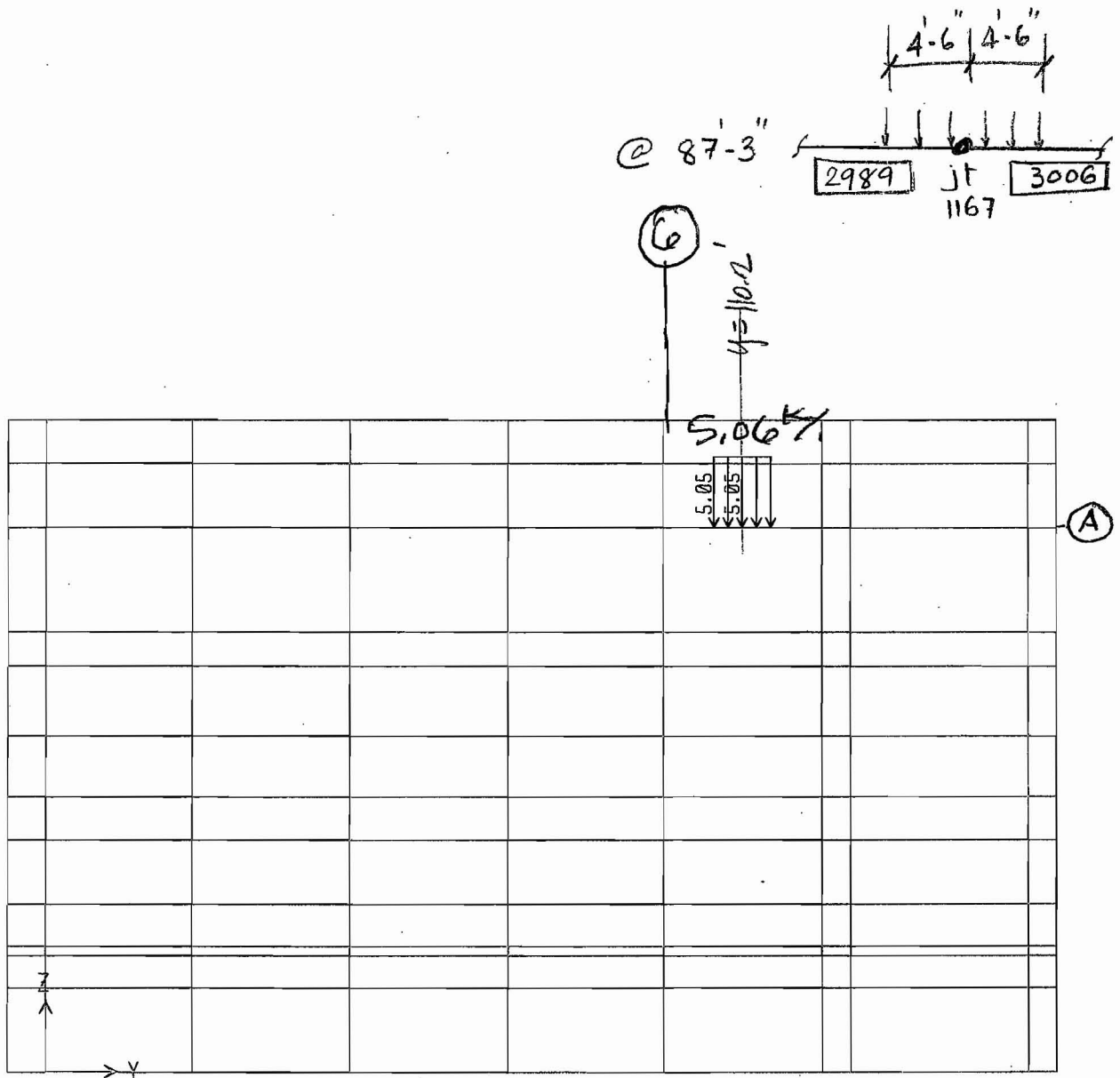
@ 87'-3"



@ 87'-3" CTM Maintenance crane

GRID "G"

$$X = 78.75'$$

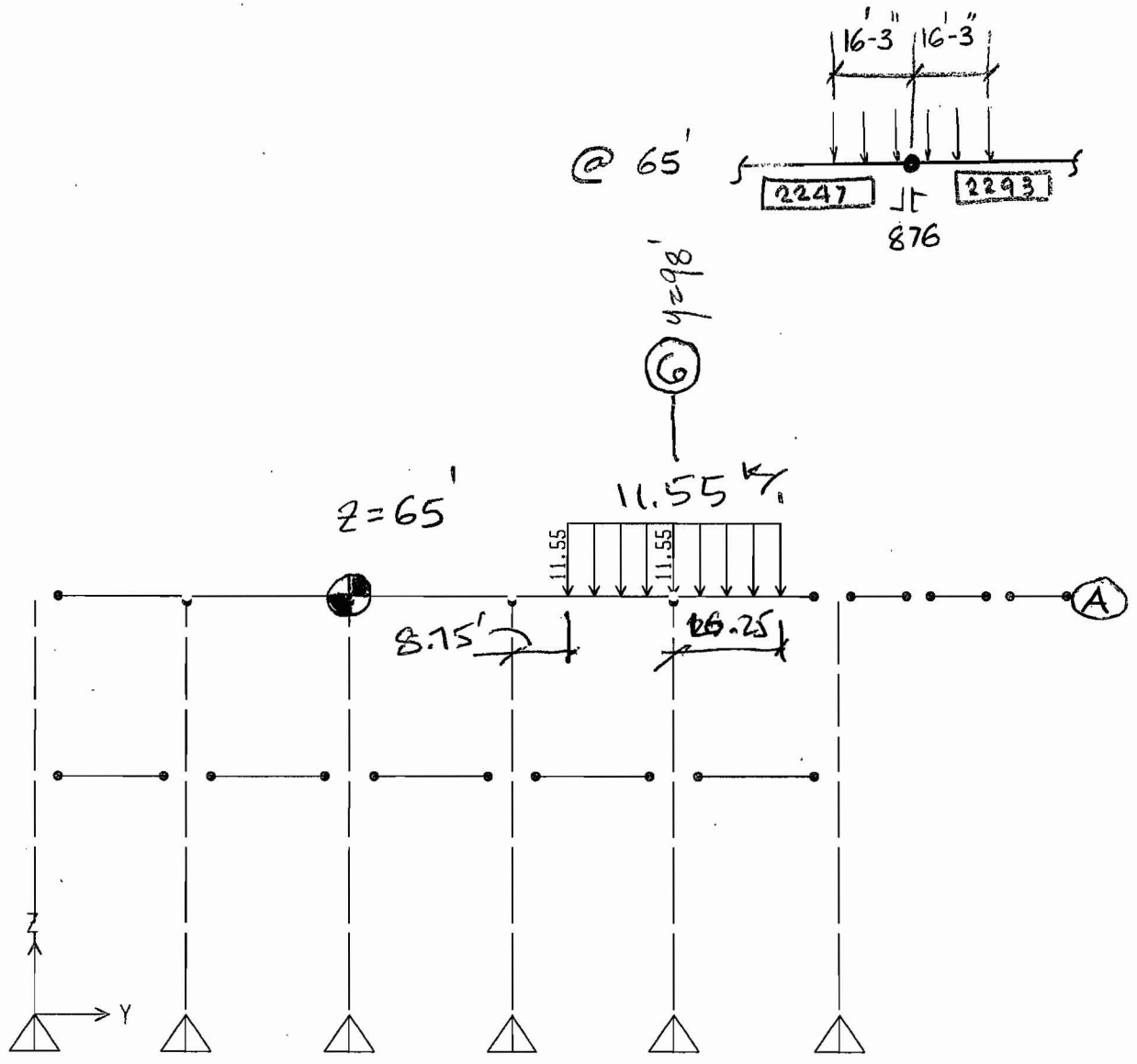


@ 87'-3" CTM Maintenance crane.

GRID "G"

X=78.75

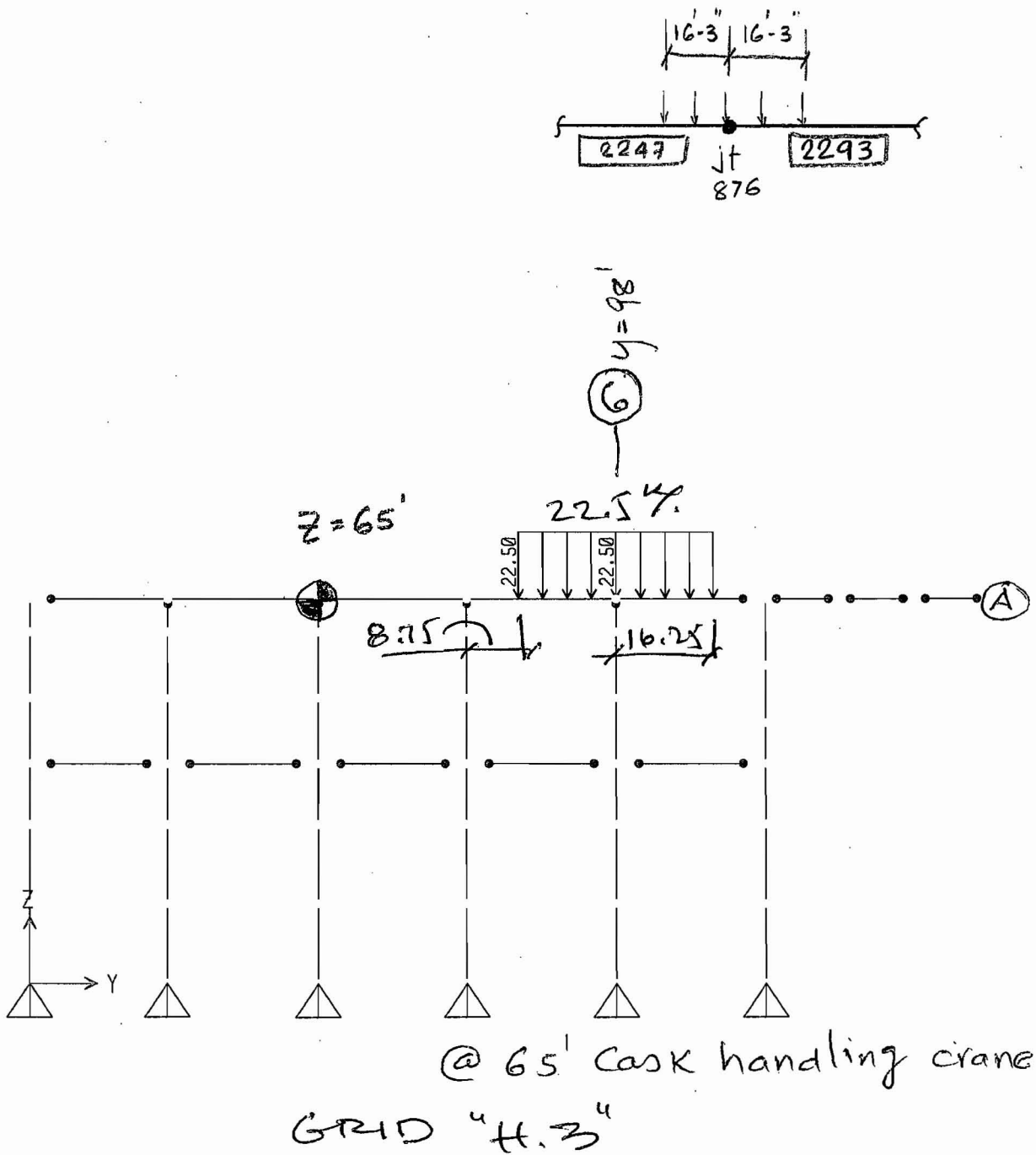




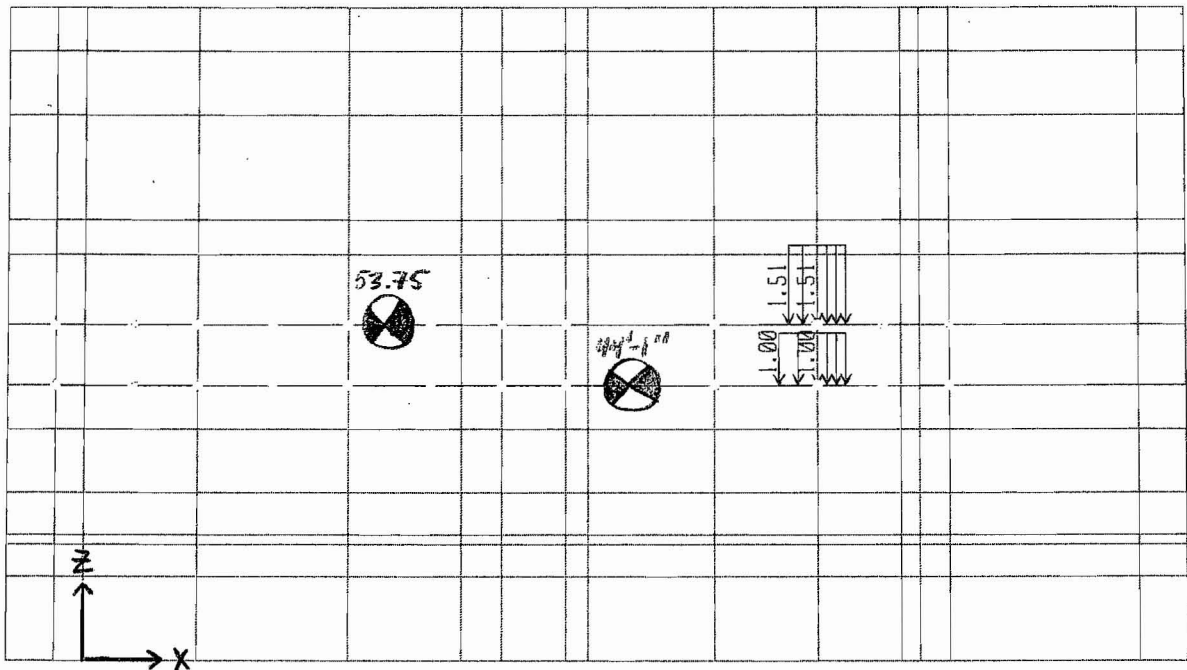
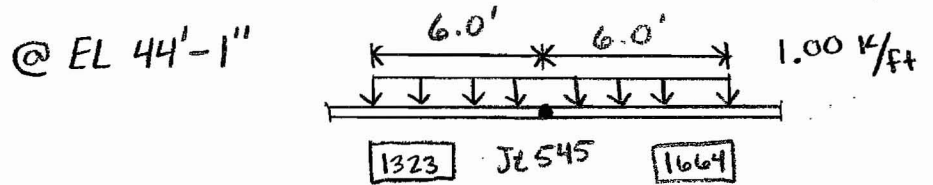
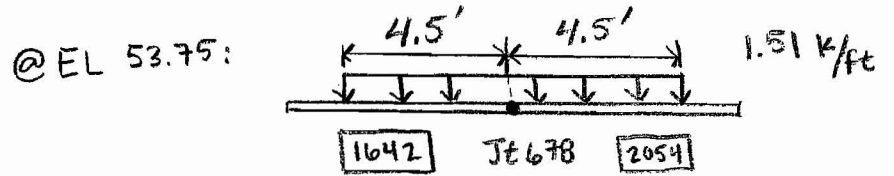
@ 65' cask handling crane.

GRID<sup>u</sup> H.3<sup>u</sup>

X = 59.5



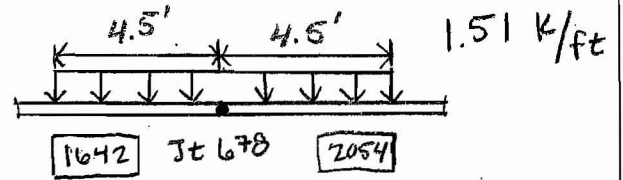
X = 59.5



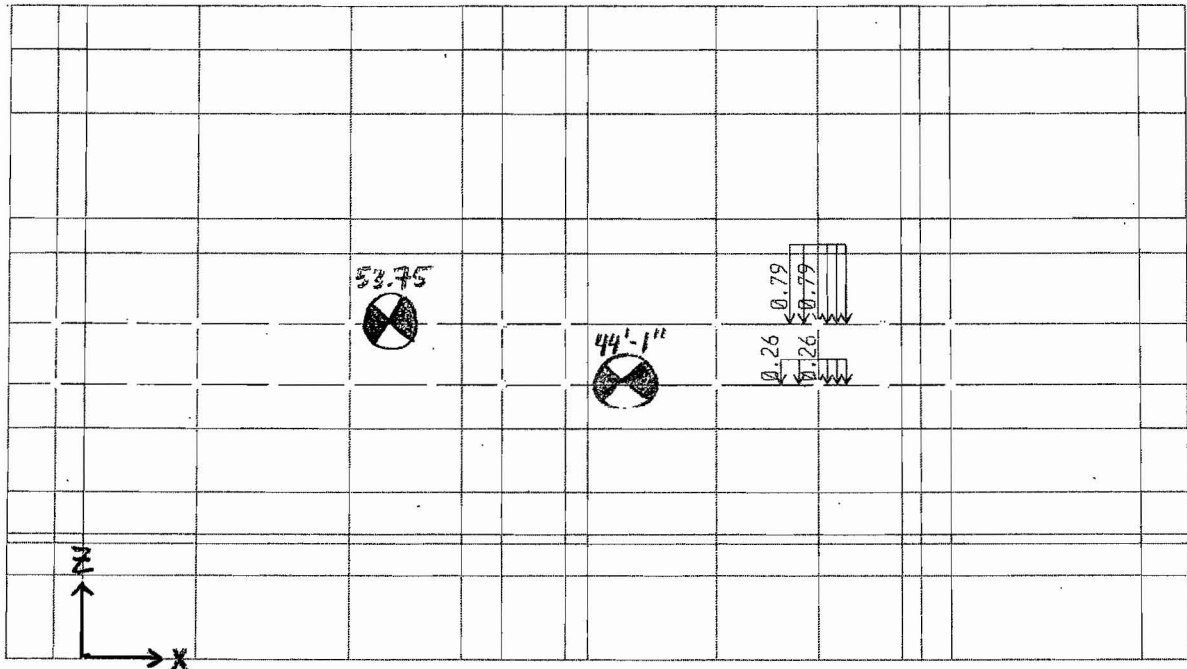
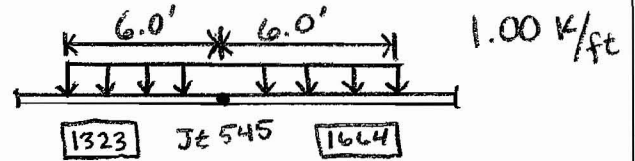
53.75' : WP CLOSURE ROOM CRANE  
44'-1" : REMOTE HANDLING CRANE

Y = 155.50

@ EL 53.75:



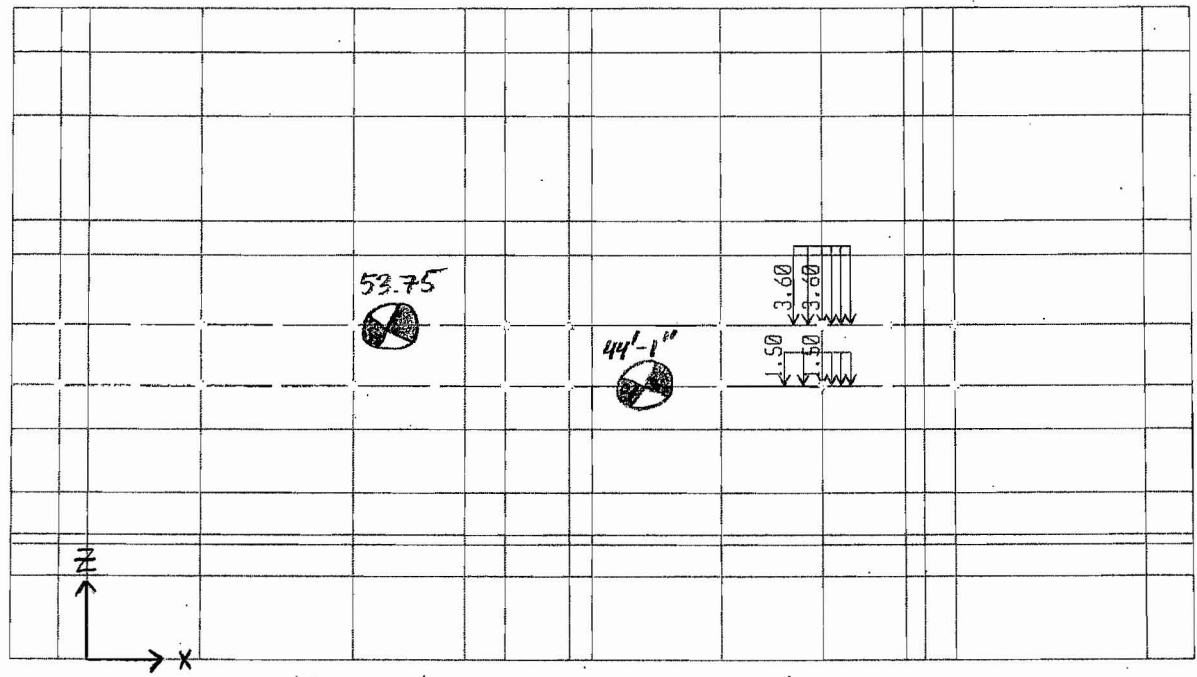
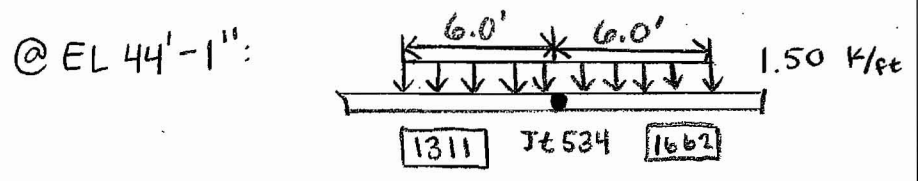
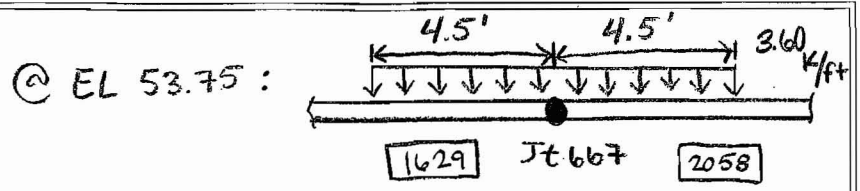
@ EL 44'-1":



53.75': WP CLOSURE ROOM CRANE  
44'-1": REMOTE HANDLING CRANE

Y = 155.50

mas  
2/22/08

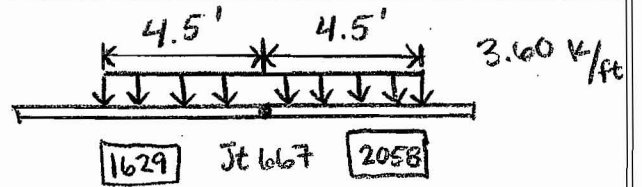


@ 53.75' : WP CLOSURE ROOM CRANE  
@ 44'-1" : REMOTE HANDLING CRANE

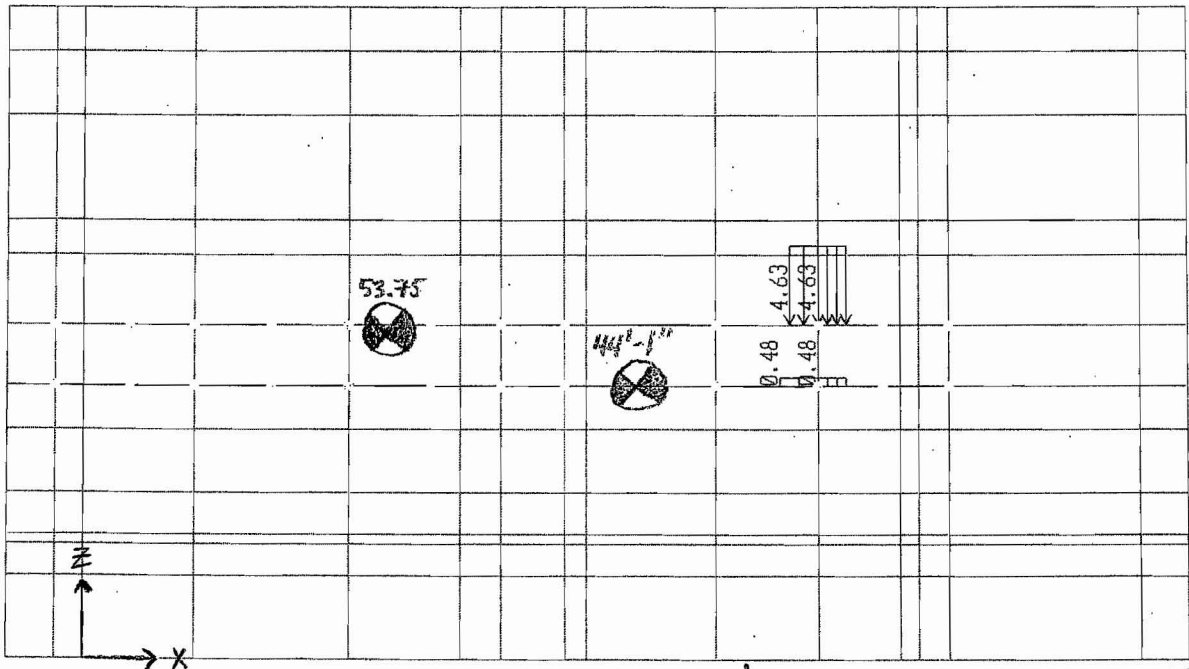
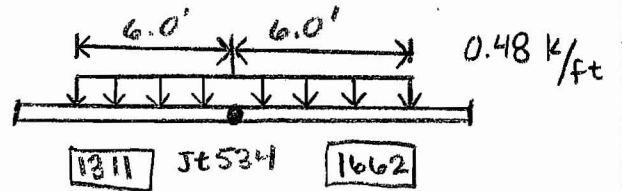
Y-127.50

MAN  
2/21/08

@ EL 53.75:



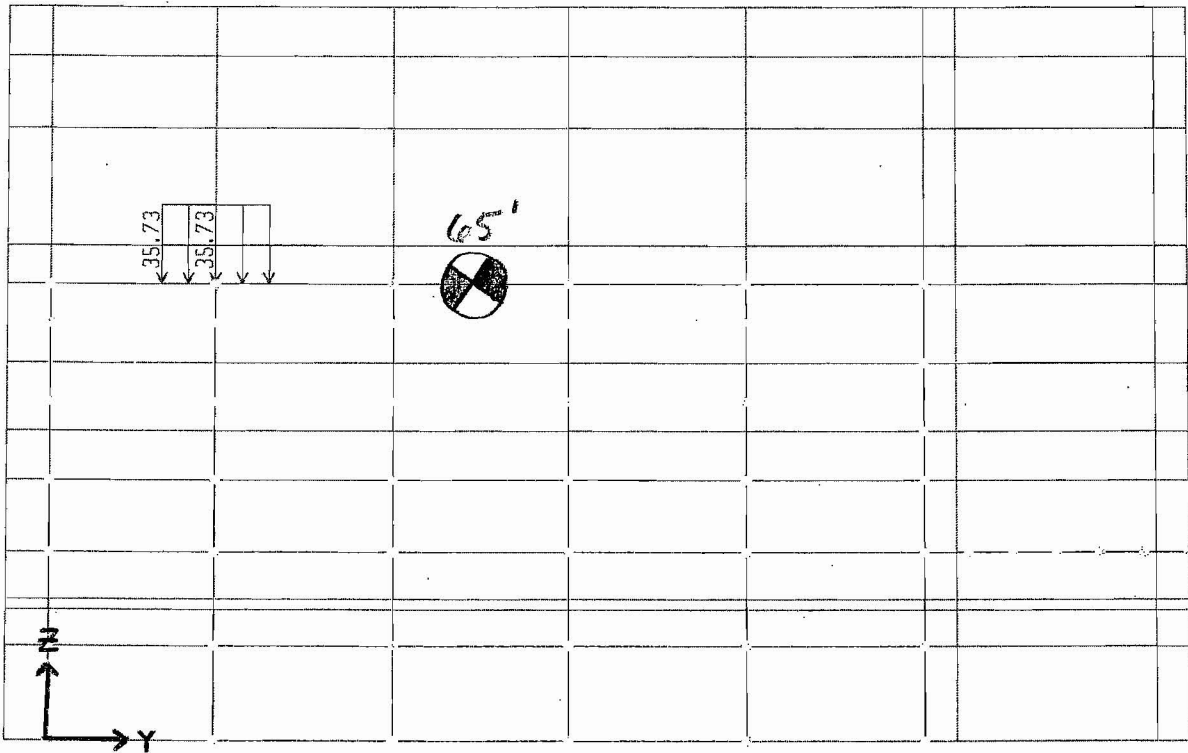
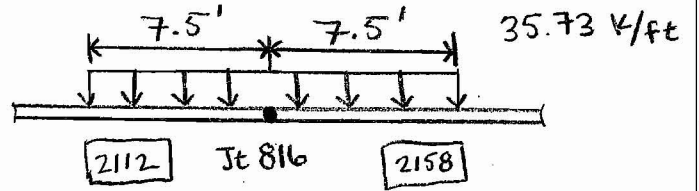
@ EL 44'-1":



@ 53.75: WP CLOSURE ROOM CRANE  
@ 44'-1": REMOTE HANDLING CRANE

4.127.50

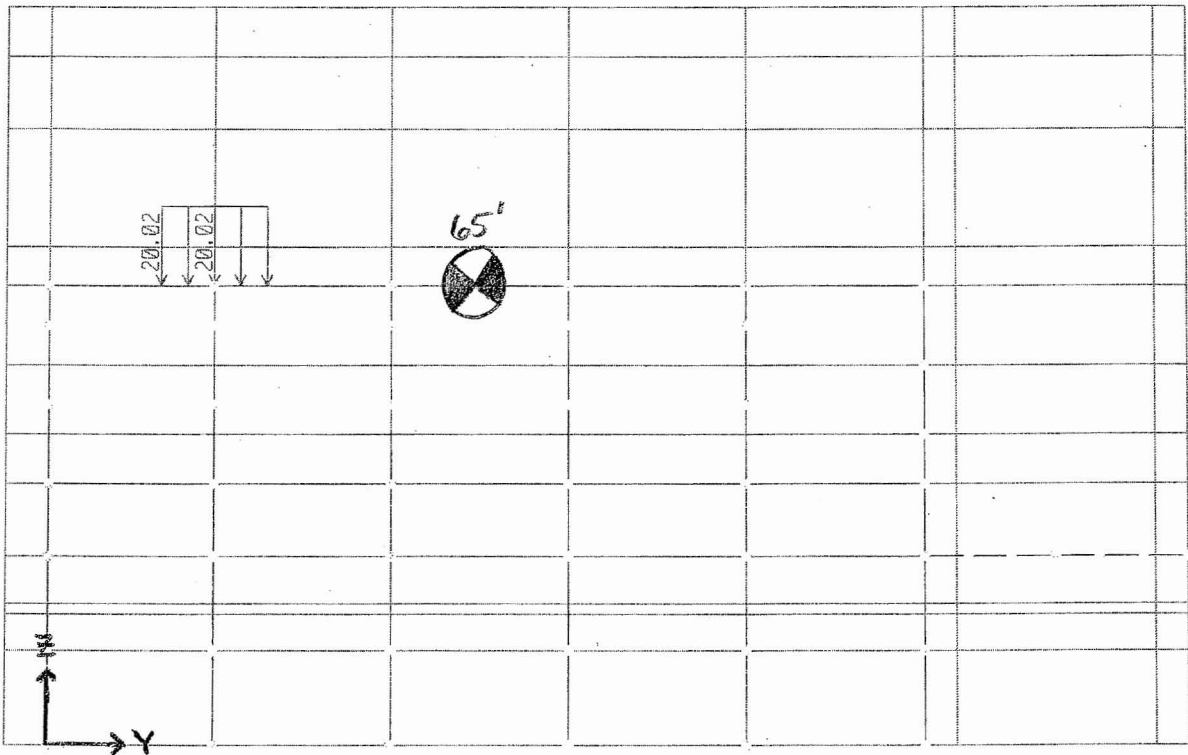
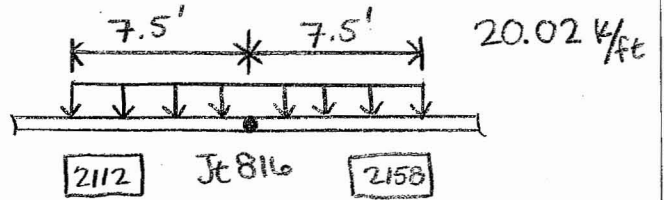
@ EL 65':



65': CANISTER TRANSFER MACHINE CRANE

X = 79.75

@EL 65':

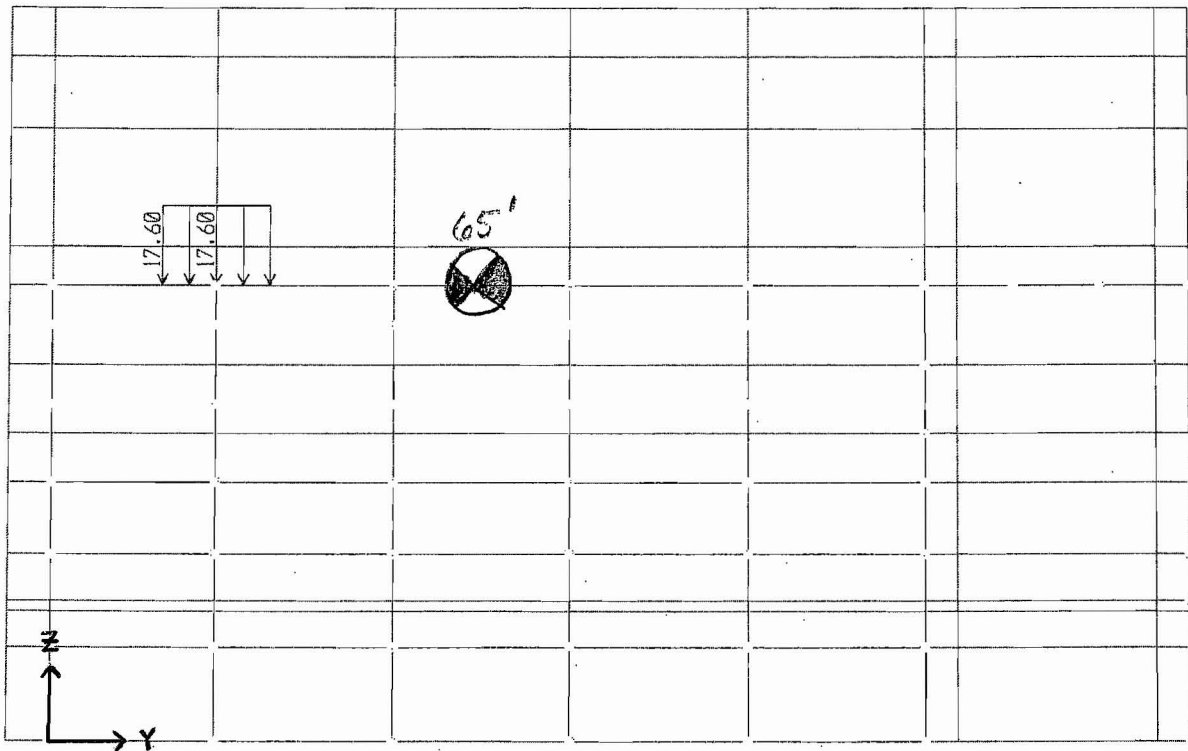
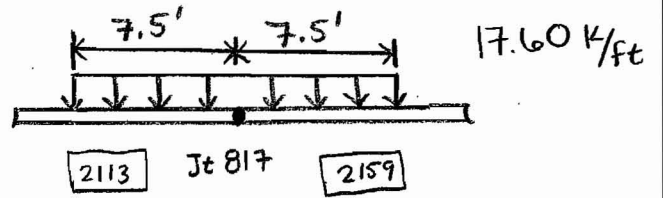


65': CANISTER TRANSFER MACHINE CRANE

$X = 79.75$



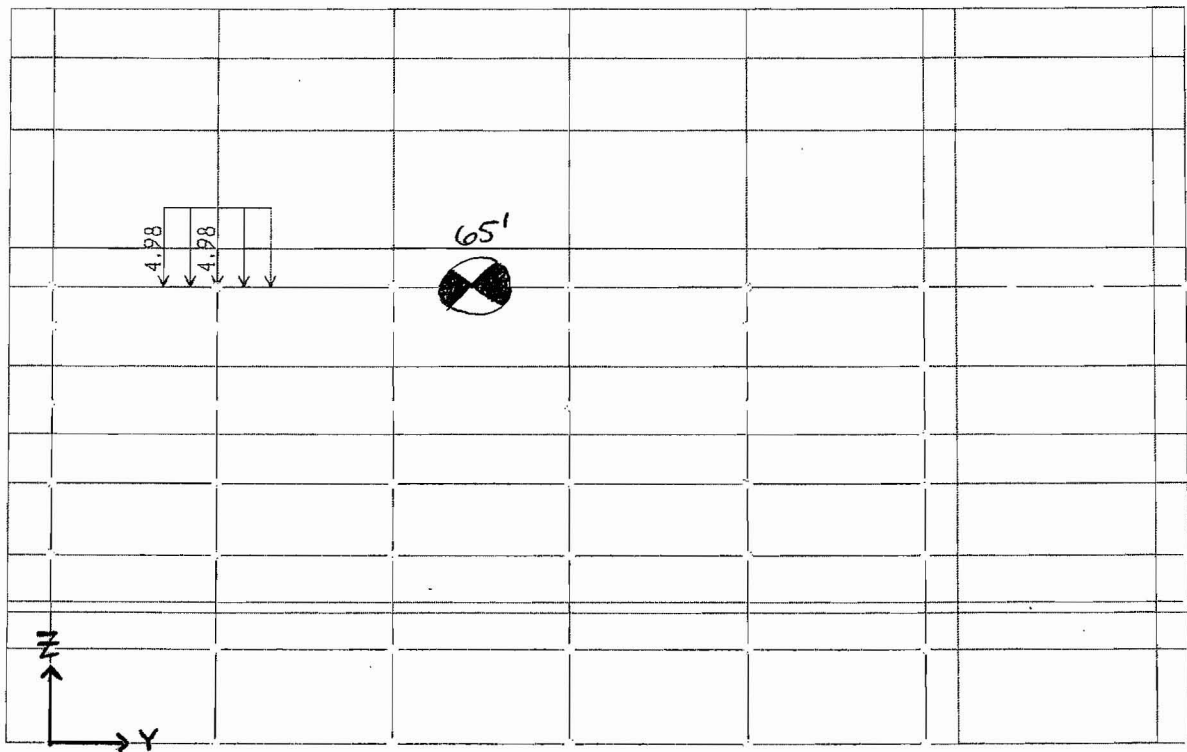
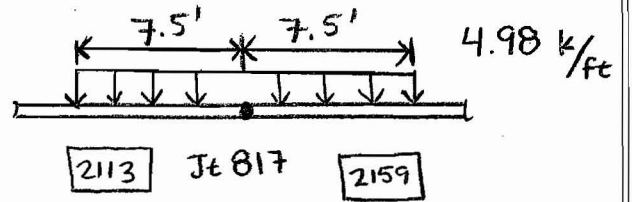
@ EL 65':



65': CANISTER TRANSFER MACHINE CRANE

X = 129.25

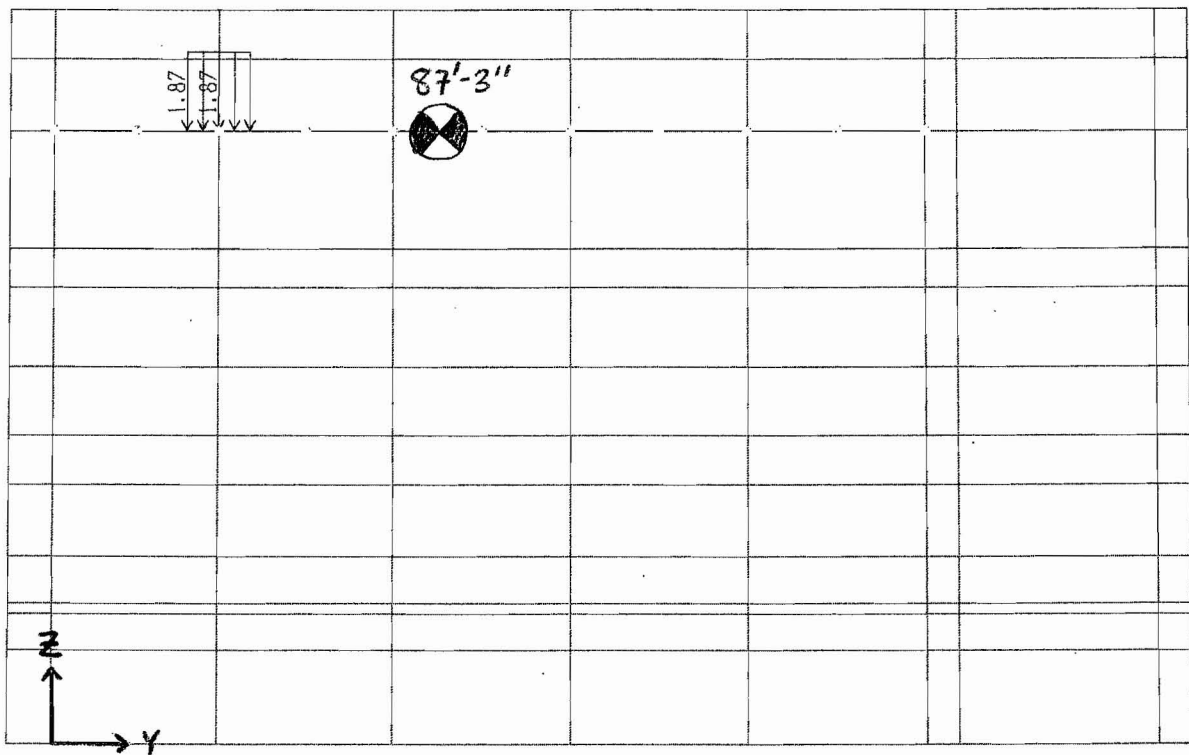
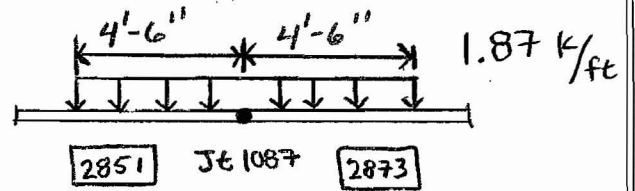
@ EL 65':



65': CANISTER TRANSFER MACHINE CRANE

X=129.25

@ EL 87'-3":

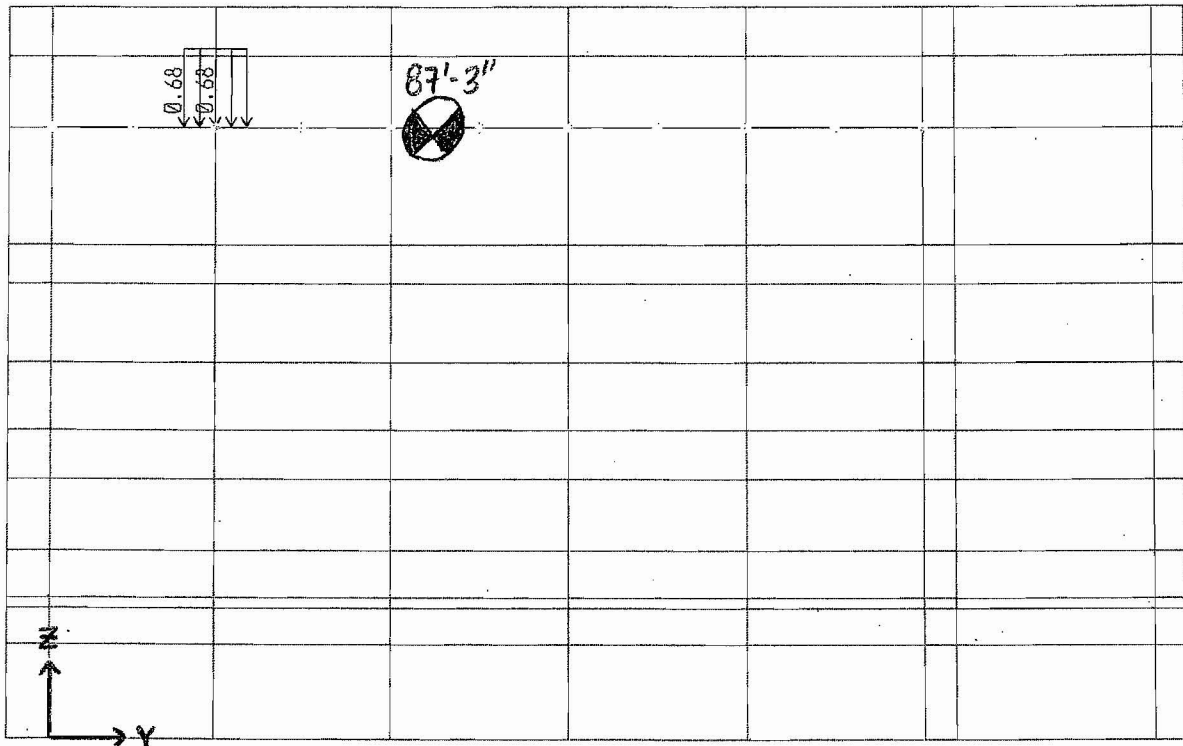
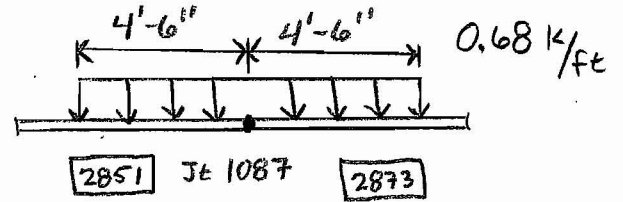


87'-3": CTM MAINTENANCE CRANE

X = 130.25

MA  
2/22/08

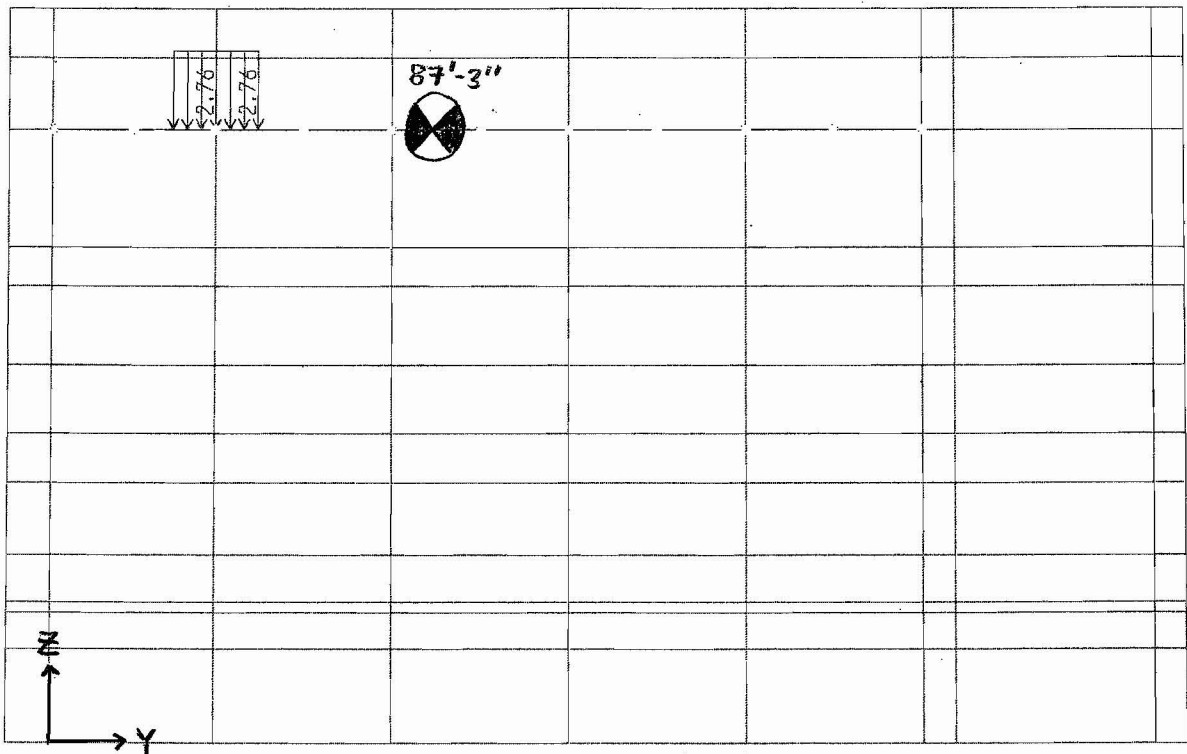
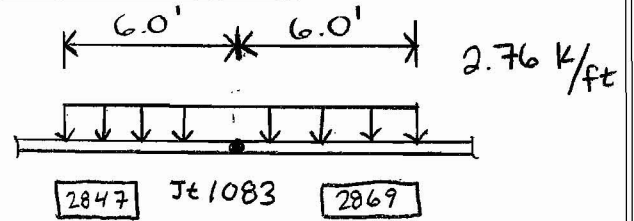
@ EL 87'-3"



87'-3": CTM MAINTENANCE CRANE

X = 130.25

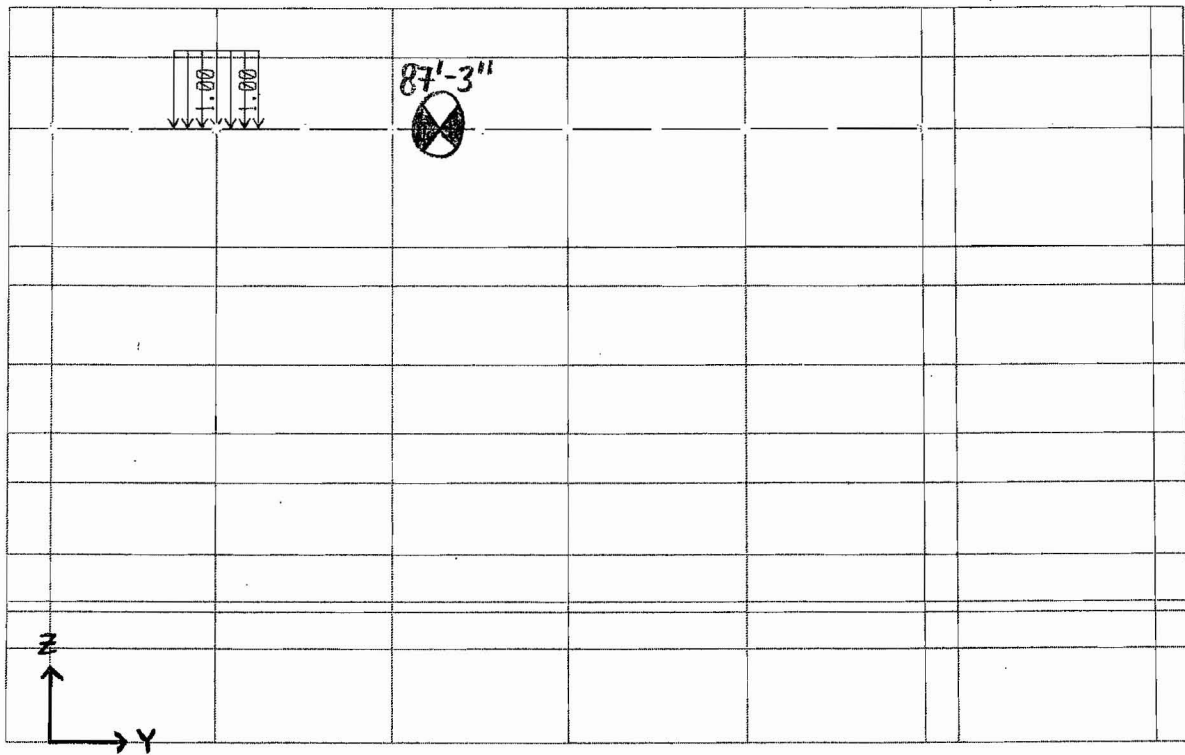
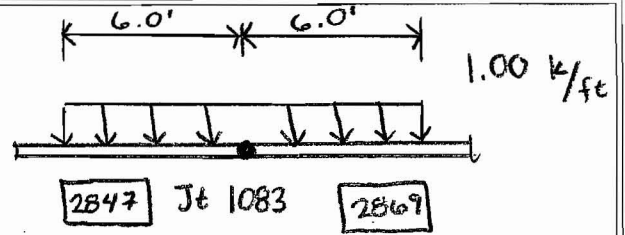
@EL 87'-3":



87'-3": Cask Preparation CRANE

X = 63.50

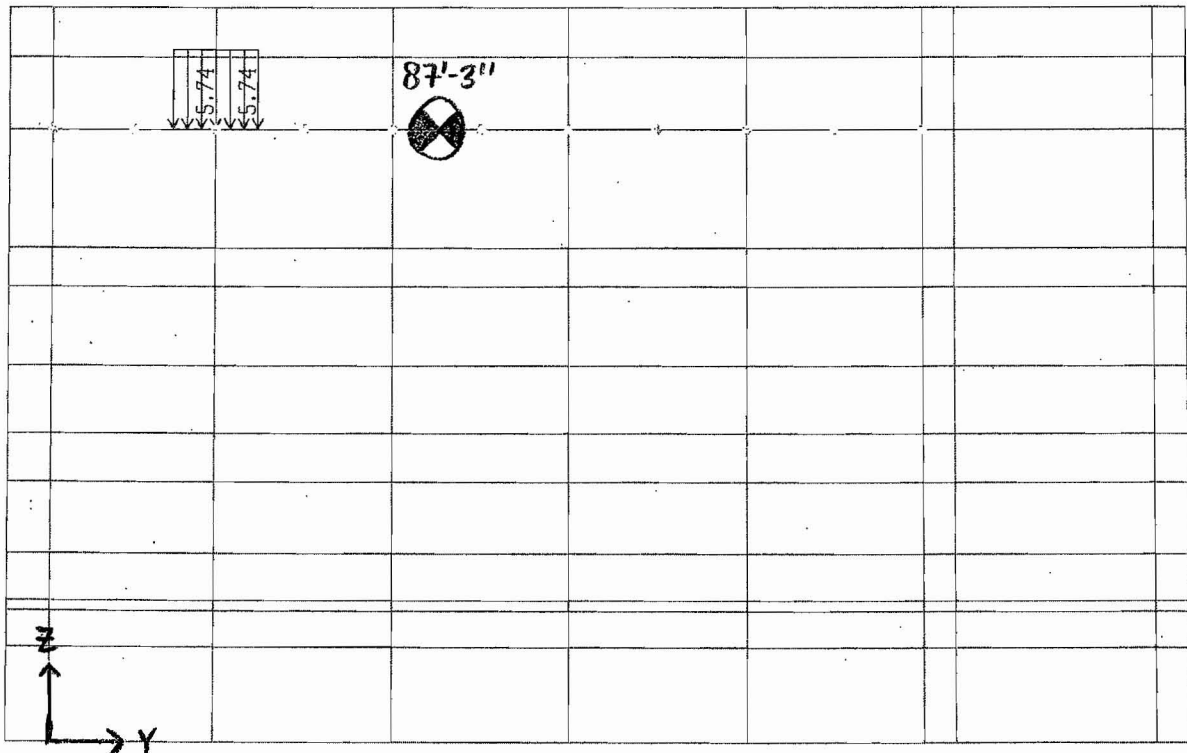
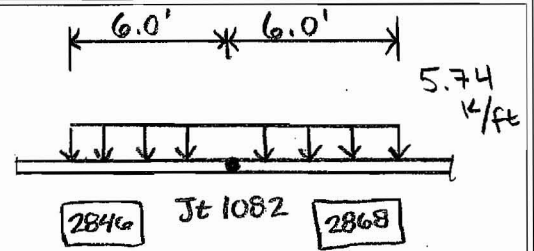
@EL 87'-3"



87'-3": Cask Preparation CRANE

$X = 63.50$

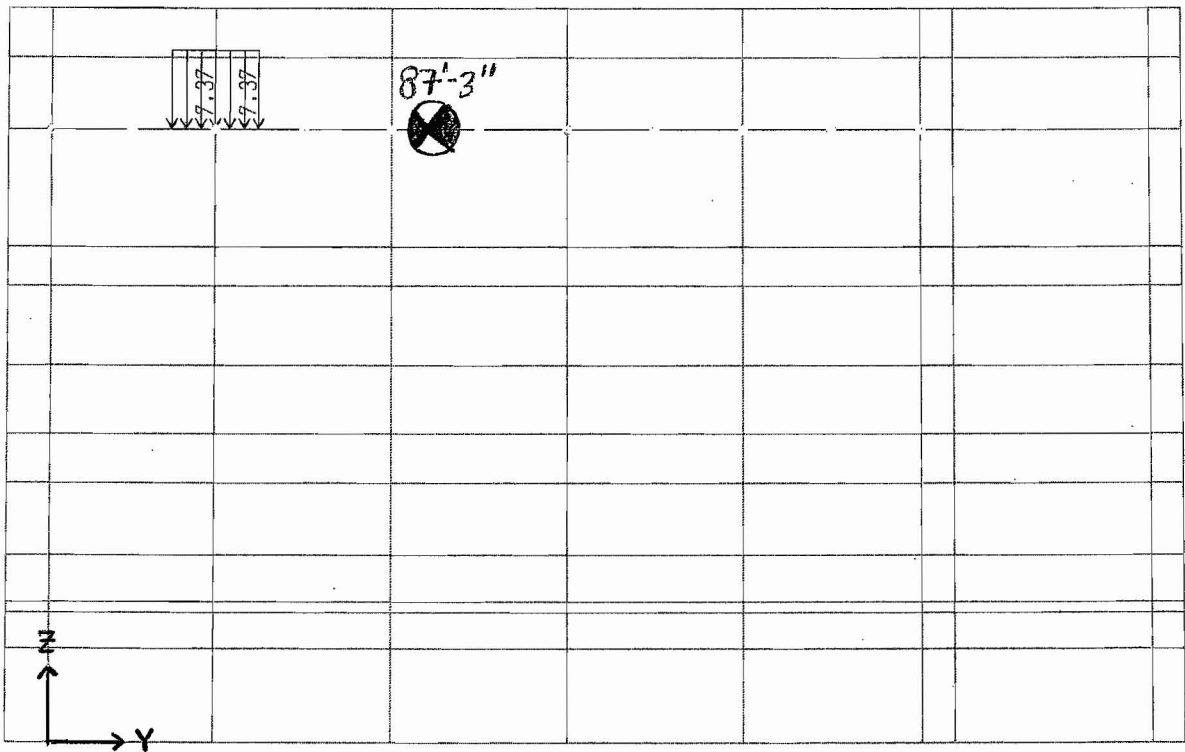
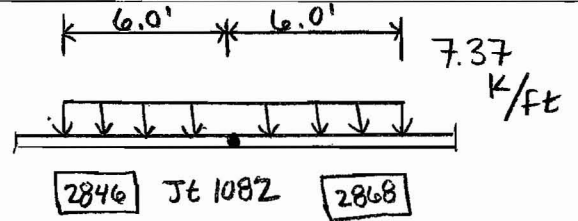
@ EL 87'-3" :



87'-3" : Cask Preparation CRANE

$x = -2.0$

@EL 87'-3" :

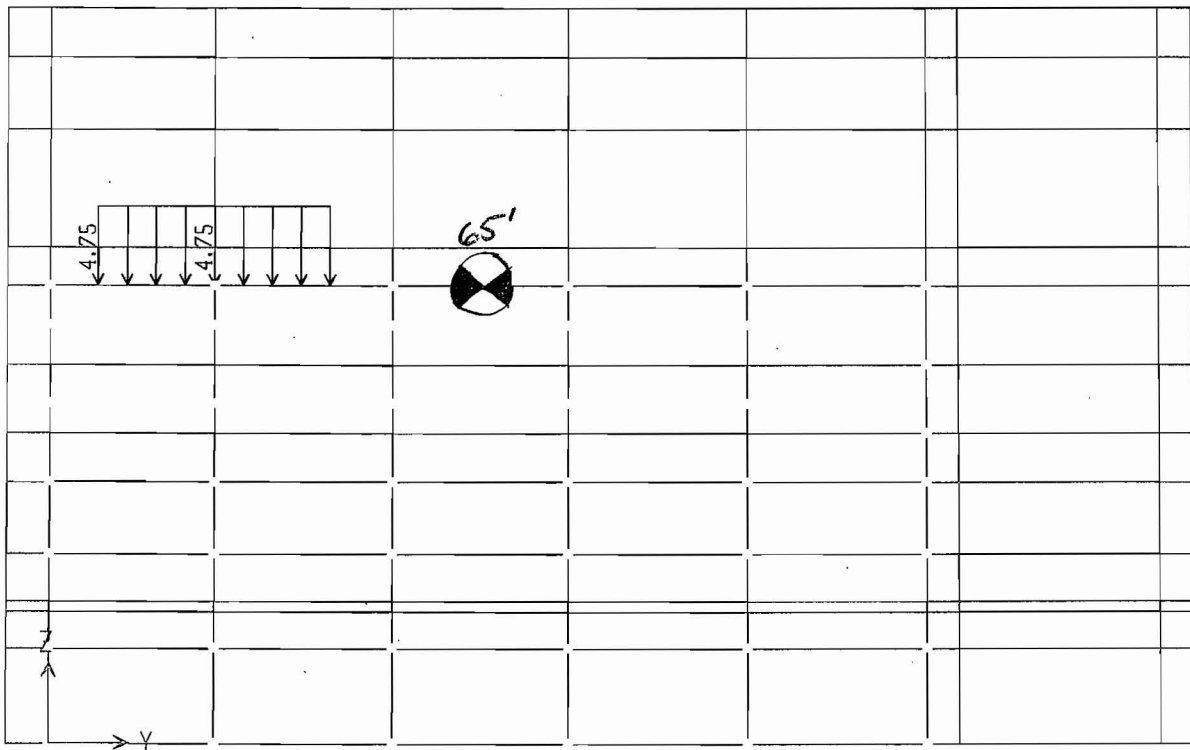
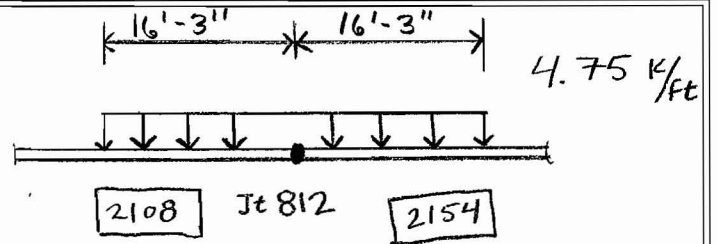


87'-3" : Cask Preparation CRANE

$x = -2.0$



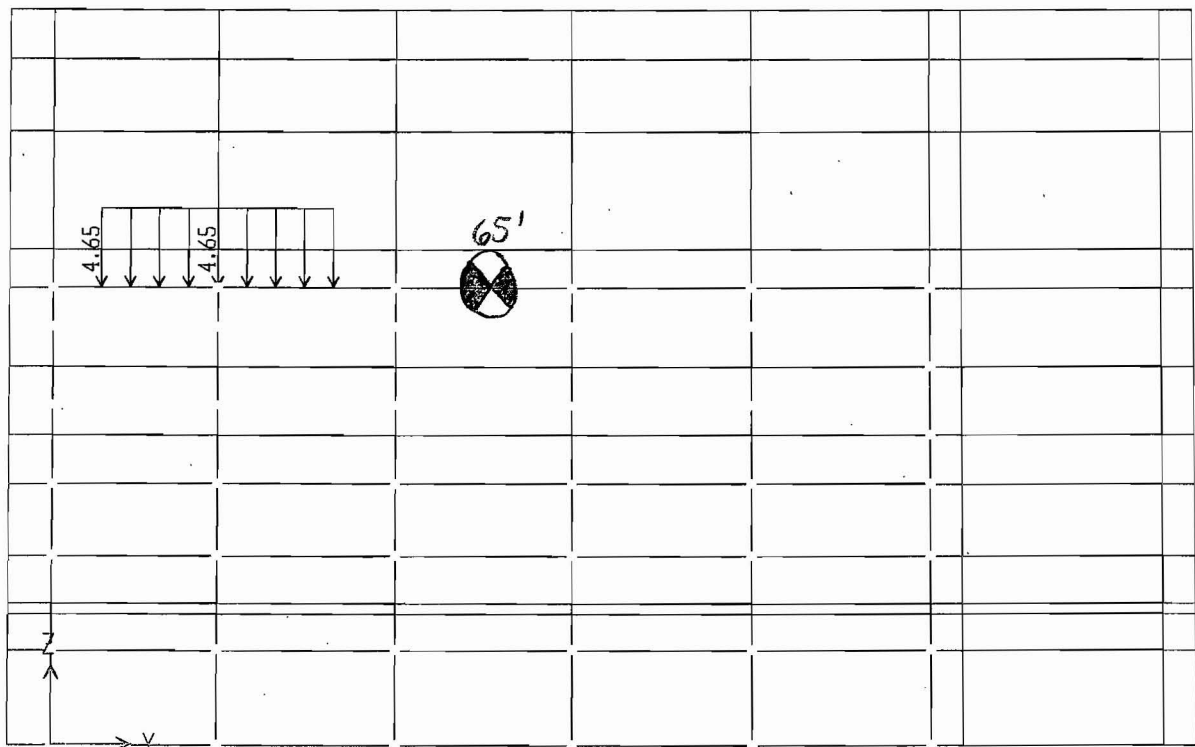
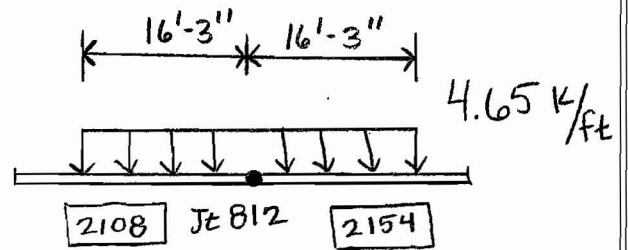
@ EL 65':



65': CRANE HANDLING CRANE

X=00

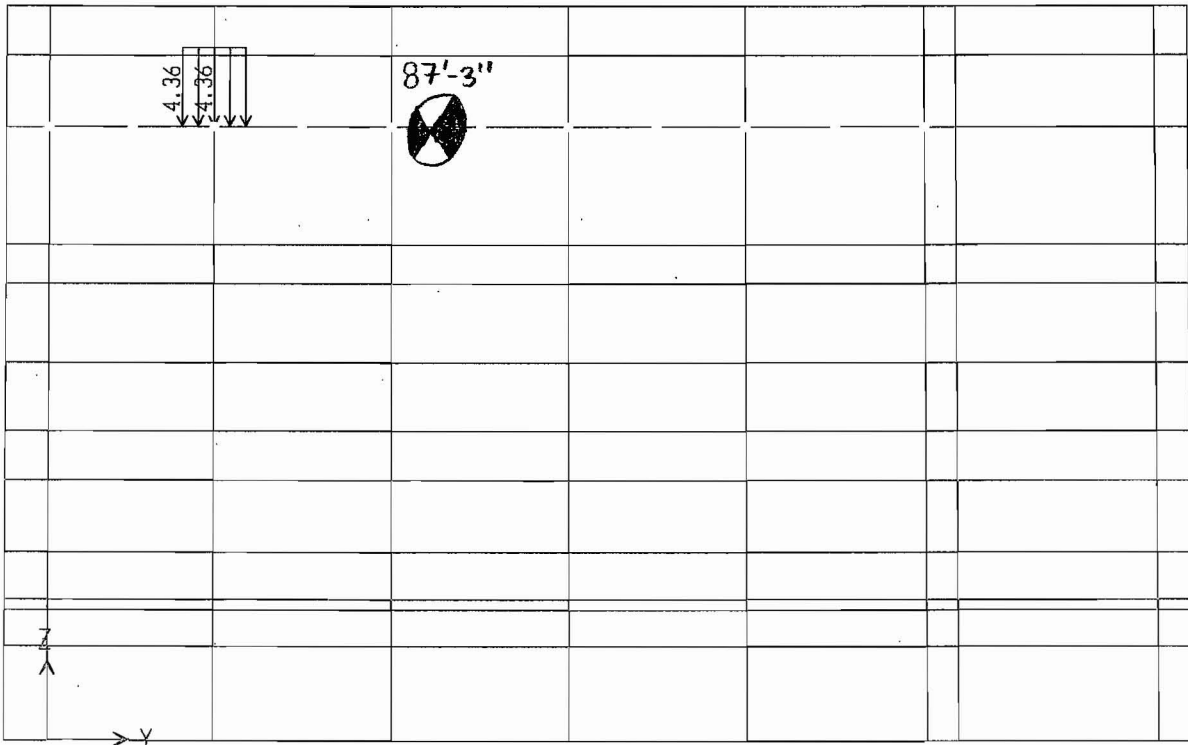
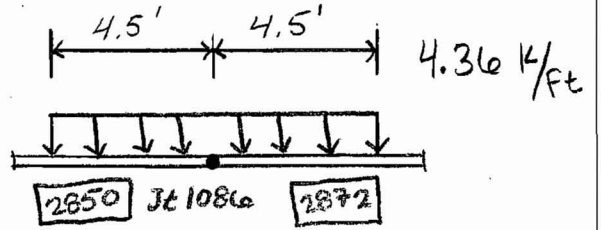
@EL 65':



65': CASK HANDLING CRANE

X=00

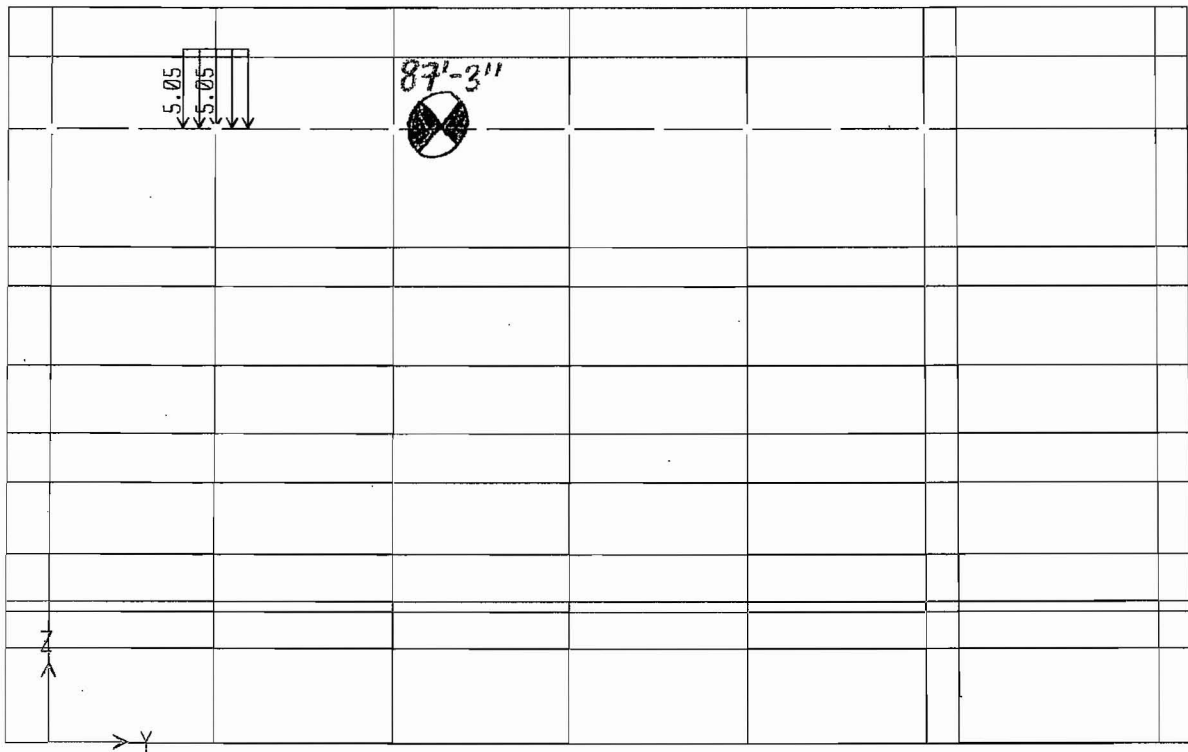
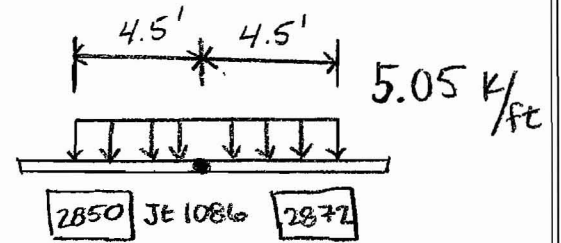
@EL 87'-3":



87'-3": CTM MAINTENANCE CRANE

X = 78.75

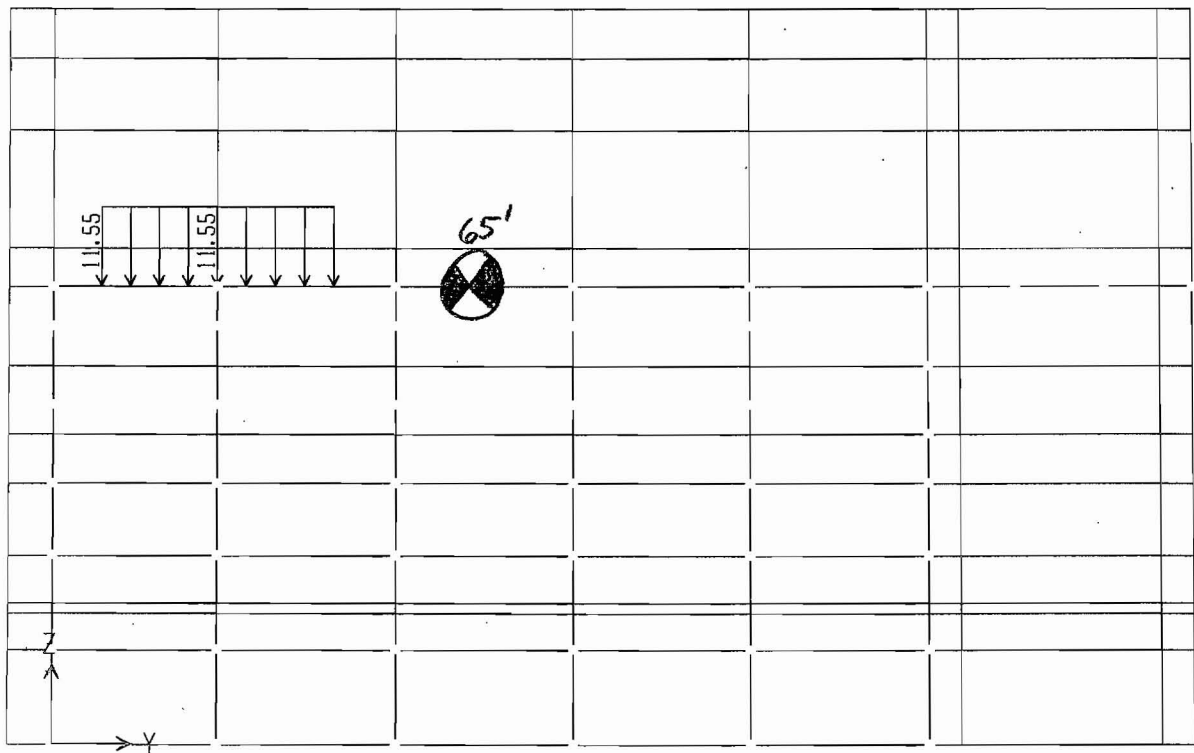
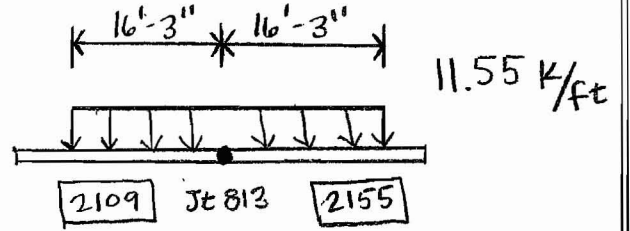
@EL 87'-3"



87'-3": CTM MAINTENANCE CRANE

X = 78.75

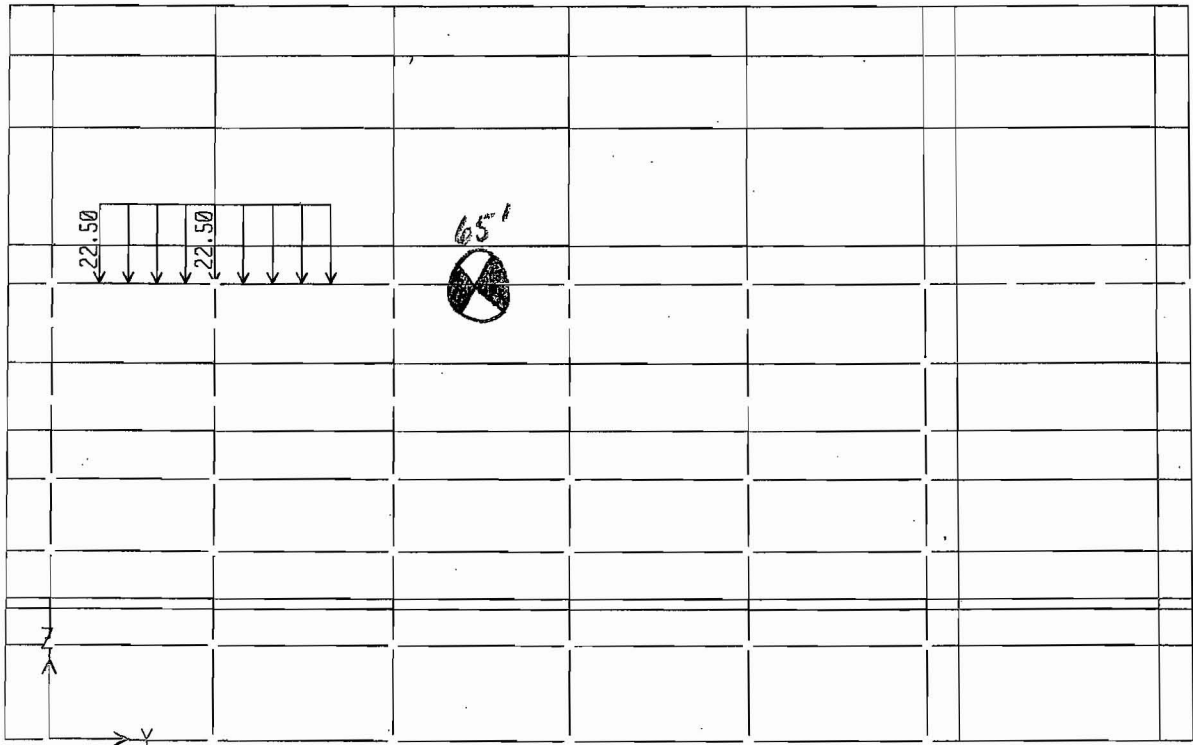
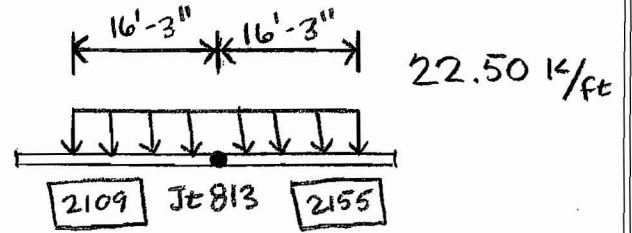
@EL 65':



65': CRANE HANDLING CRANE

X = 59.50

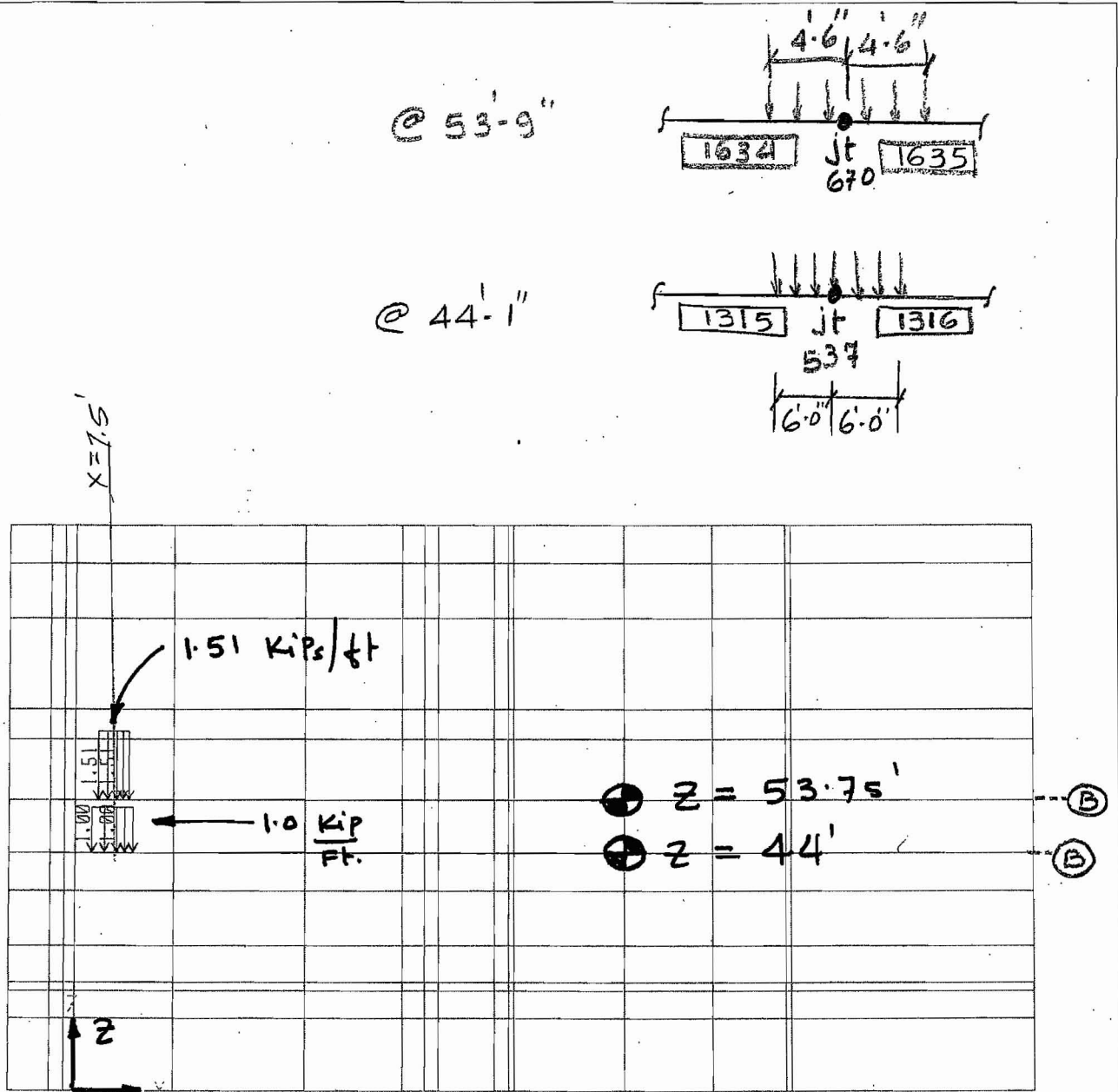
@EL 65':



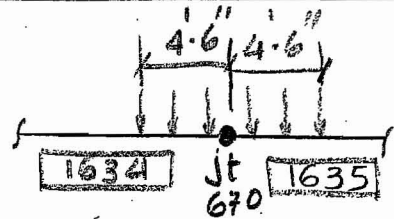
65': CASK HANDLING CRANE

X = 59.50

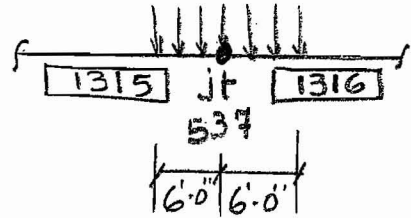
2/22/08  
mdd



@ 53'-9"



@ 44'-1"

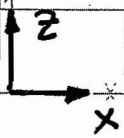


X=7.5'

1.51 Kips/ft

1.0 Kip/ft

● Z = 53.75'  
● Z = 44'

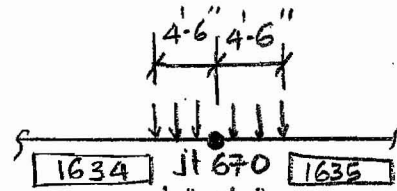


@ 53.75' WP closure Room crane.  
@ 44' Remote handling crane.

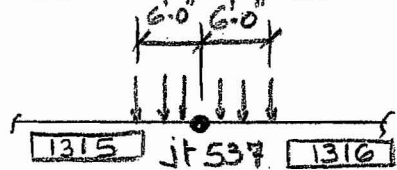
Y = 155.5'

MAN  
2/22/08

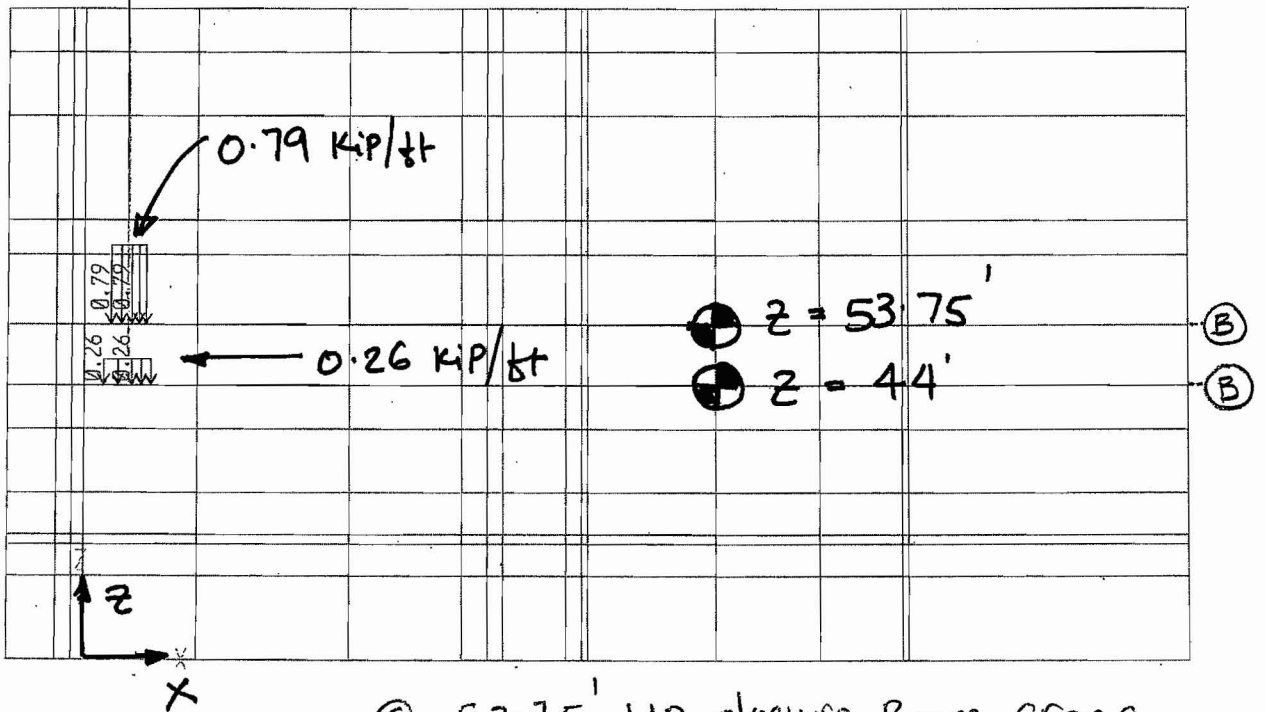
@ 53'-9"



@ 44'-1"



X = 7.5'



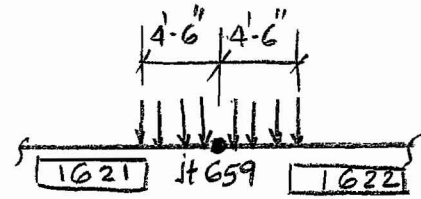
@ 53.75' WP closure Room crane.  
@ 44' Remote handling crane.

Y = 155.50'

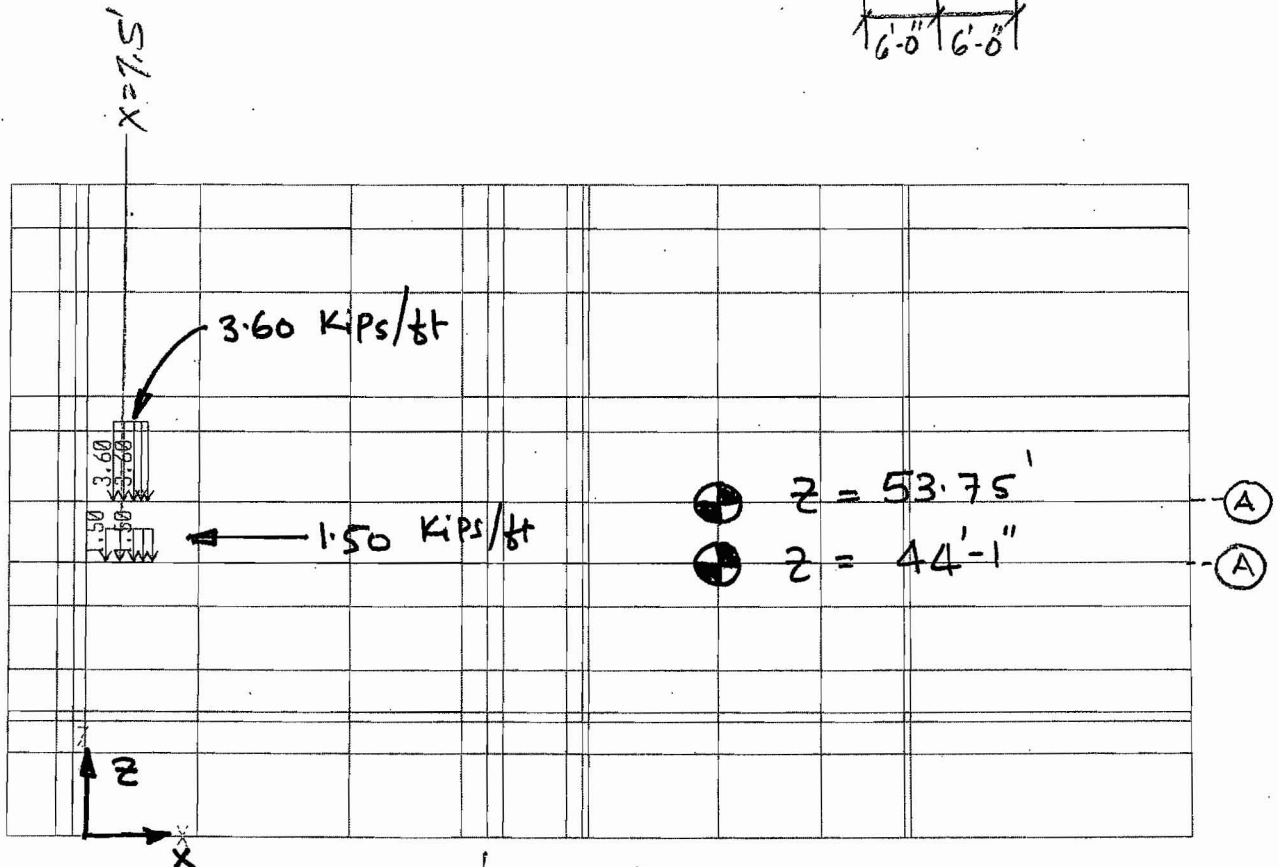
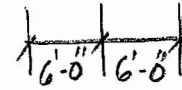
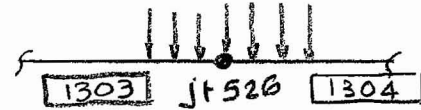


MAD  
2/21/08

@ 53'-9"



@ 44'-1"

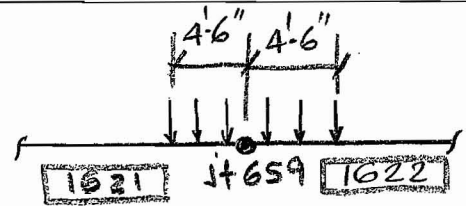


@ 53.75' WP closure Room crane.  
@ 44'-1" Remote handling crane.

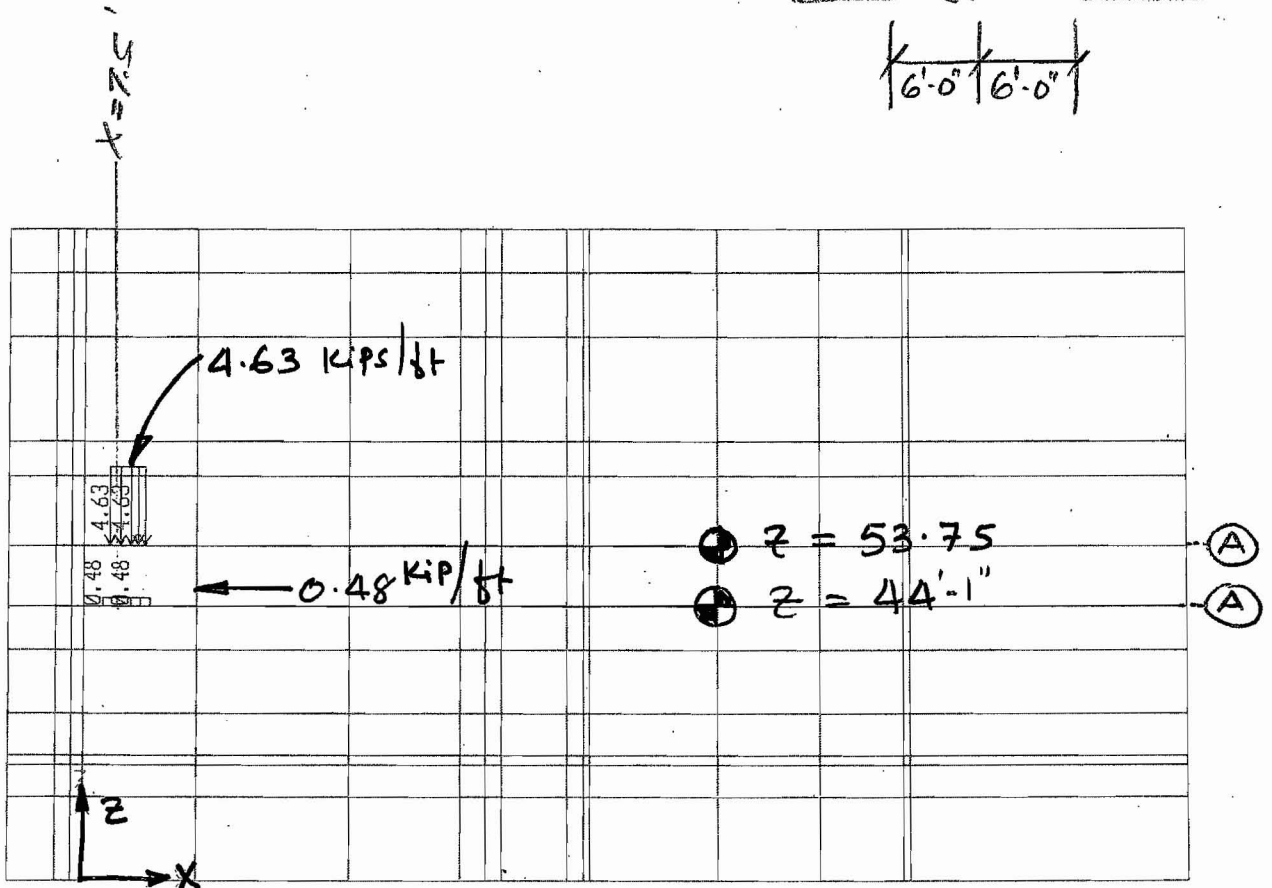
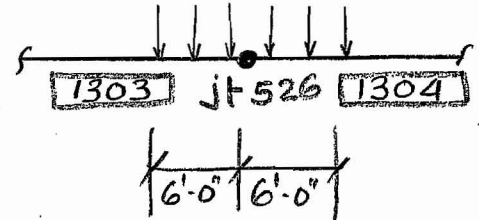
$Y = 127.50'$

MAS  
2/2/08

@ 53'-9"



@ 44'-1"



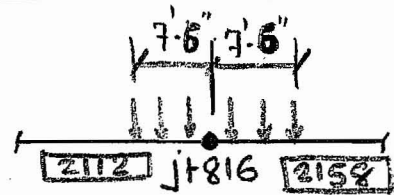
@ 53.75' WP closure Room crane.  
@ 44'-1" Remote handling crane.

$Y = 127.50$

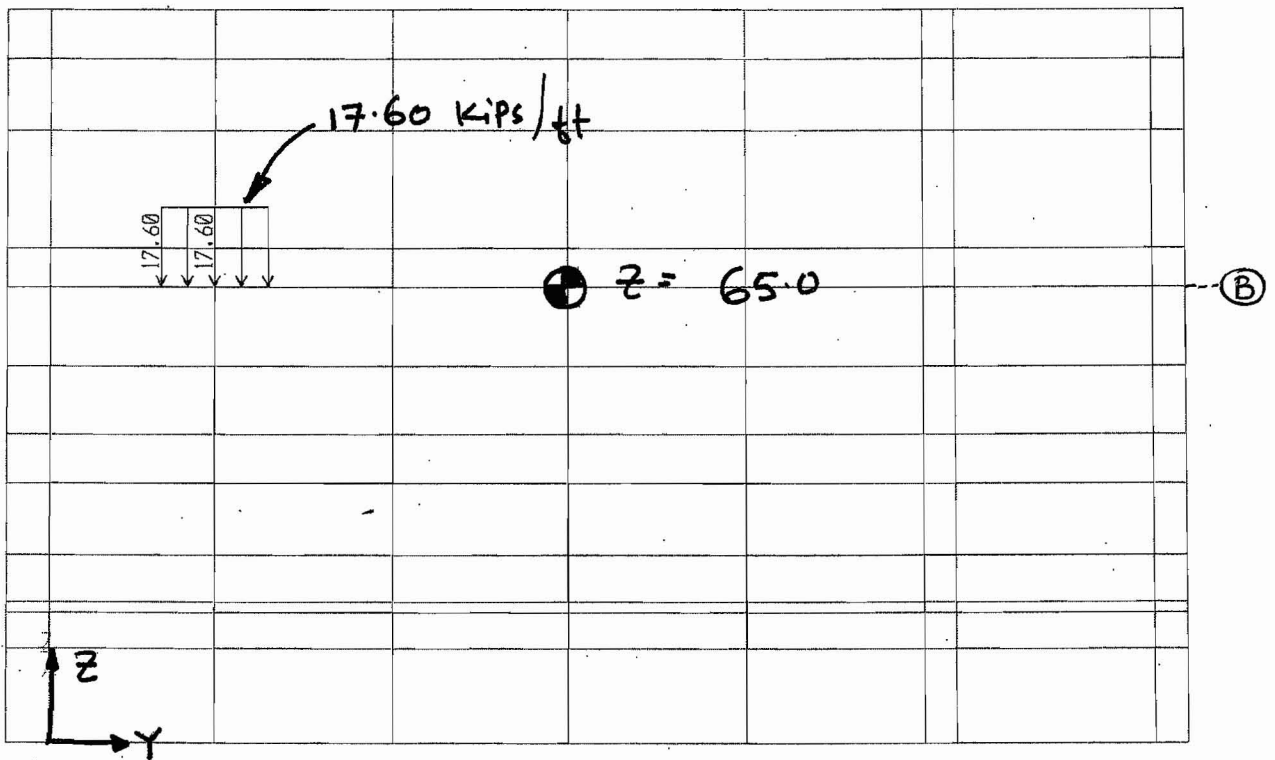
MAD  
2/21/08

MAD 2/21/08

@ 65'

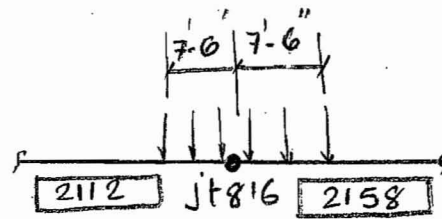


$y = 25'$

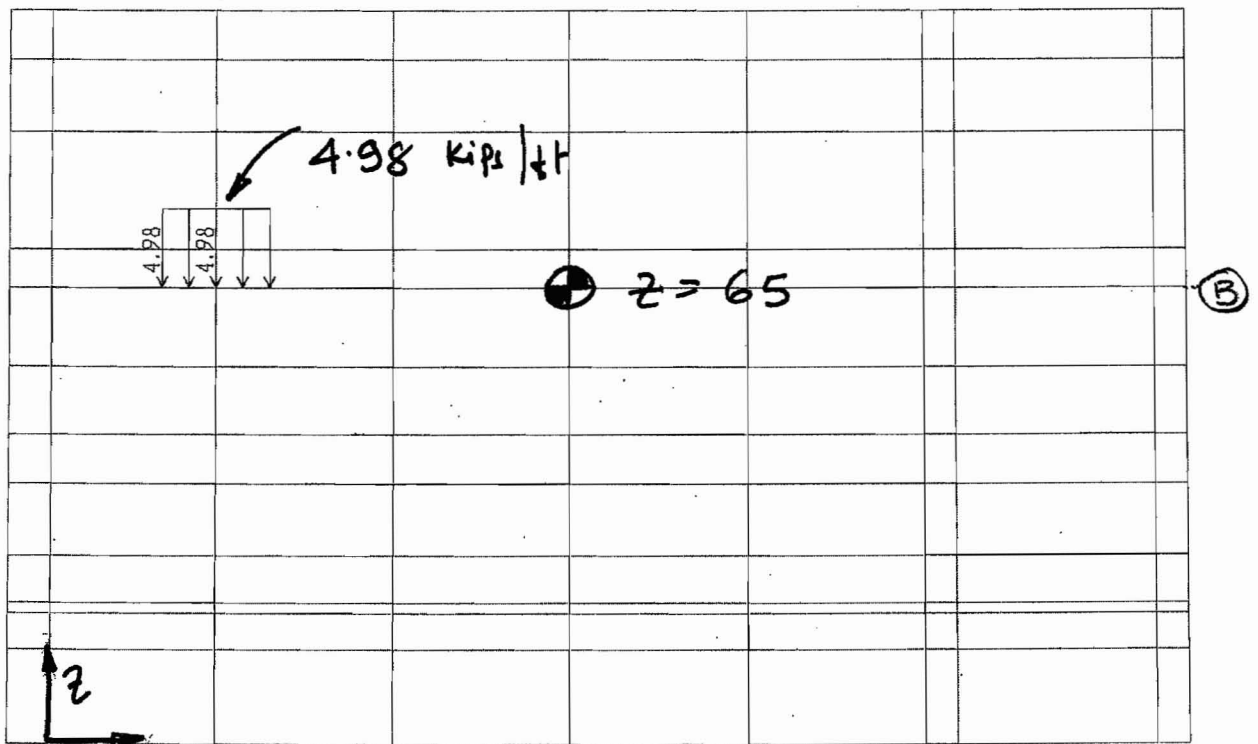


@ 65' canister transfer machine crane.

$x = 79.75'$

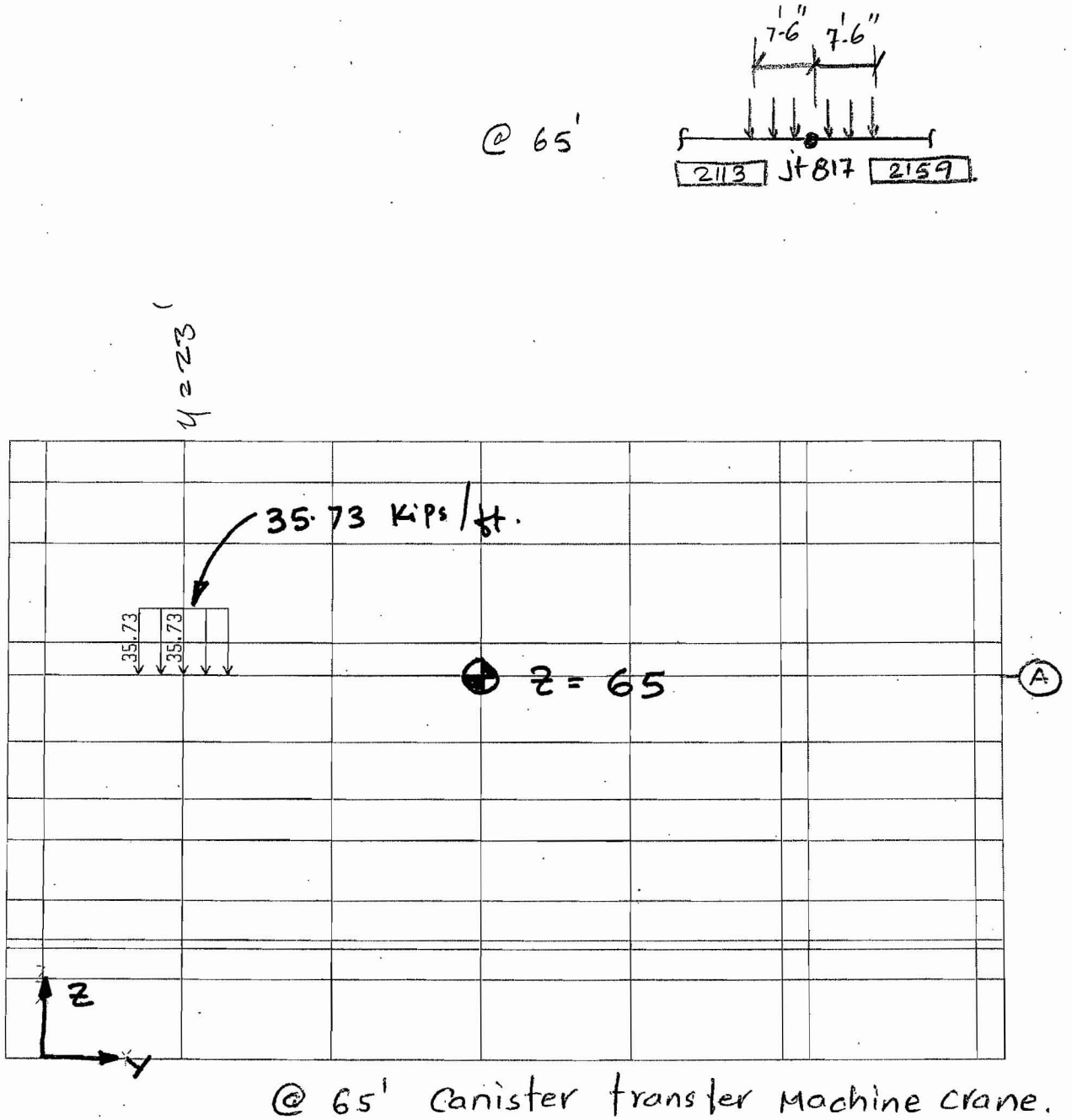


$y = 23'$



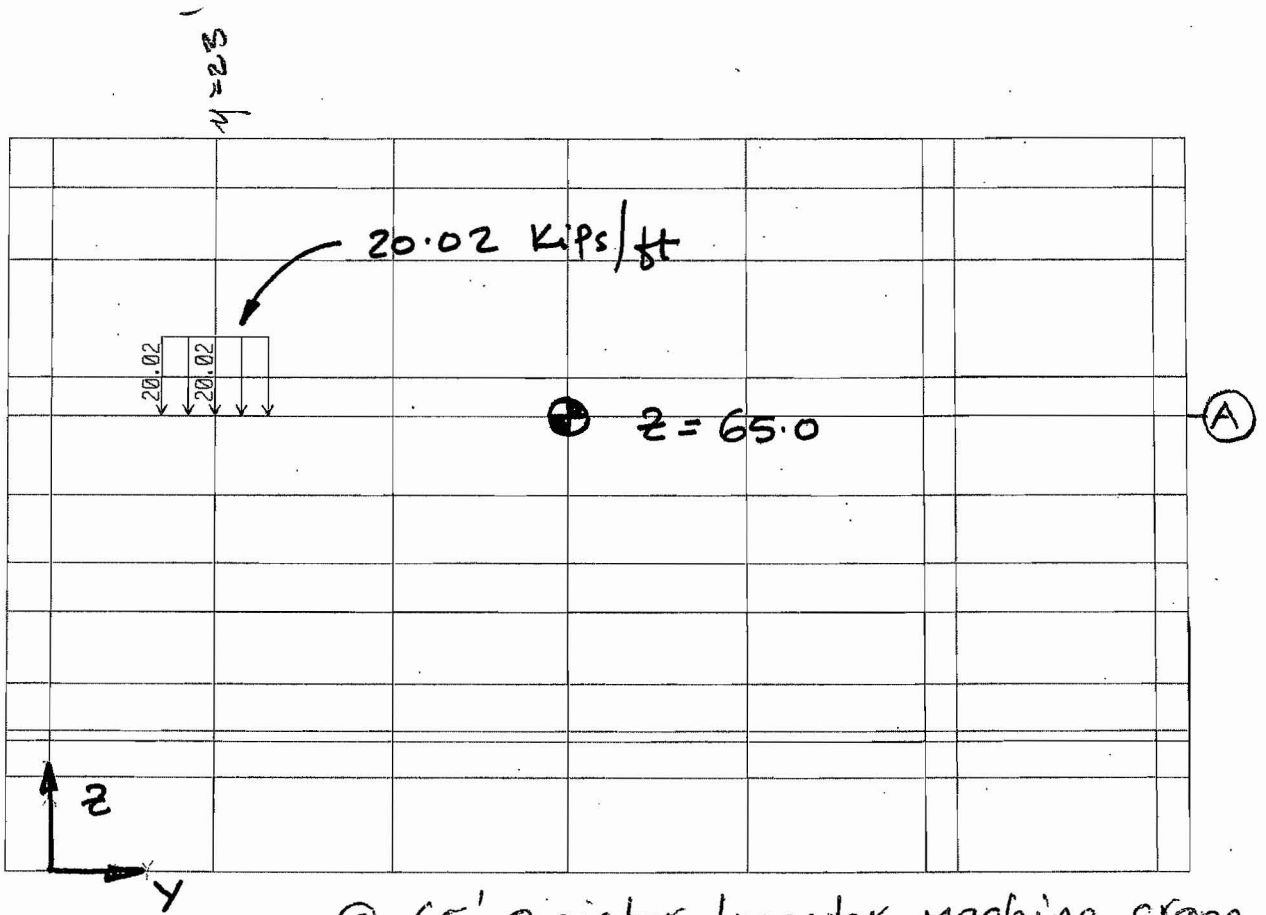
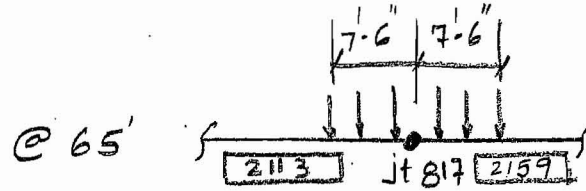
@ 65' canister transfer machine crane.

$x = 79.75'$



$x = 129.25$

MMA  
2/21/08

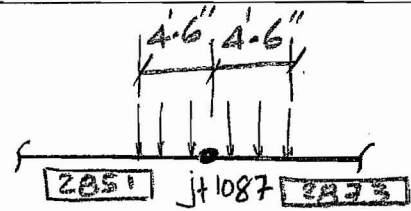


@ 65' canister transfer machine crane.

$$x = 129.25$$

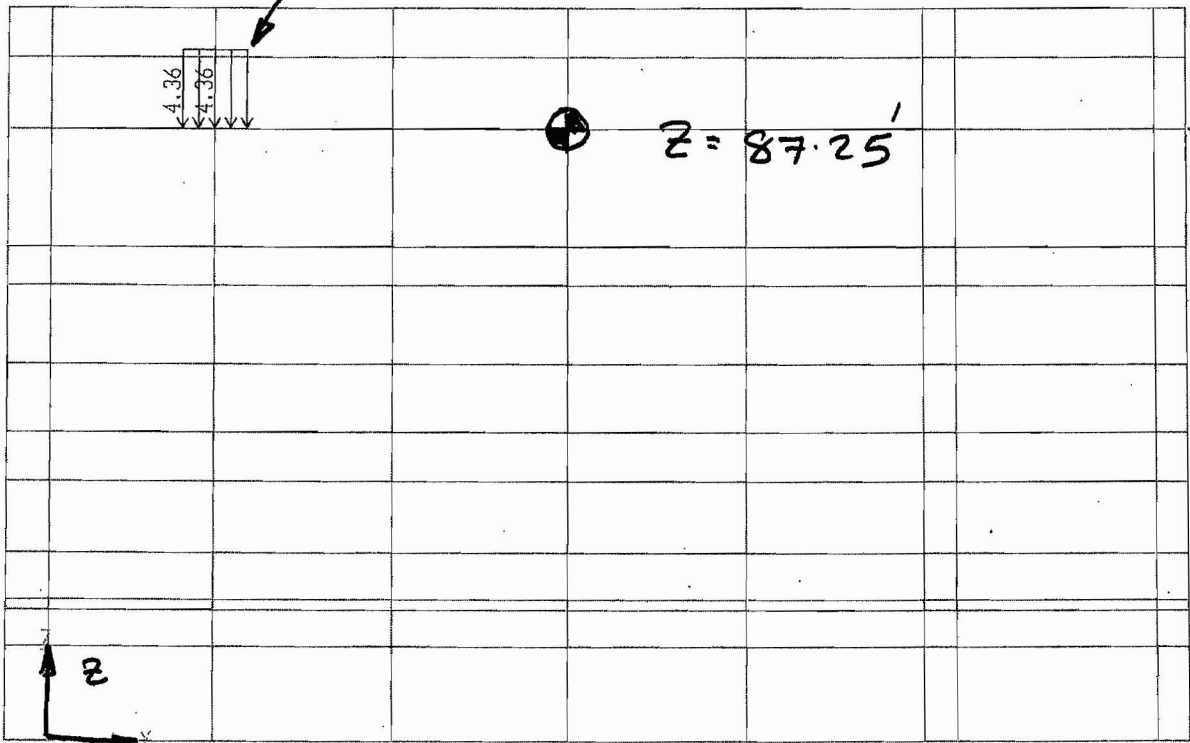
MAA  
2/21/08

@ 87'-3"



y = 23'

4.36 Kips/ft

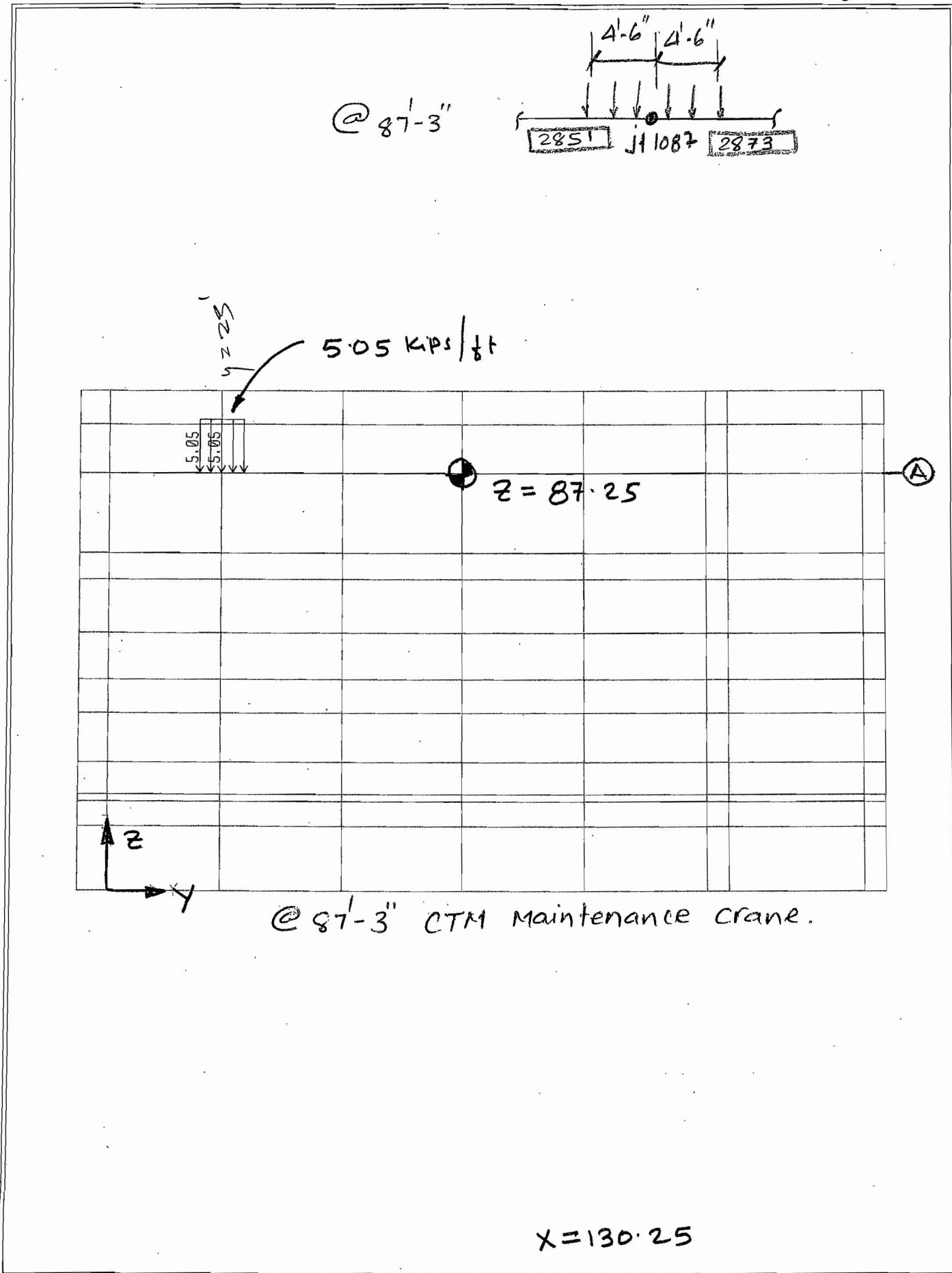


z = 87.25'

A

@ 87'-3" CTM Maintenance Crane.

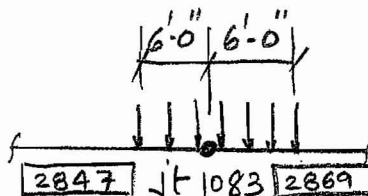
X = 130.25



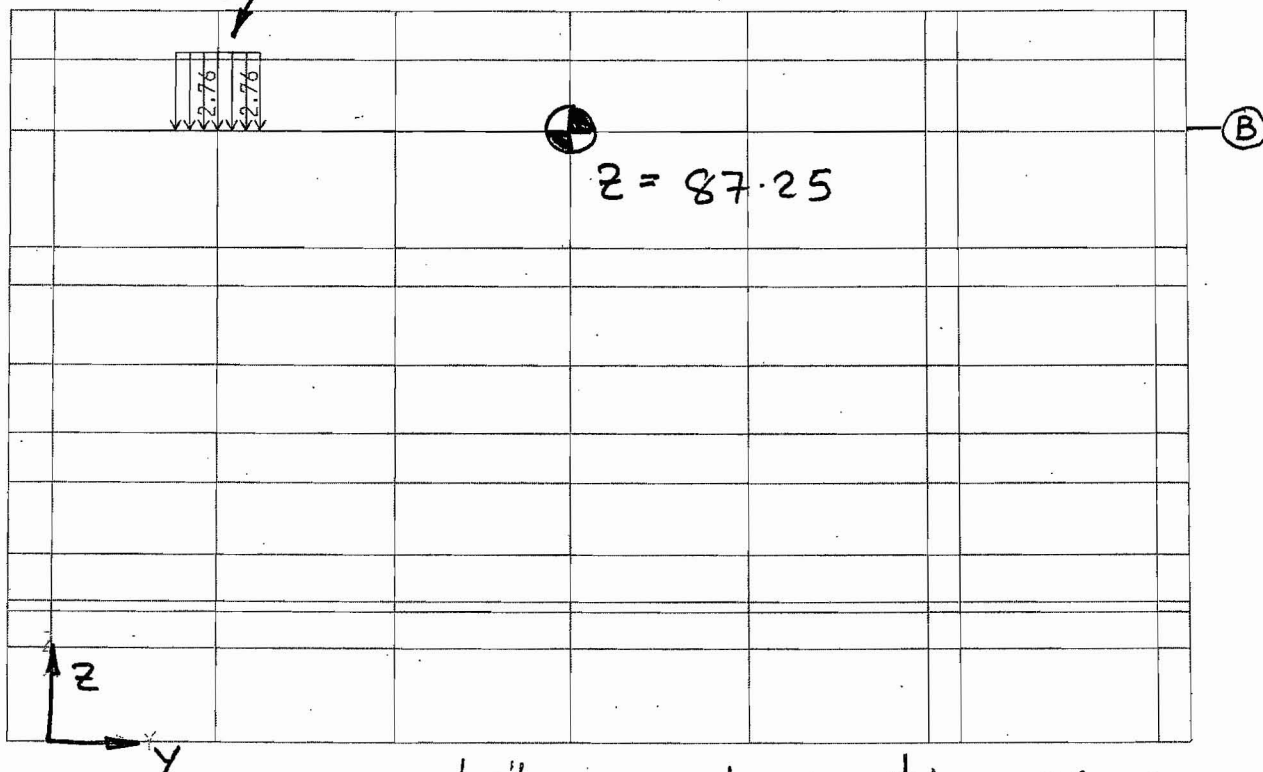


MAN  
2/2/08

@ 87'-3"



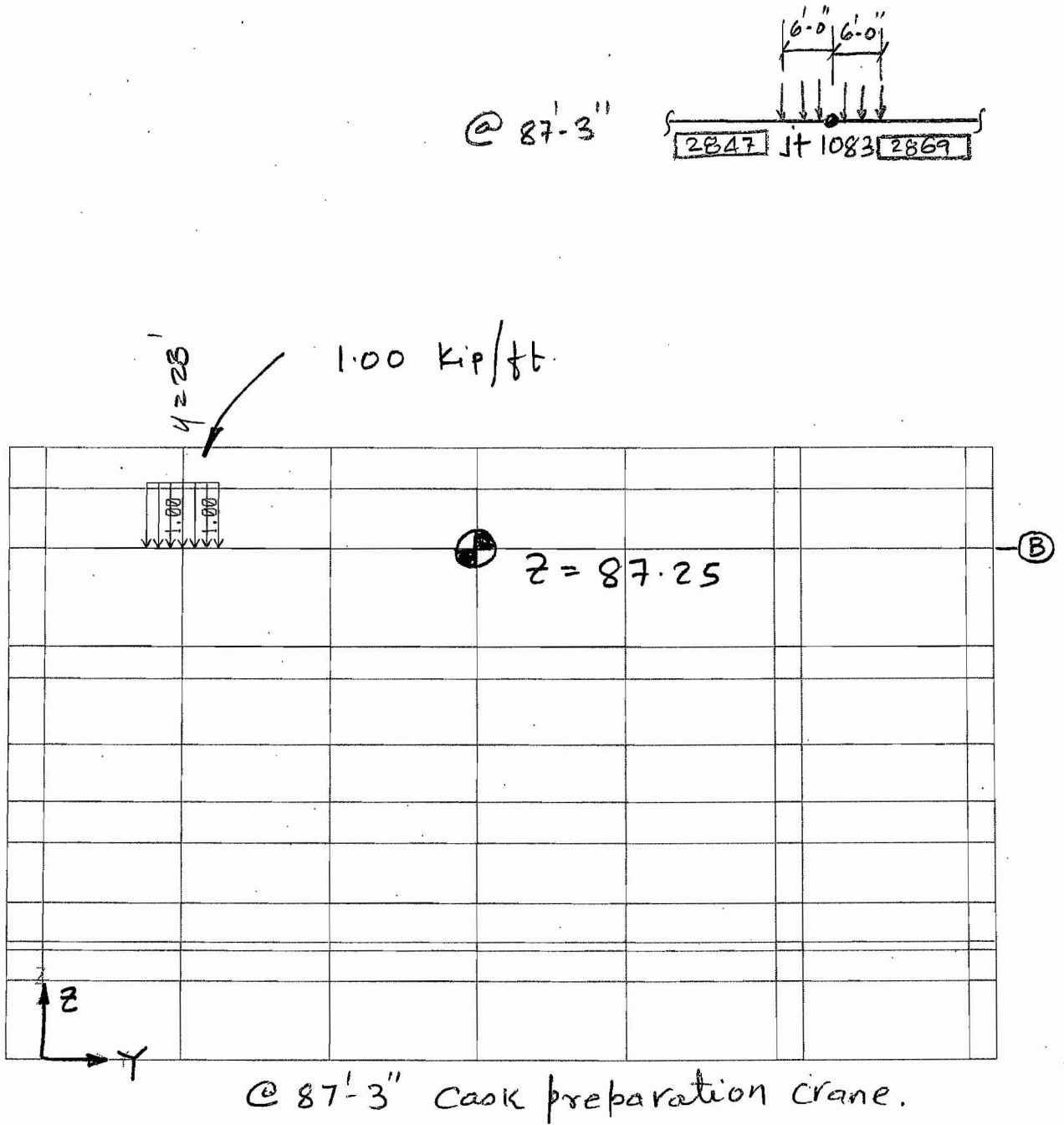
$y = 2.3$   
2.76 Kips/ft.



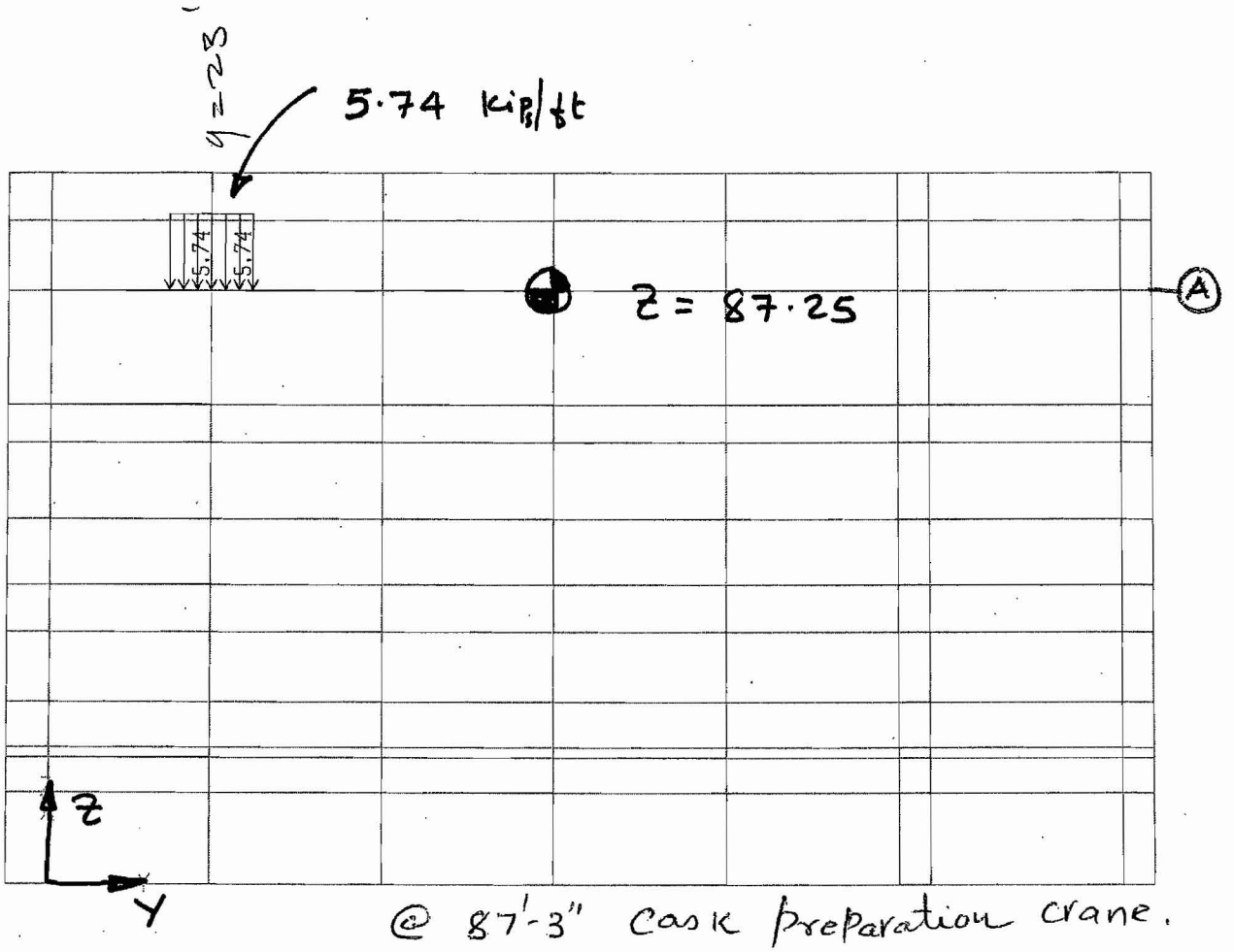
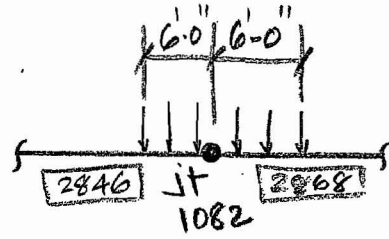
@ 87'-3" cask preparation crane.

X = 63.50

MAO  
2/2/08



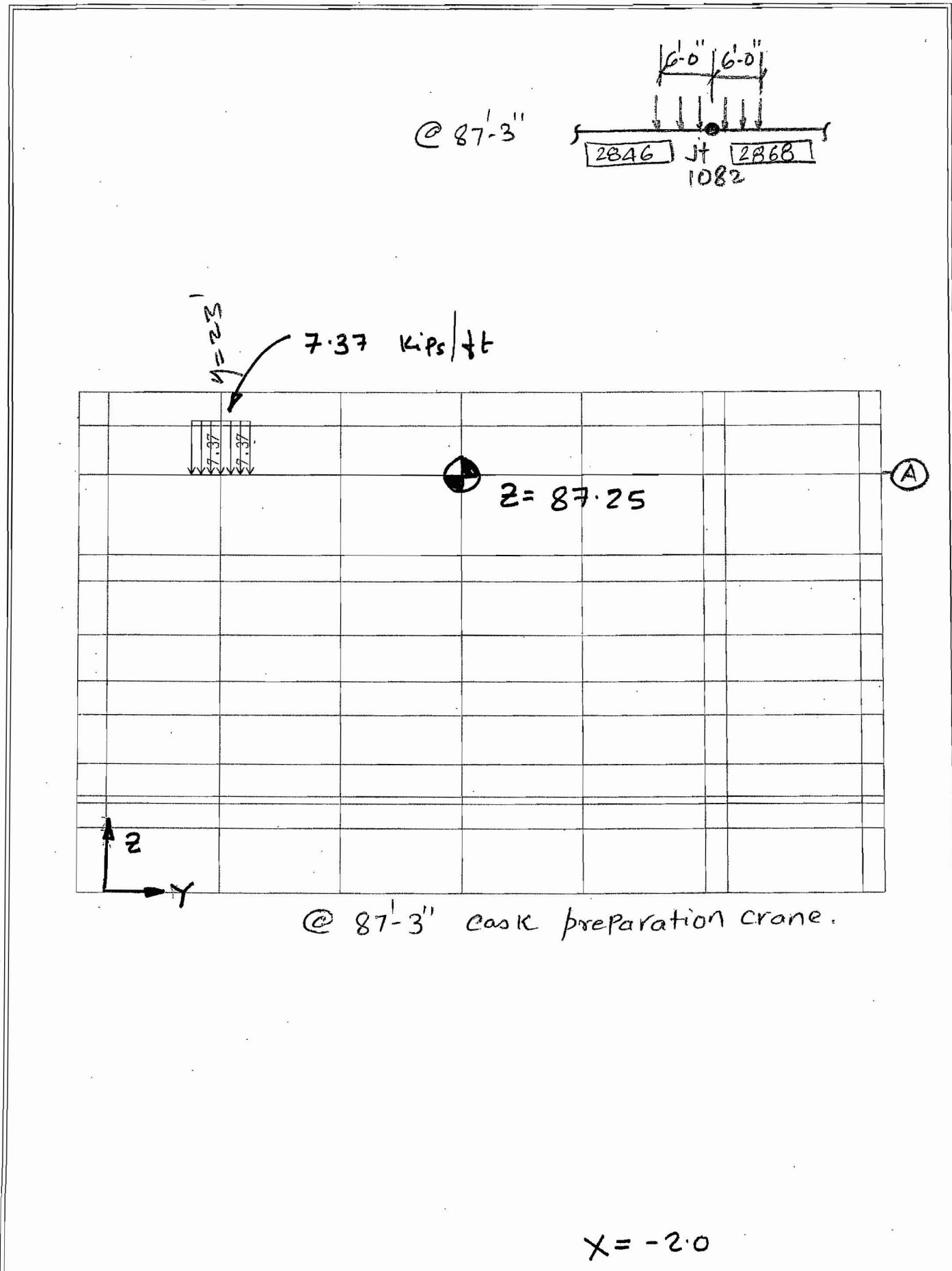
MQR  
2/21/08



@ 87'-3" cask preparation crane.

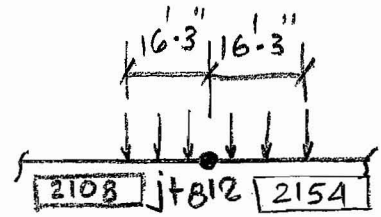
X = -2.0

MAN  
2/2/08

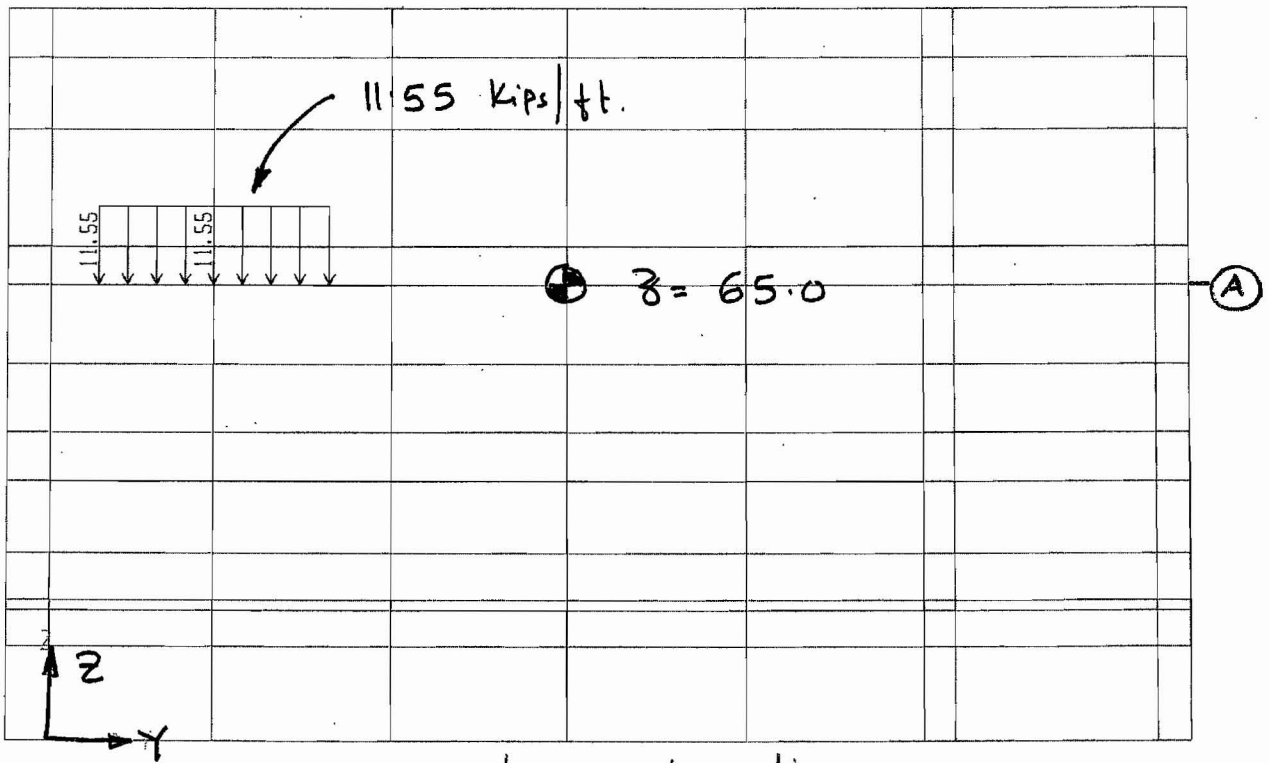


MAN  
2/21/08

@ 65'



y=0.0

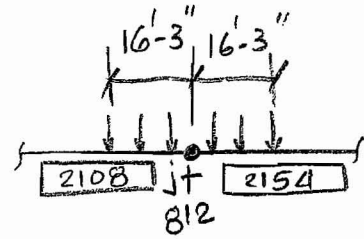


@ 65' crane handling crane.

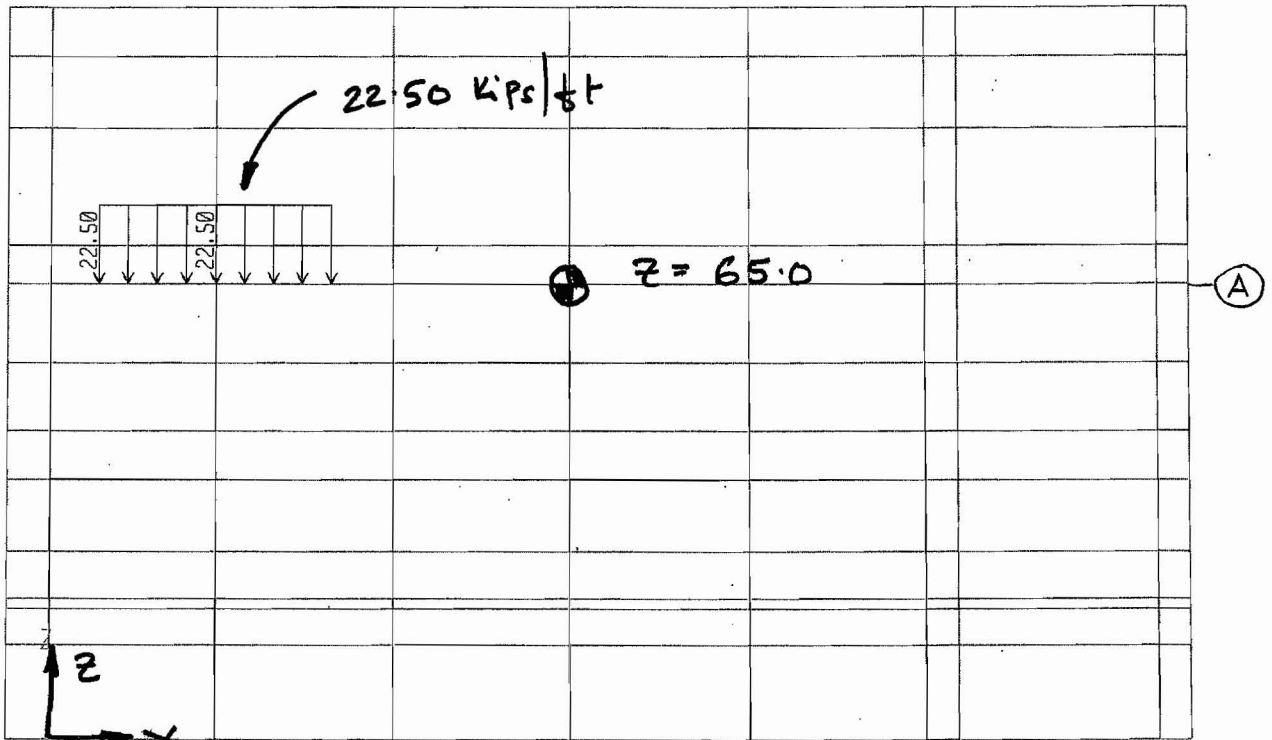
X=0.0

MAR  
2/21/08

@ 65'



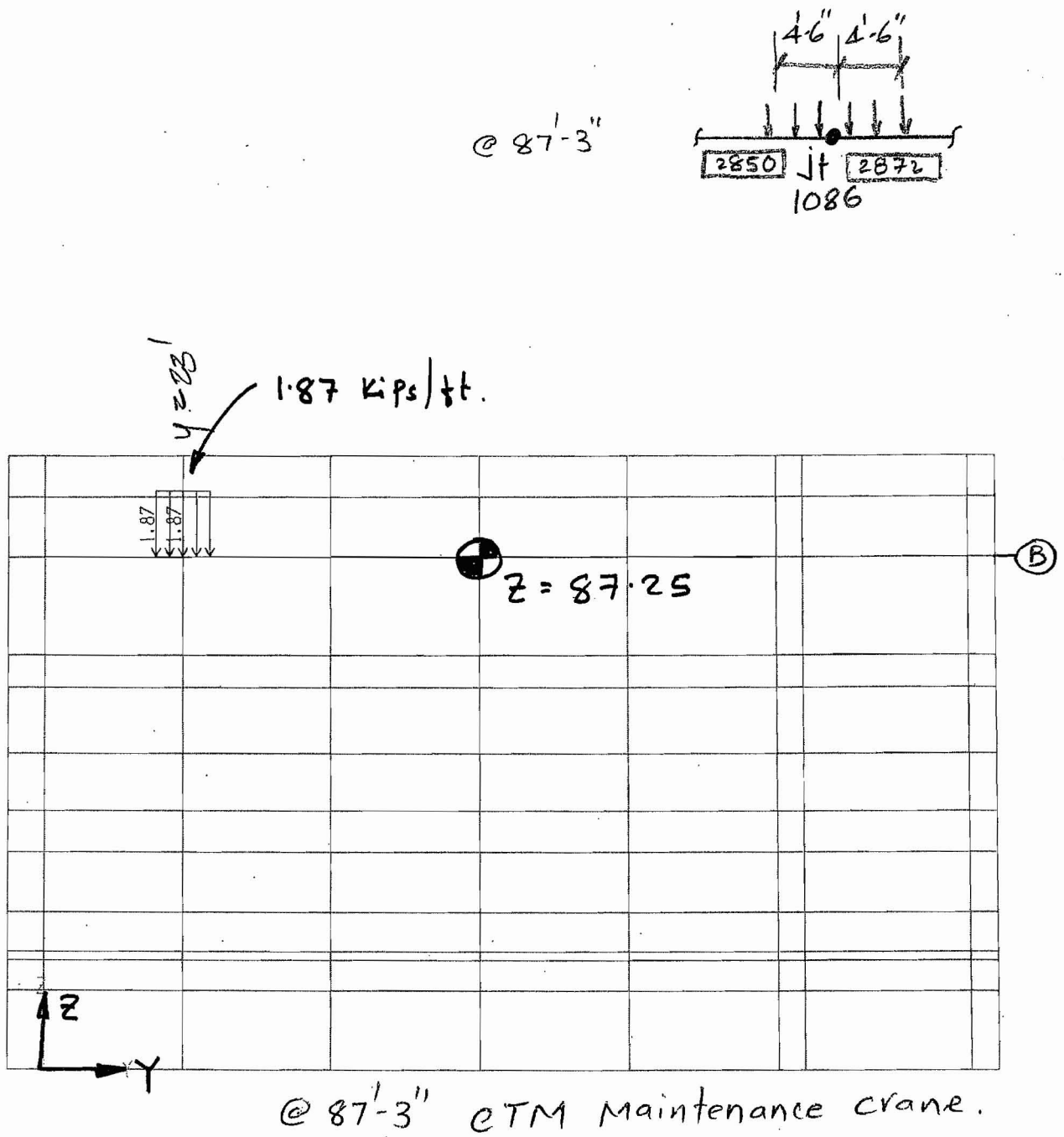
y = 23'



@ 65' cask handling crane.

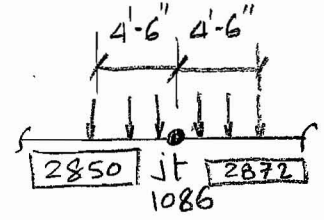
x = 0.0

MAS  
2/2/08

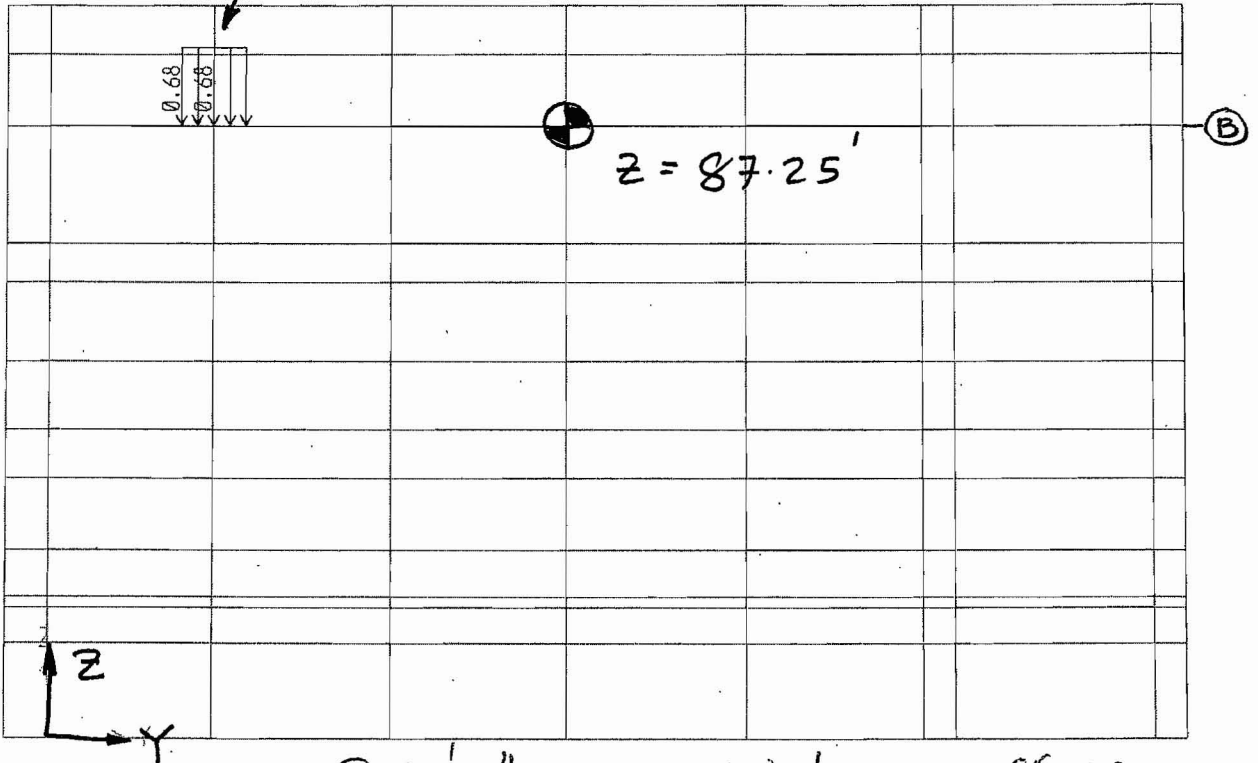


MAD  
2/21/08

@ 87'-3"



$y = z$   
0.68 kip/ft

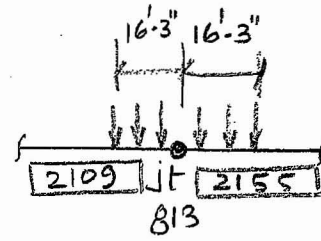


@ 87'-3" CTM Maintenance crane.

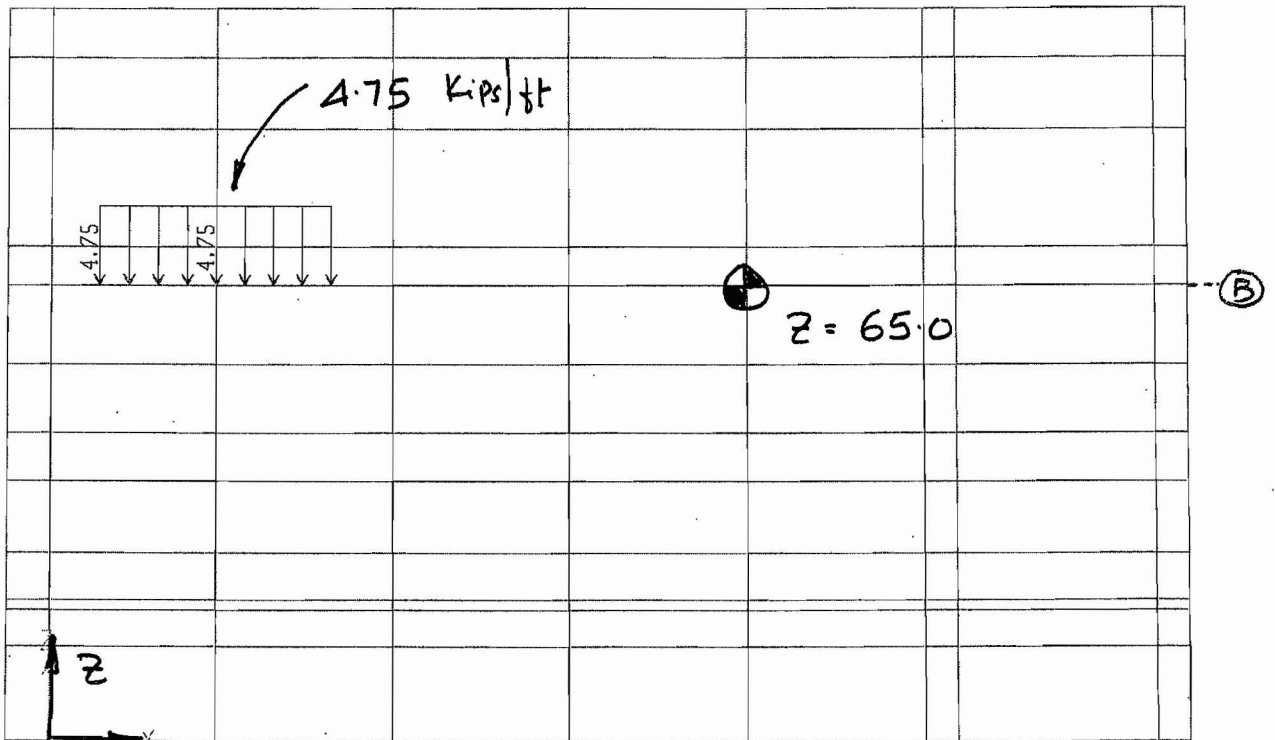
x = 78.75



@ 65'



y = 23'

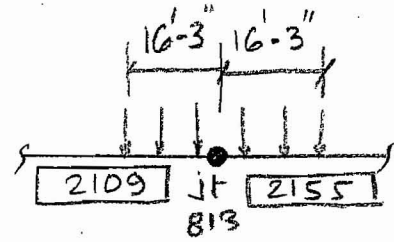


@ 65' cask handling crane.

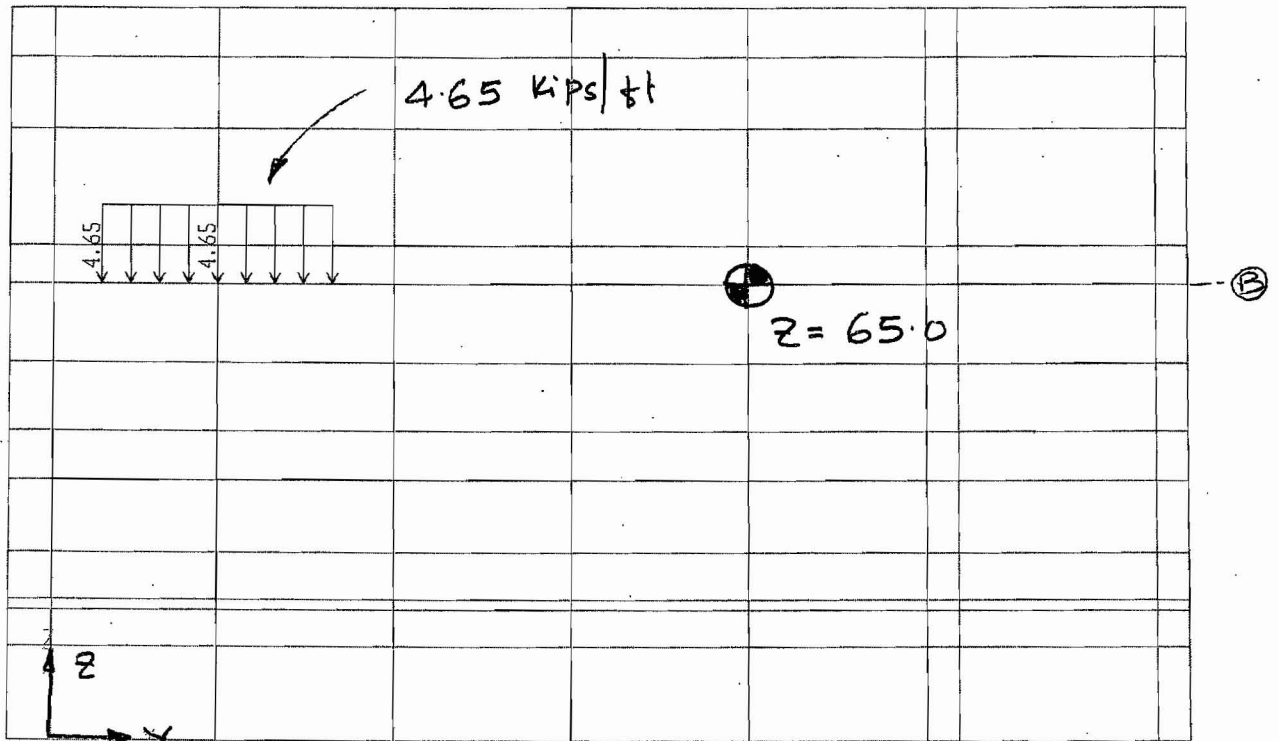
x = 59.5

MAD  
2/21/08

@ 65'



y = 23'

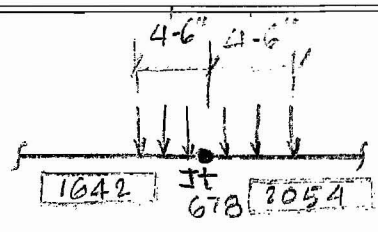


@ 65' cask handling crane.

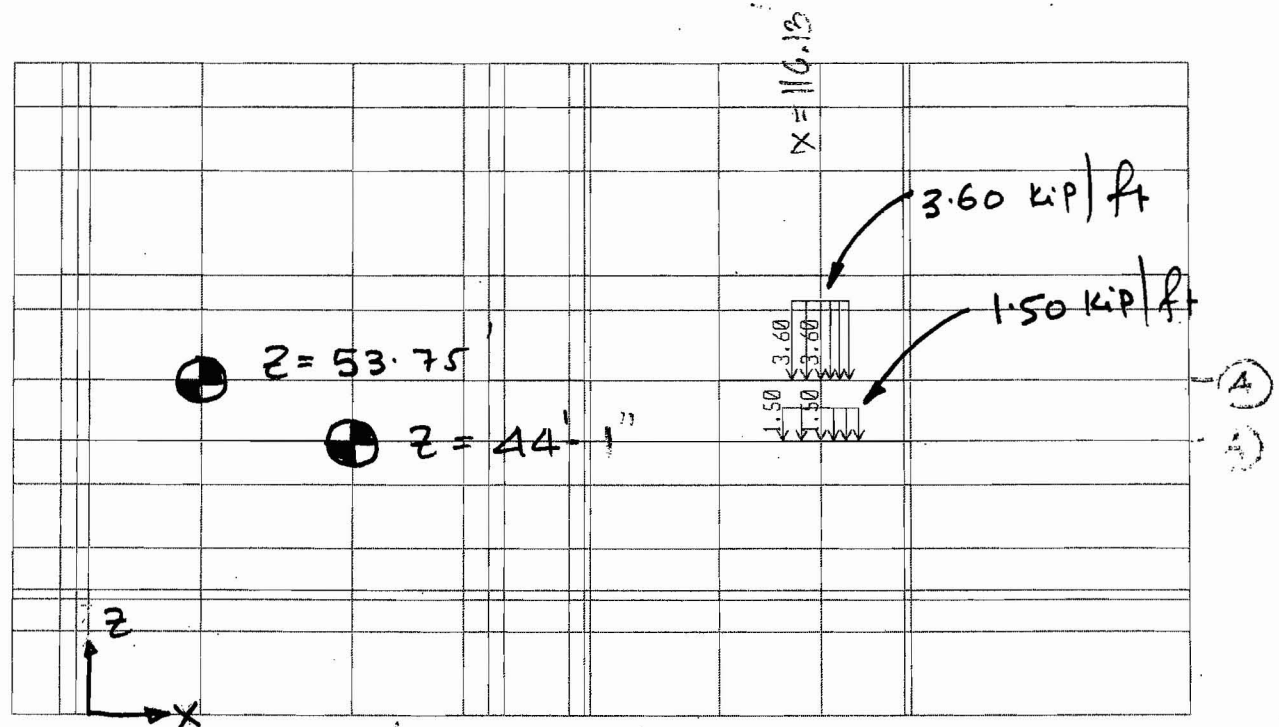
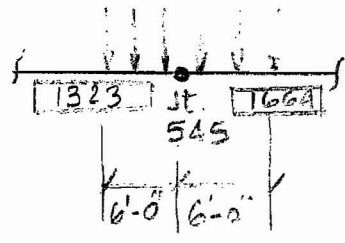
x = 59.5'

MAS  
2/2/08

@ 53'-0"



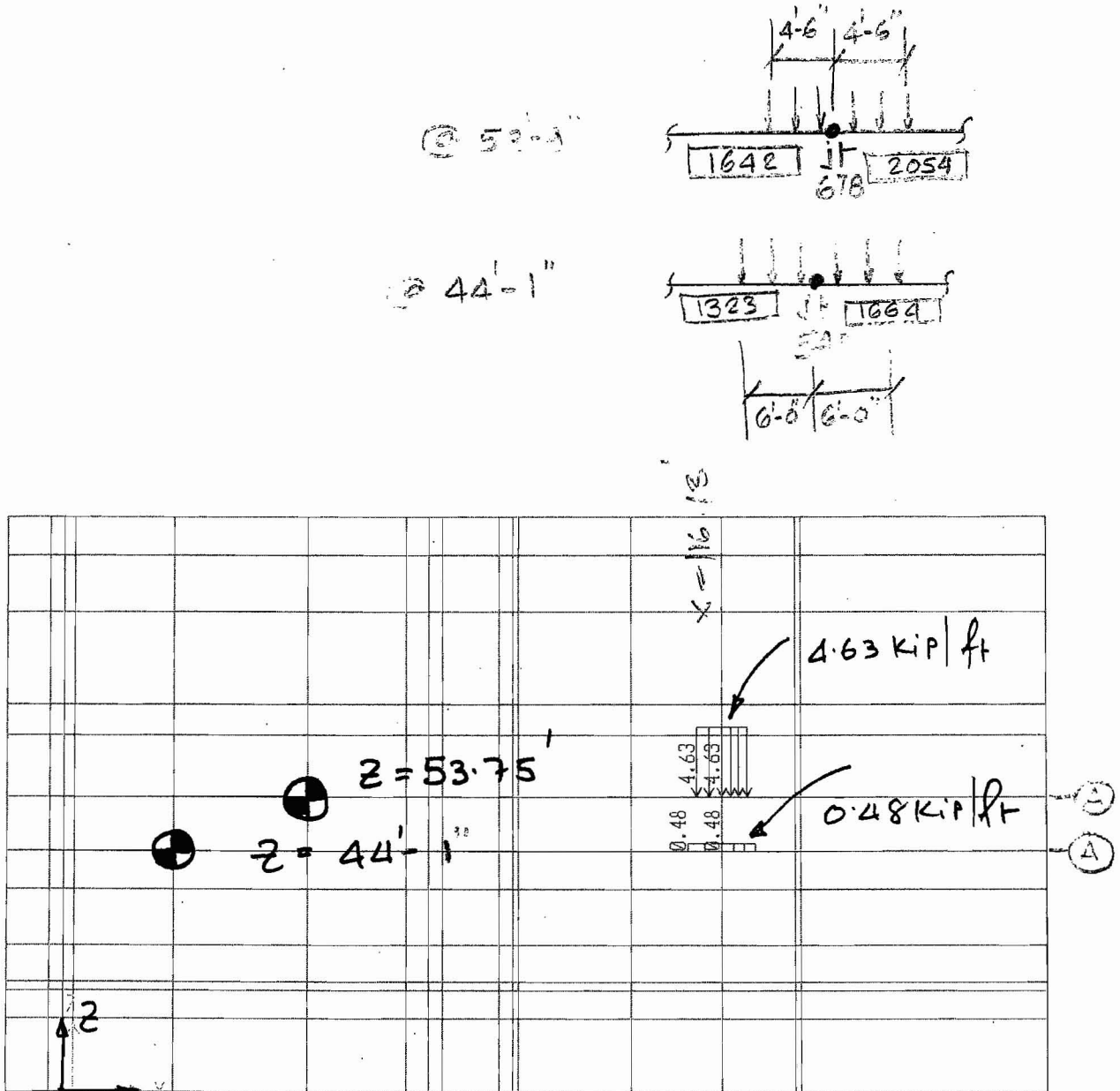
@ 44'-1"



@ 53'-75" WP closure room crane  
@ 44'-1" Remote handling crane.

Y = 155.50'

MAA  
2/21/08

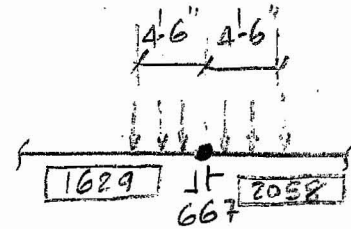


@ 53.75' WP closure room crane  
@ 44'-1" Remote handling crane.

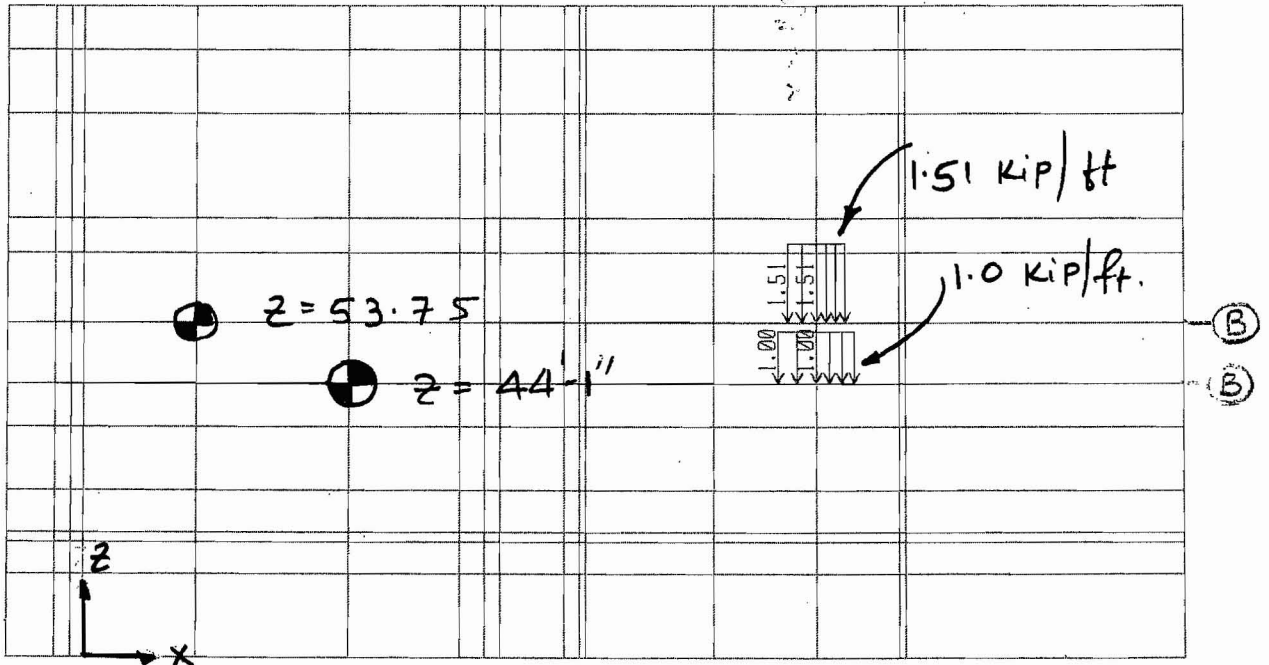
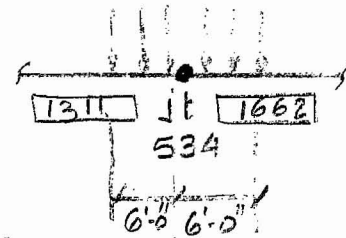
$$Y = 155.50'$$

MAN  
2/22/08

@ 53'-9"



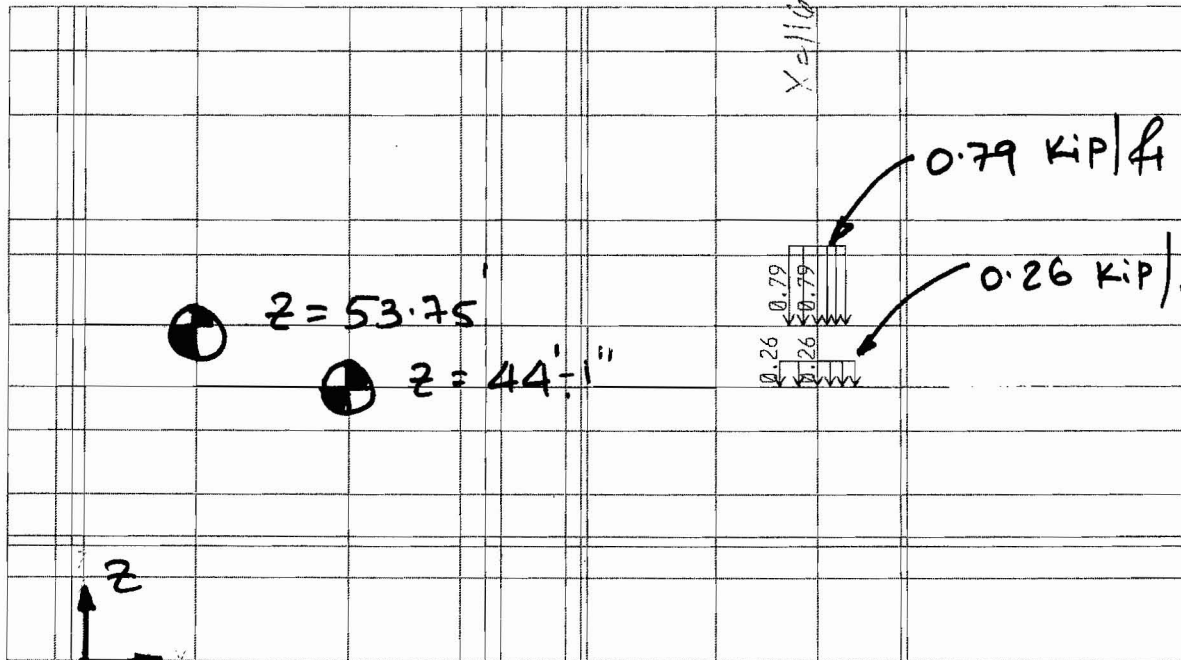
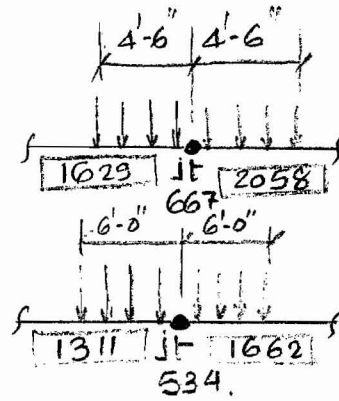
@ 44'-1"



@ 53.75' WP closure Room crane.  
@ 44'-1" Remote handling crane.

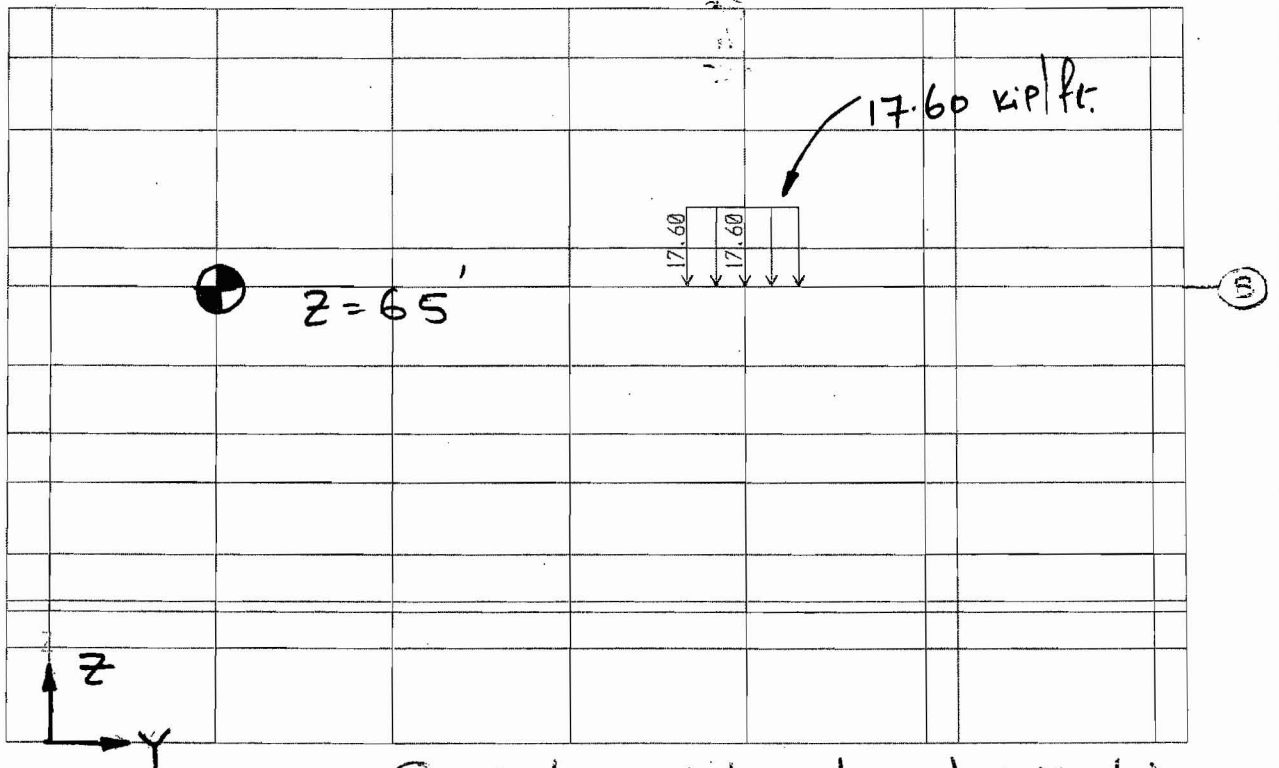
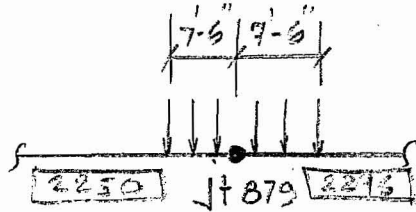
$y = 127.50'$

@ 53'-9"  
 @ 44'-1"



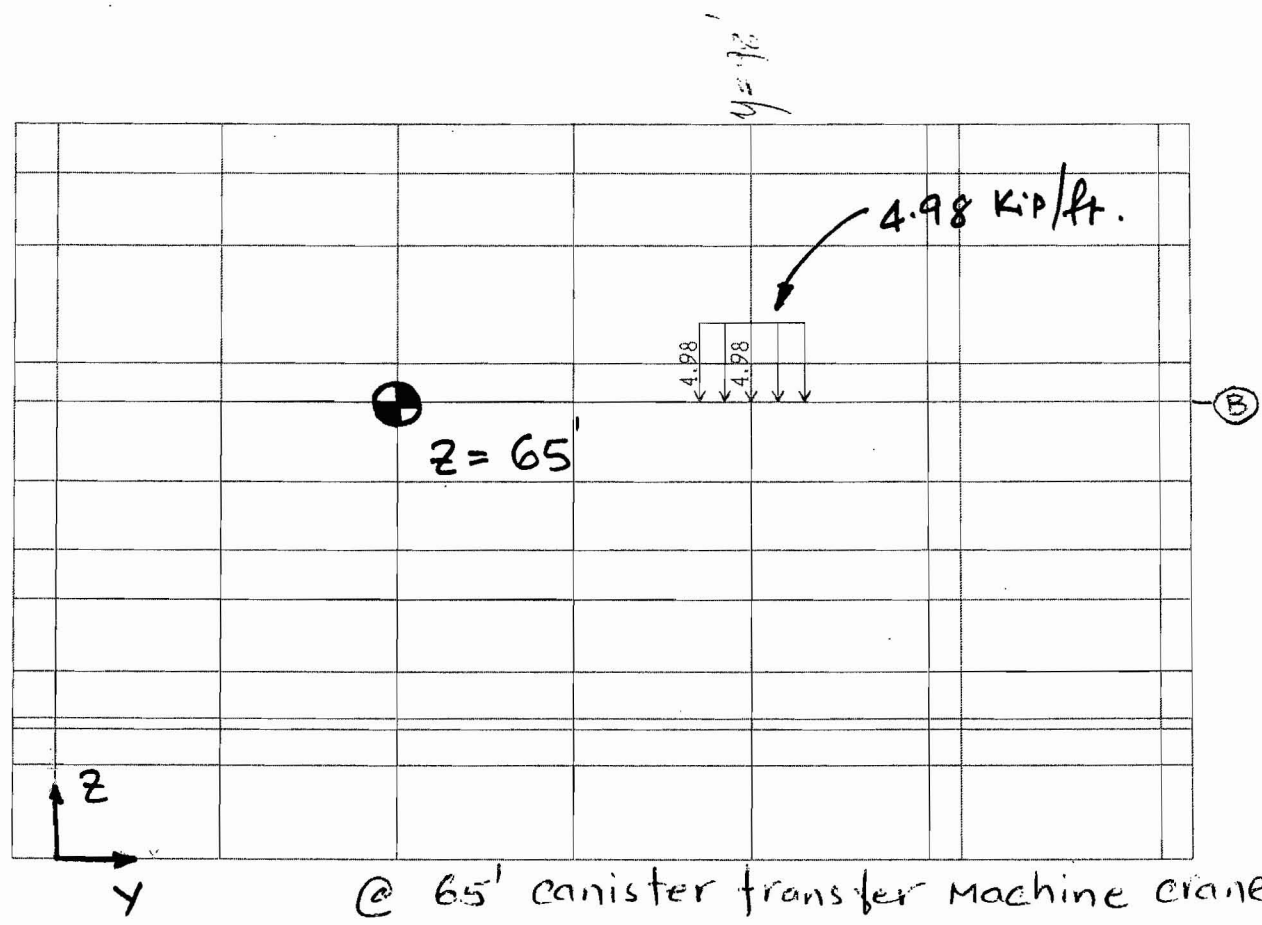
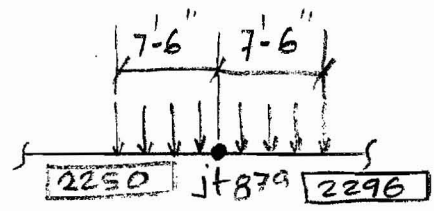
@ 53.75' WP closure room crane.  
 @ 44'-1" remote handling crane.

Y = 127'-50"



@ 65' canister transfer Machine crane.

X = 79.75'

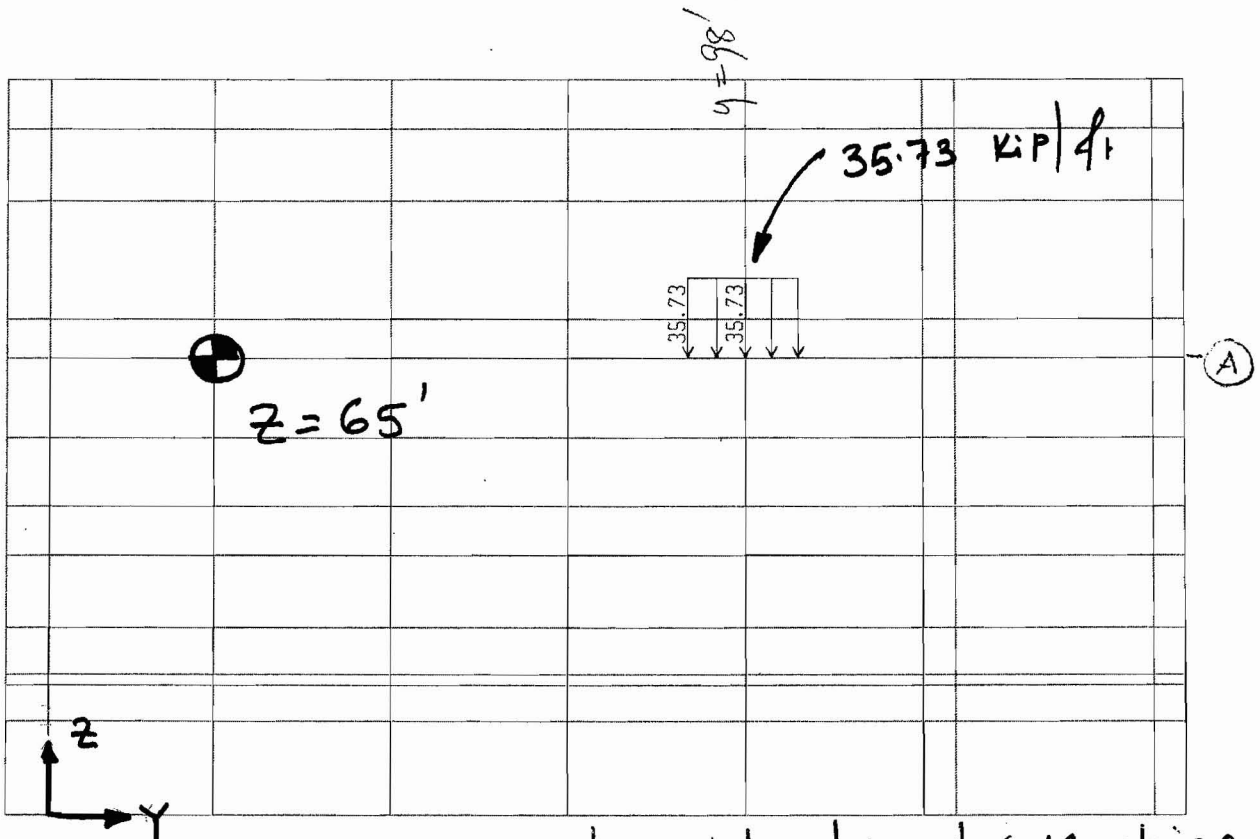
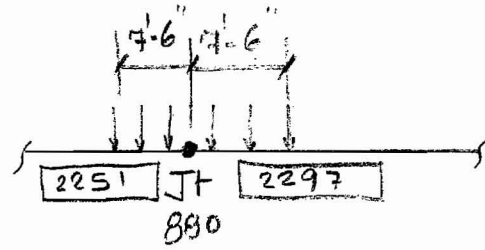


@ 65' canister transfer machine crane.

$x = 79.75'$



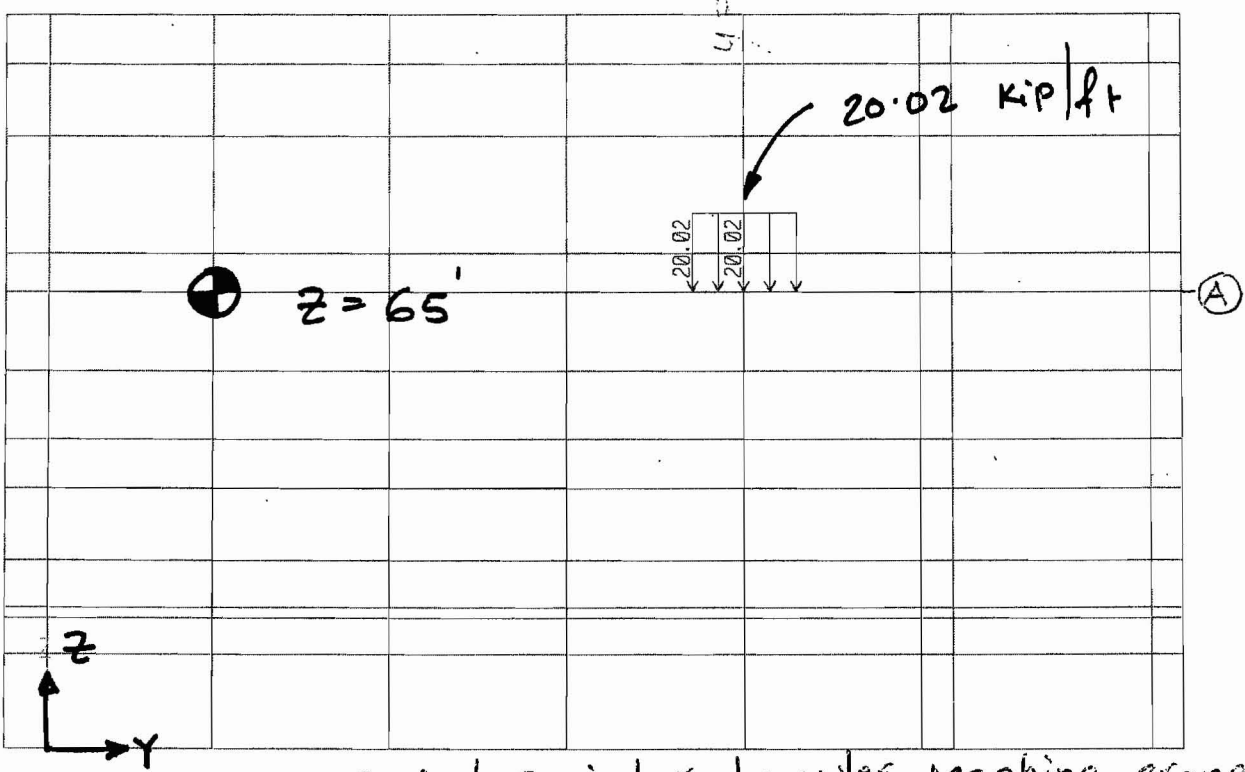
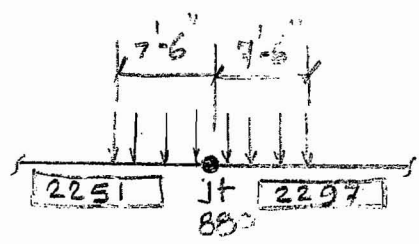
@ 65'



@ 65' canister transfer machine crane.

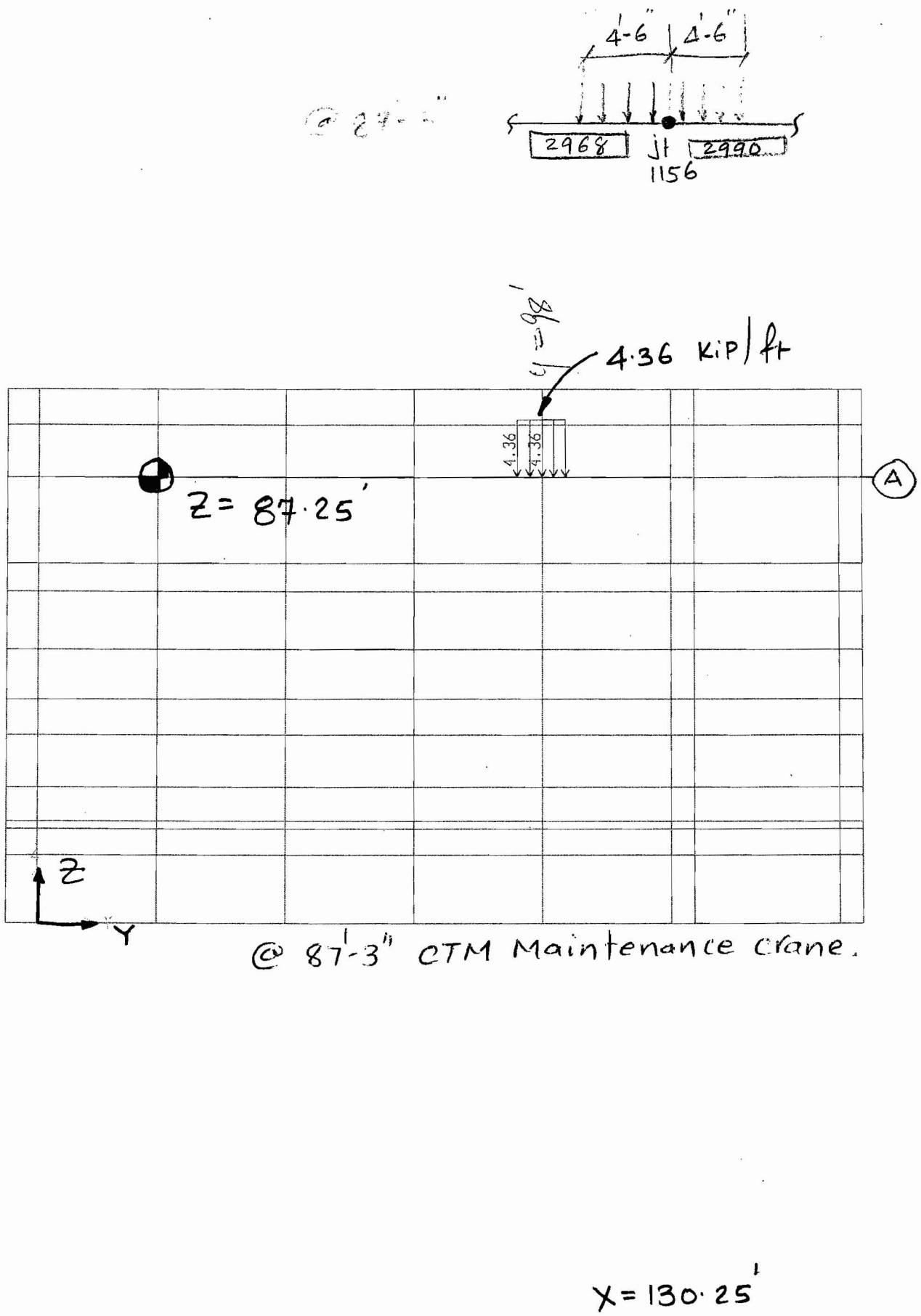
x = 129.25'

@ 65

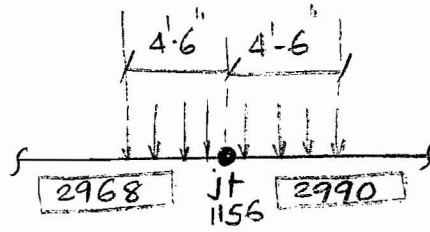


@ 65' canister transfer machine crane.

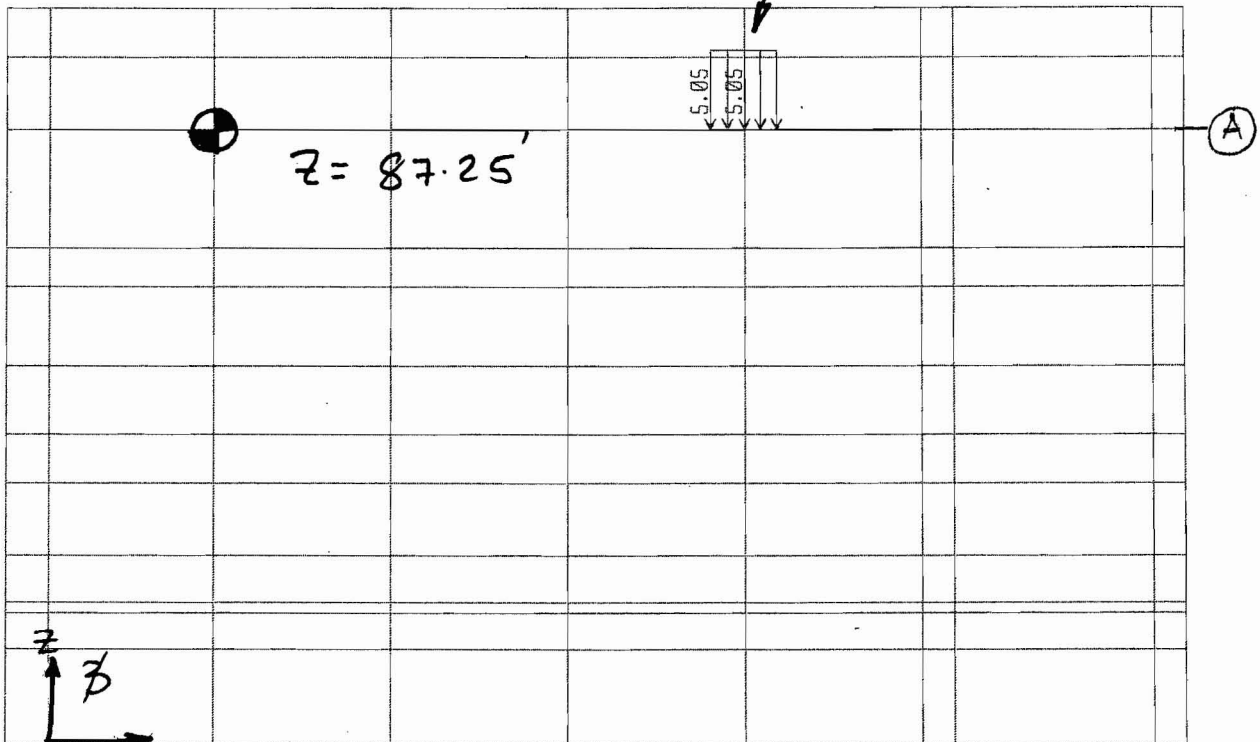
X = 129.25



@ 87'-3"



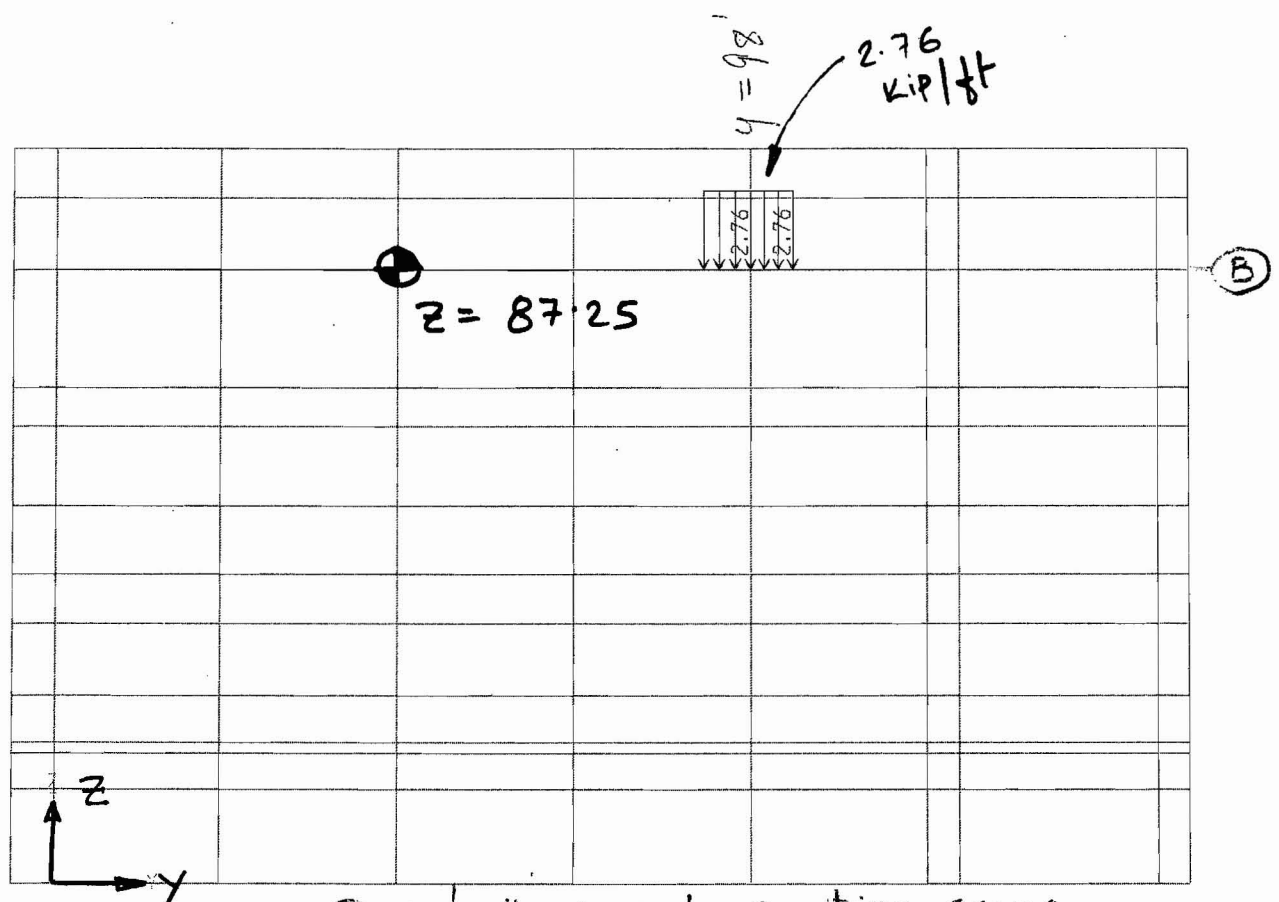
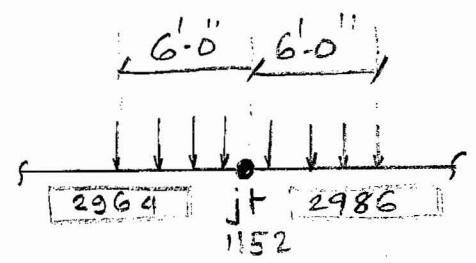
5.05 kip/ft



@ 87'-3" CTM maintenance crane.

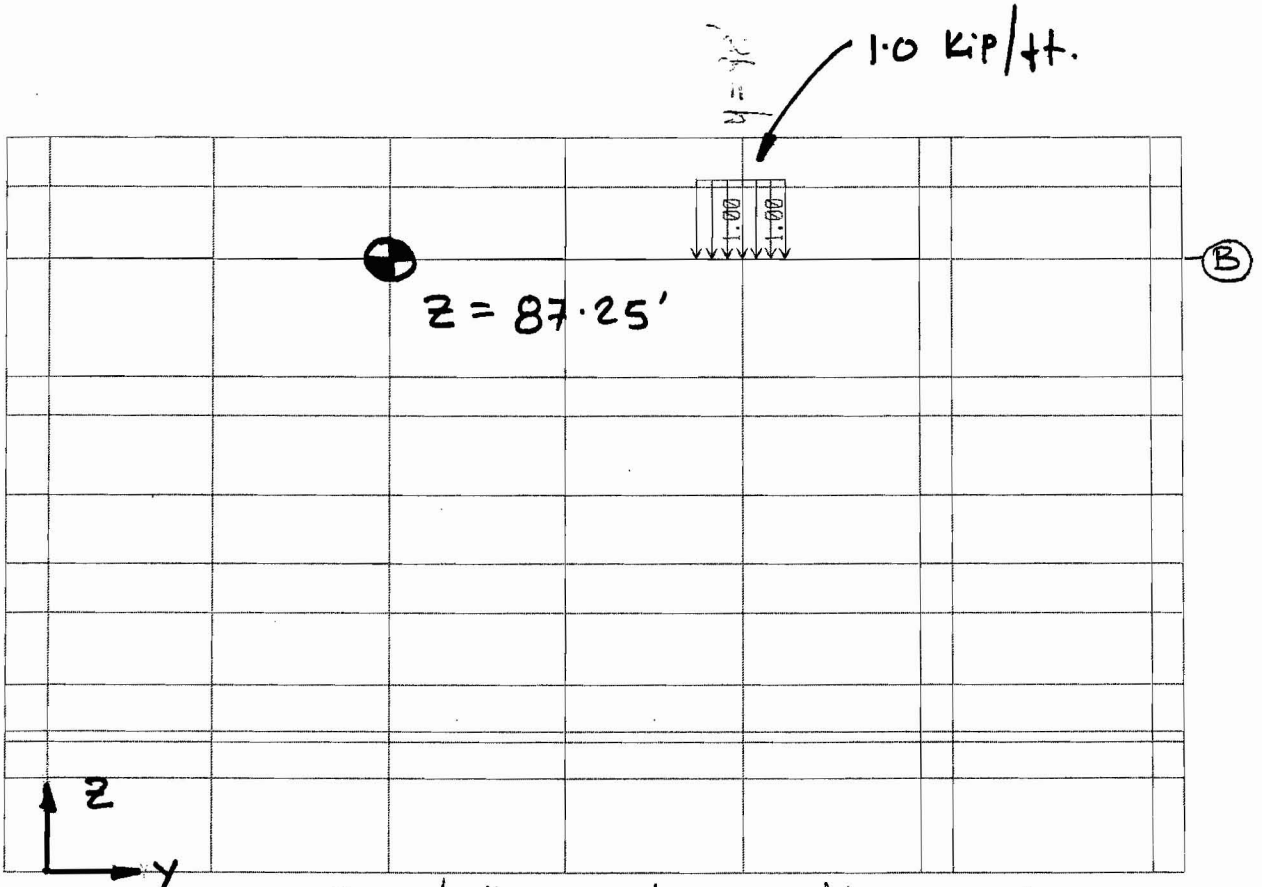
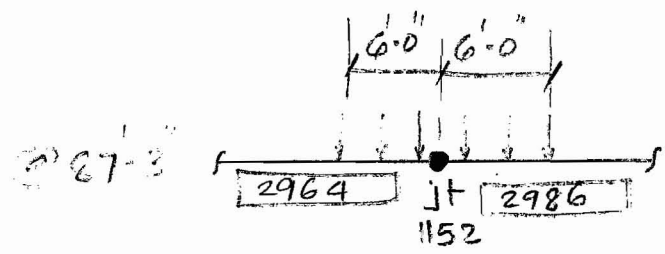
X = 130.25'

@ 87'-3"



@ 87'-3" Cask preparation crane.

X = 63.50'

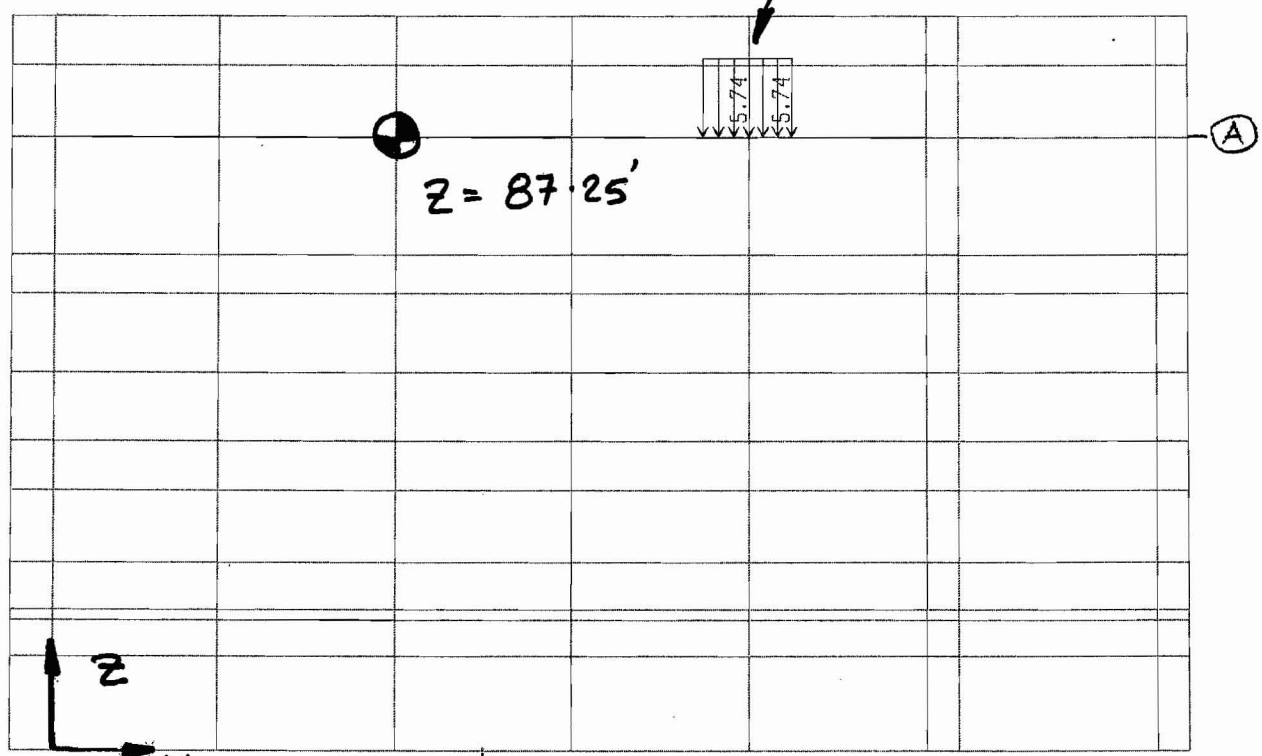
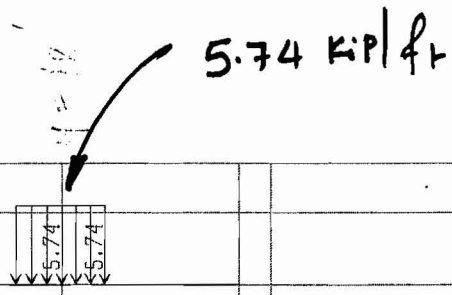
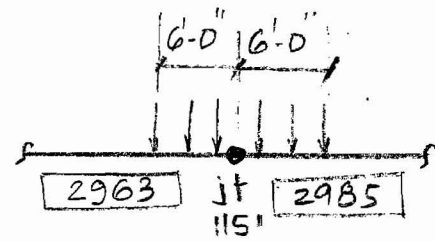


@ 87'-3" cask preparation crane.

$x = 63.50'$

MAA  
2/2/08

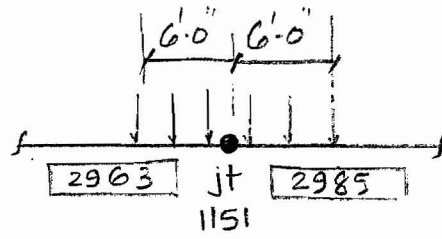
@ 87'-3"



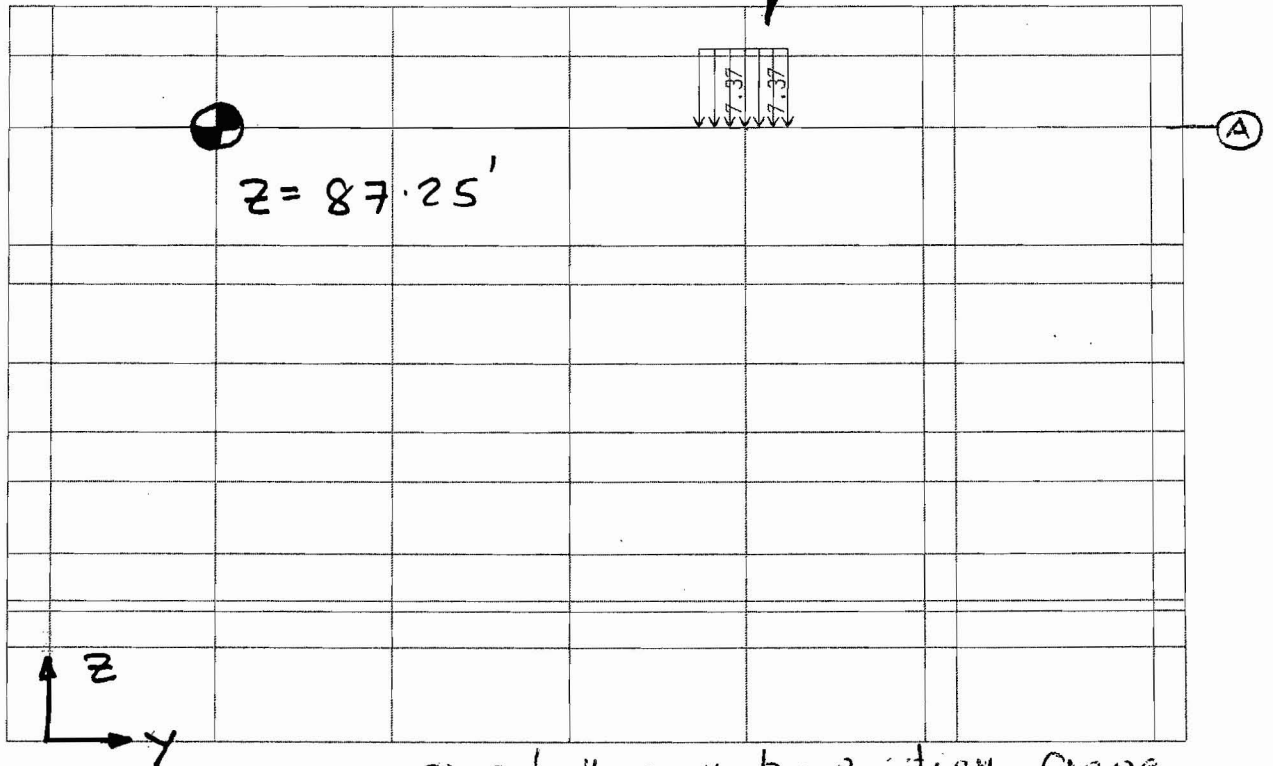
@ 87'-3" cask preparation crane.

x = -2.0'

@ 87'-3"



7.37 kip/ft

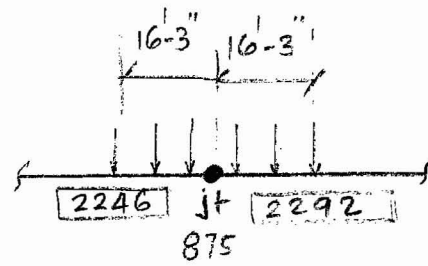


@ 87'-3" cask preparation crane.

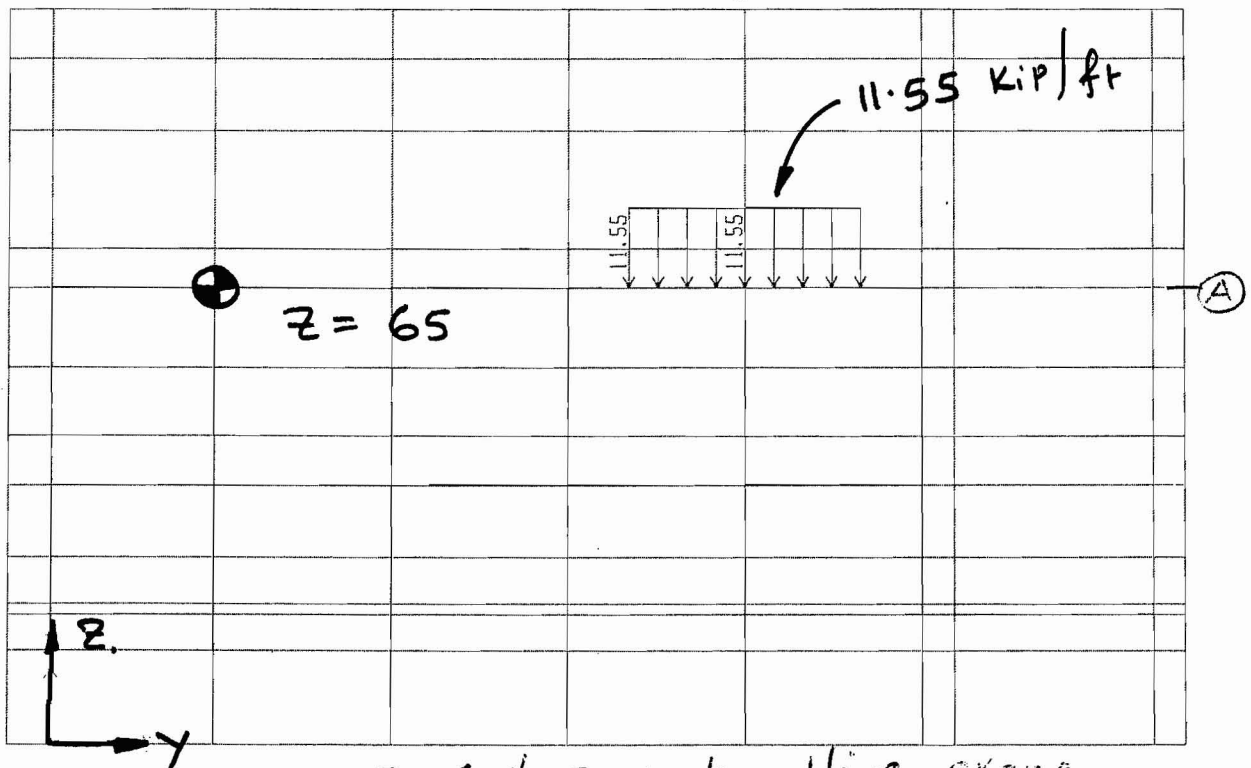
x = -2.0'



@ 65'



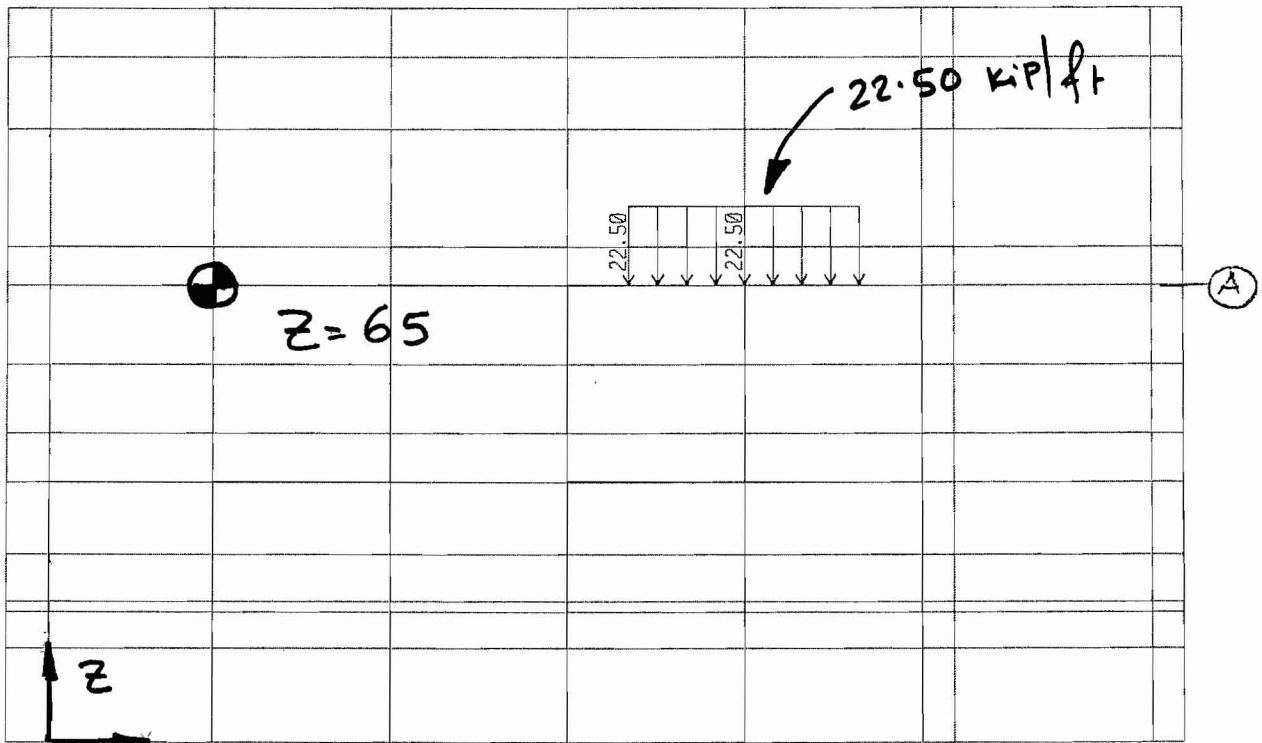
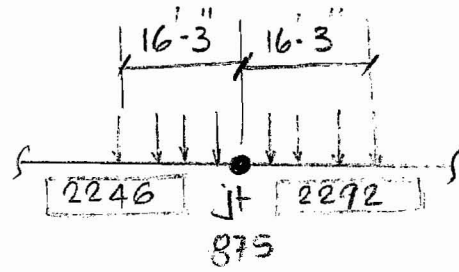
$y = h$



@ 65' cask handling crane.

x = 0.0'

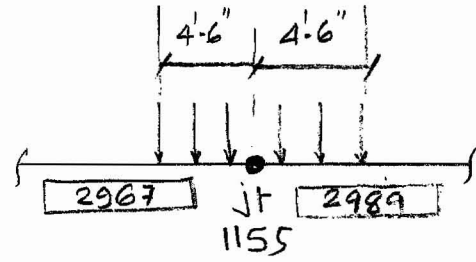
@ 65'



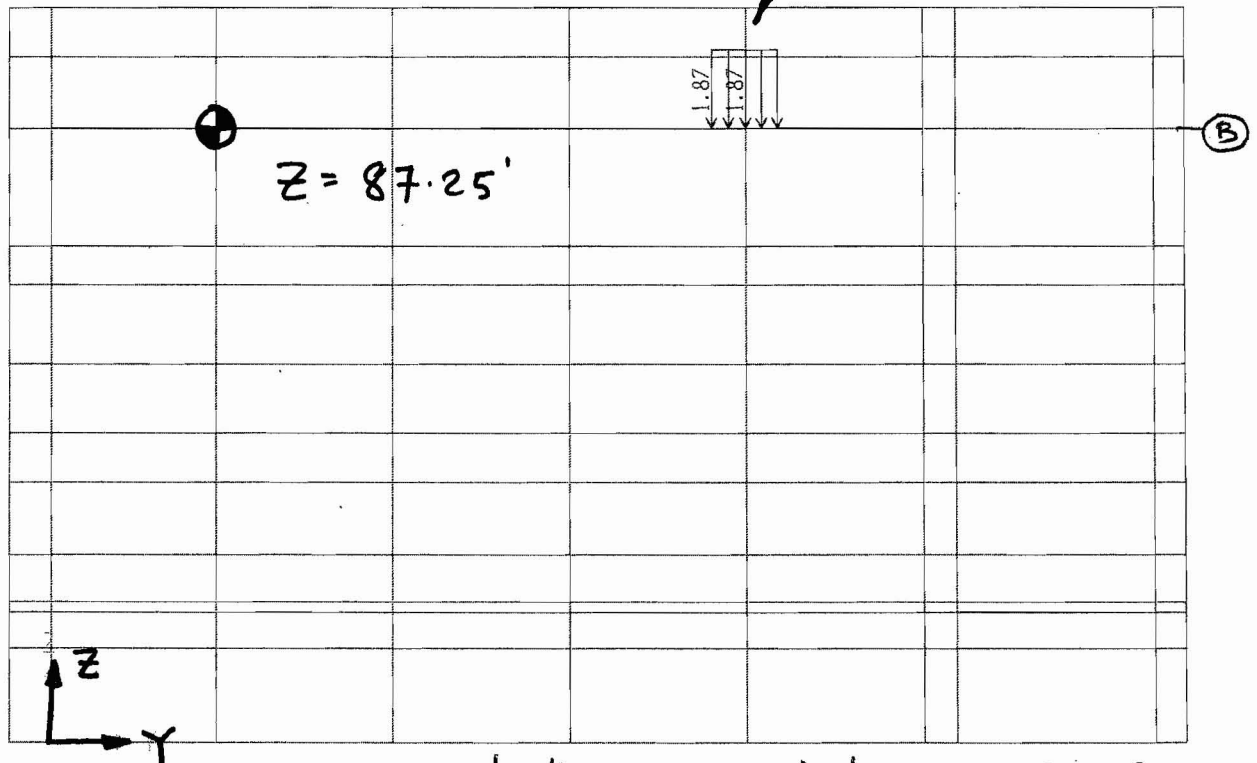
@ 65' cask handling crane.

x = 0.0'

@ 87'-3"



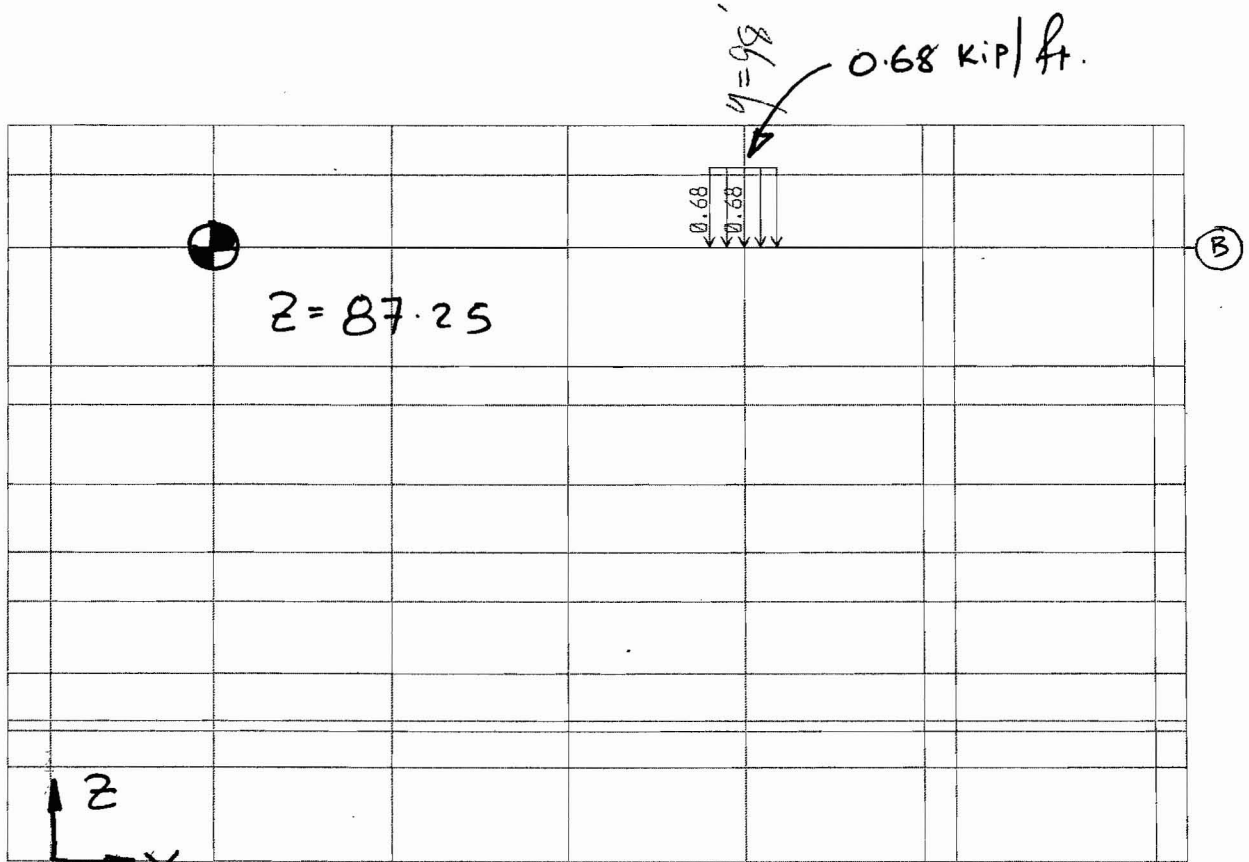
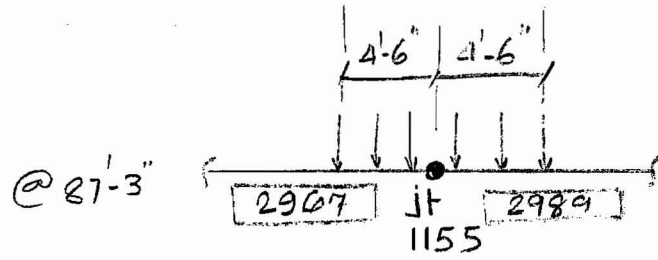
1.87 KIP/ft



@ 87'-3" CTM Maintenance crane.

X = 78.75'

MAA  
2/21/08

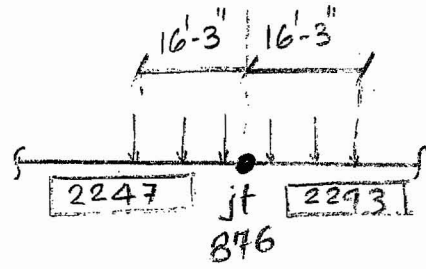


$@ 87'-3"$  CTM maintenance crane.

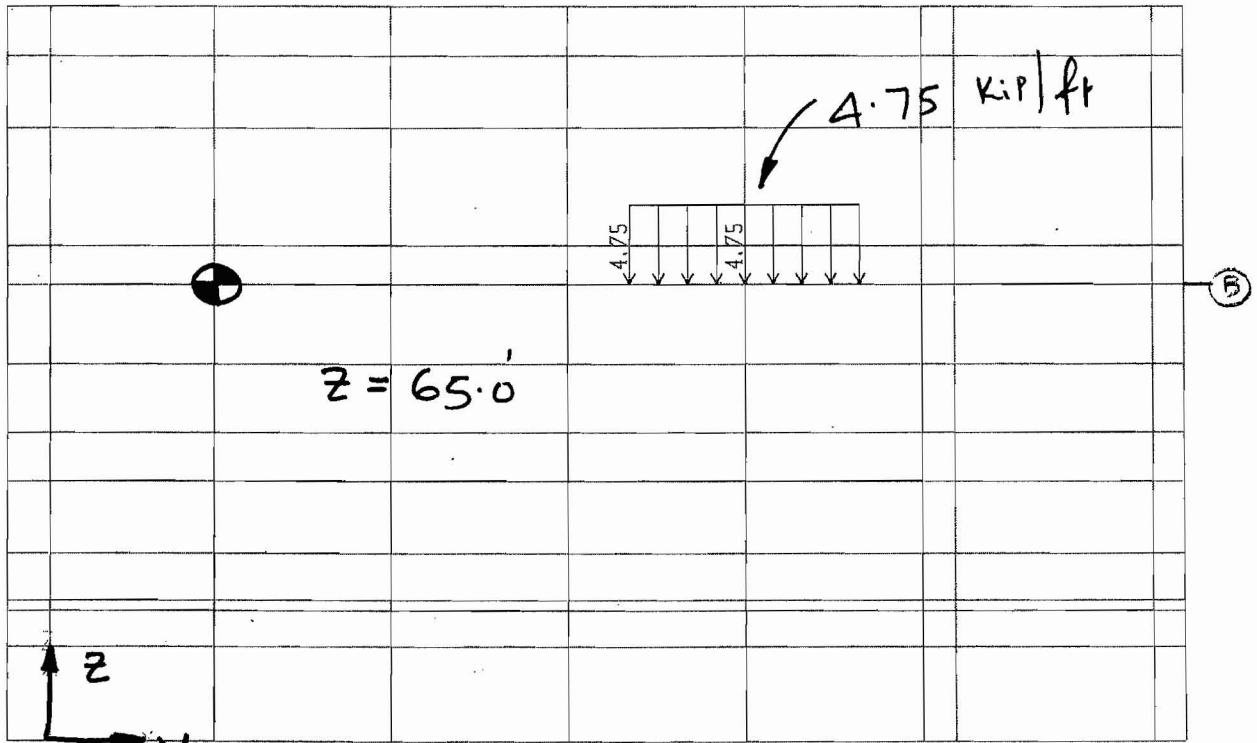
$X = 78.75'$

MAA  
2/21/08

ⓐ 65'



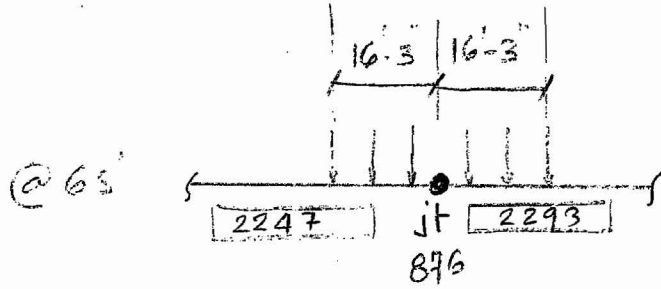
4 = 98'



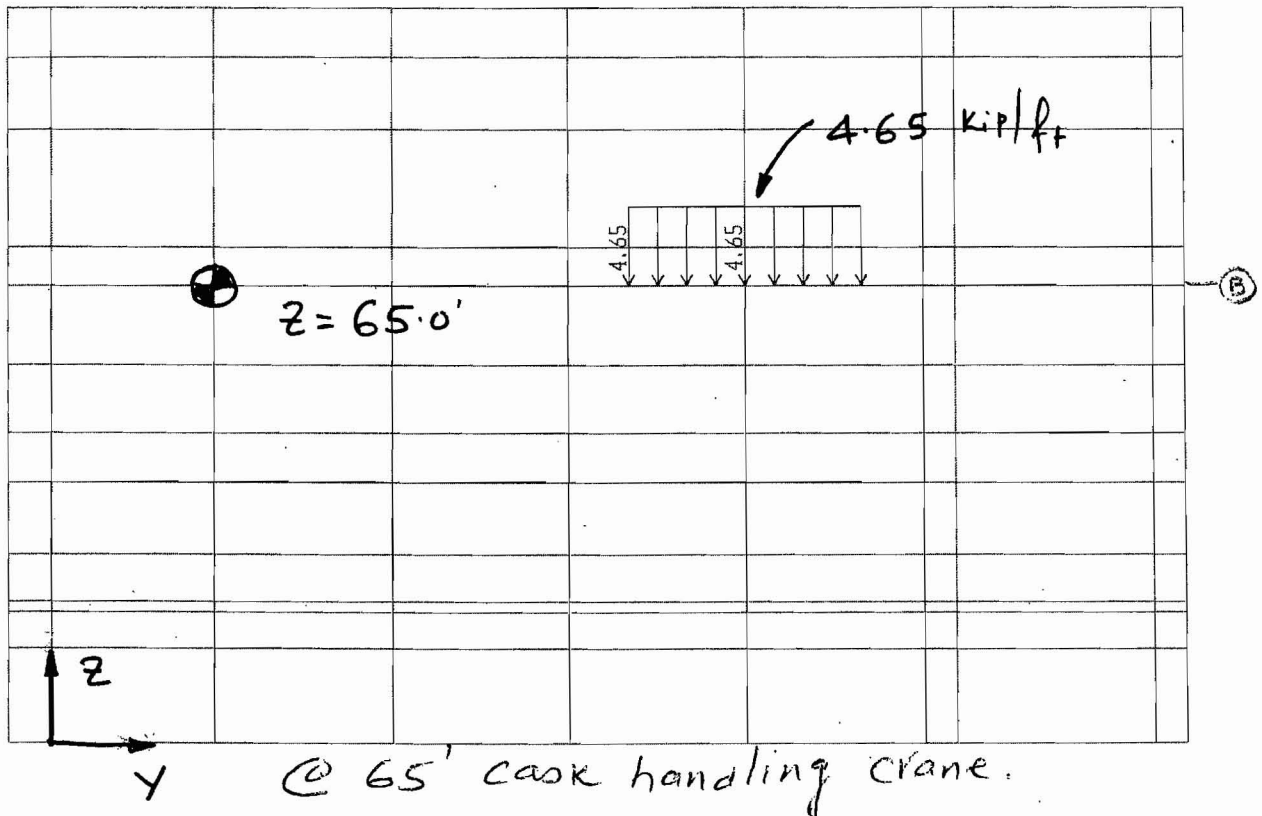
@ 65' cask handling crane.

$x = 59.50'$

MDA  
2/21/08

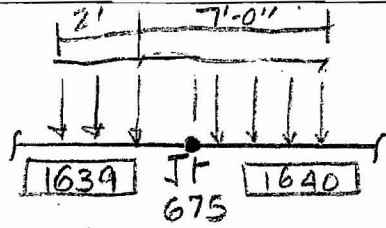


$C_p = 0.92$

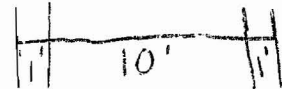
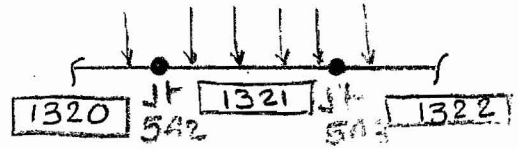


x = 59.50'

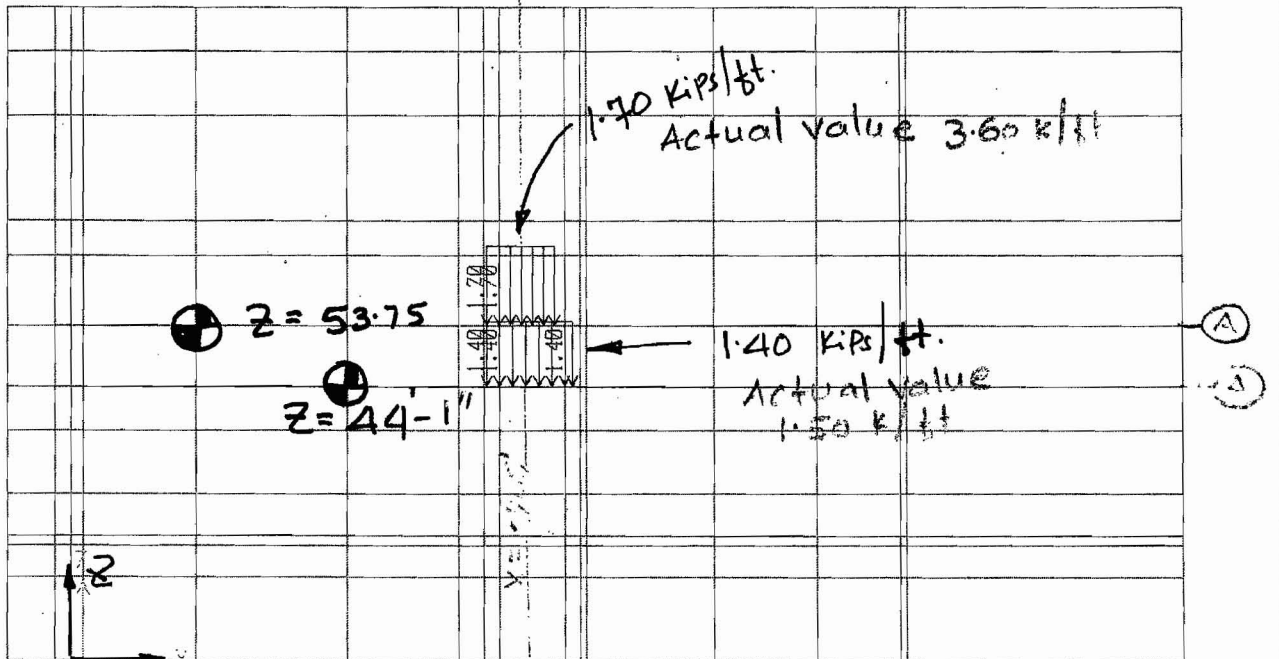
@ 53'-9"



@ 44'-1"



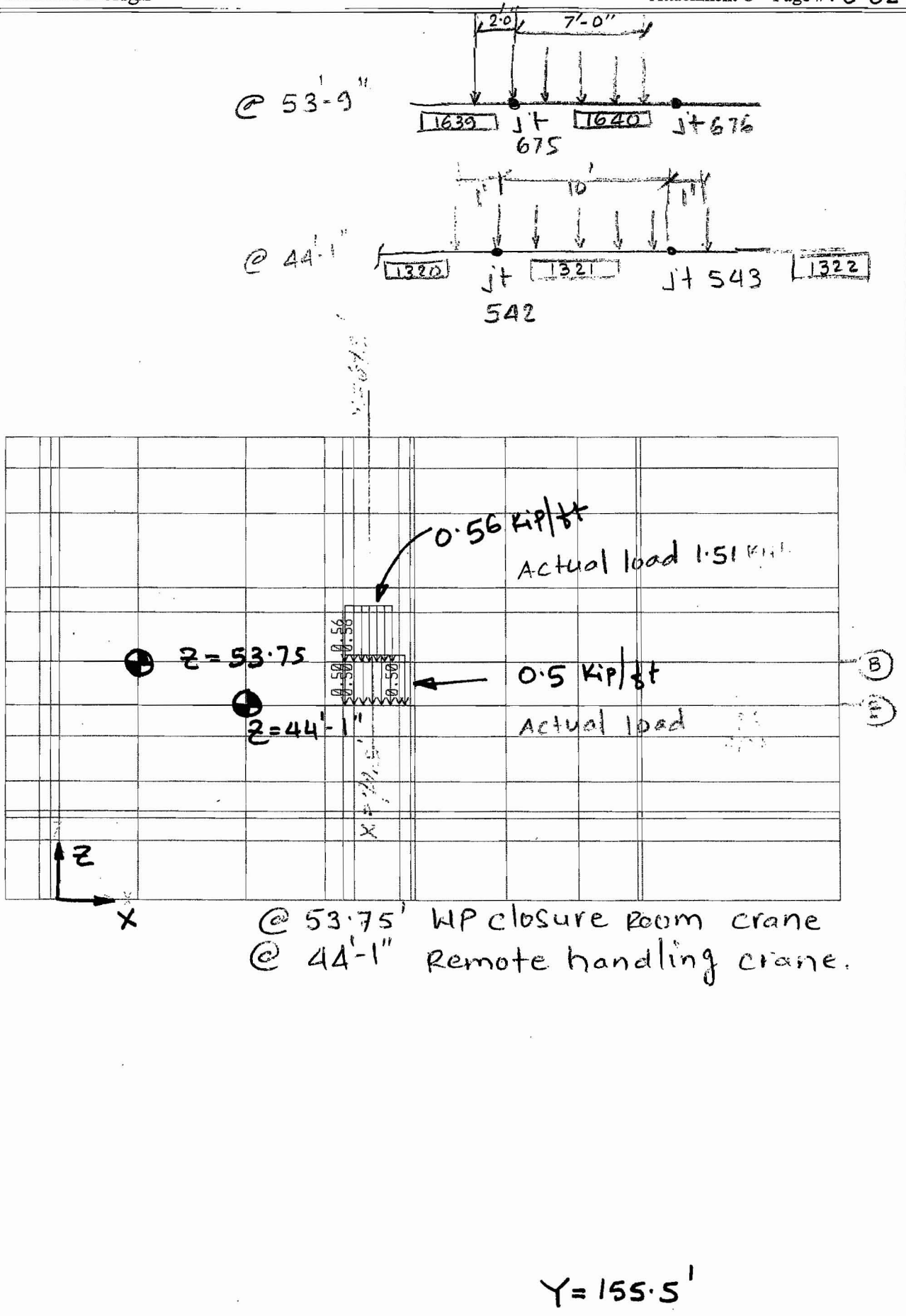
X = 69.5



@ 53.75' WP closure room crane.  
 @ 44'-1" Remote handling crane.

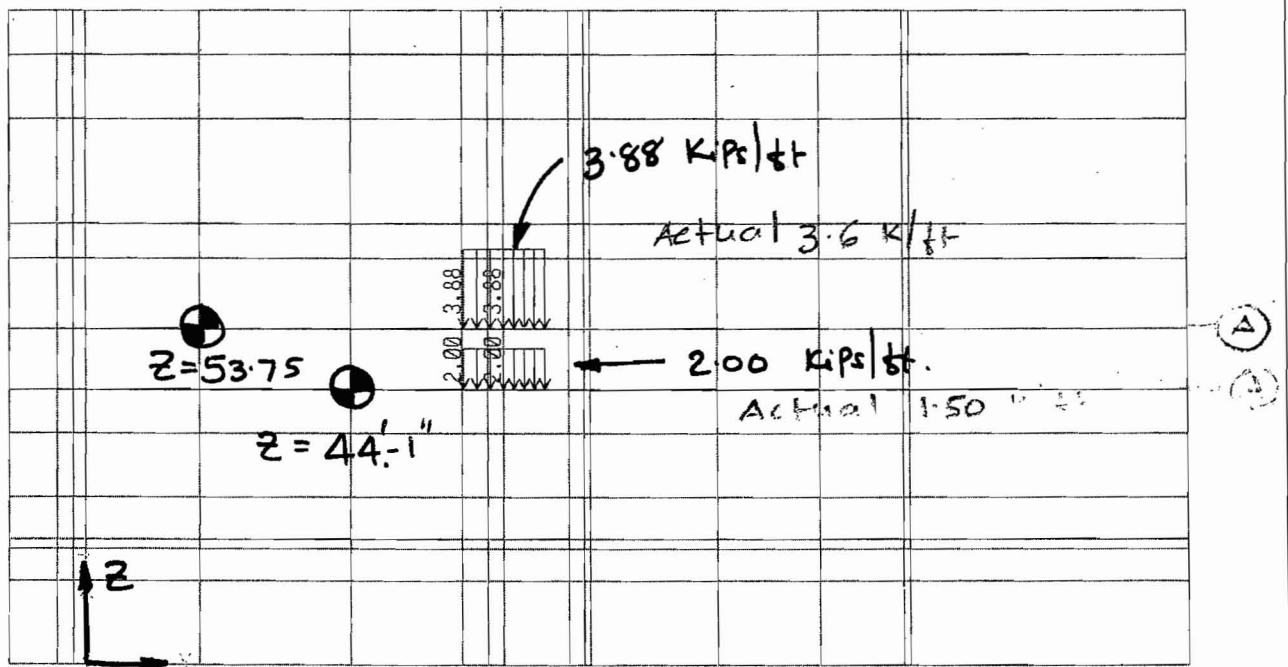
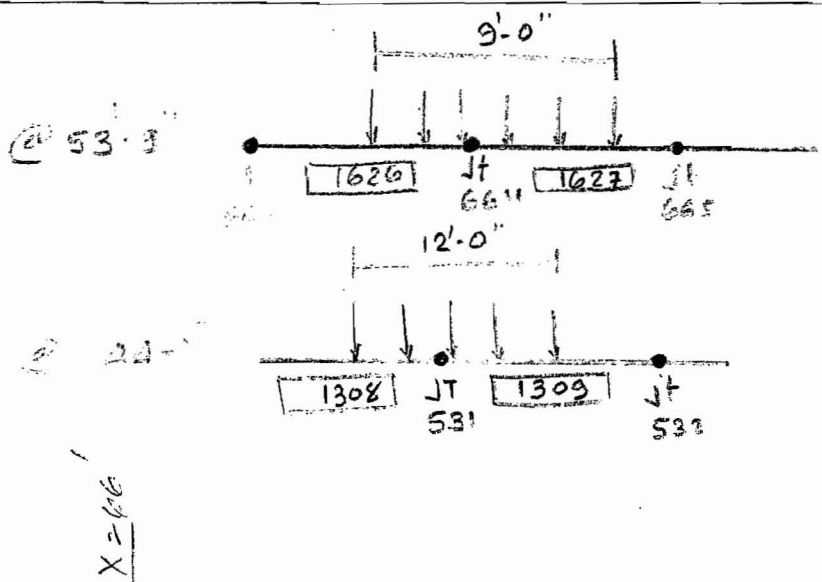
Y = 153.5'

MAD  
2/2/08





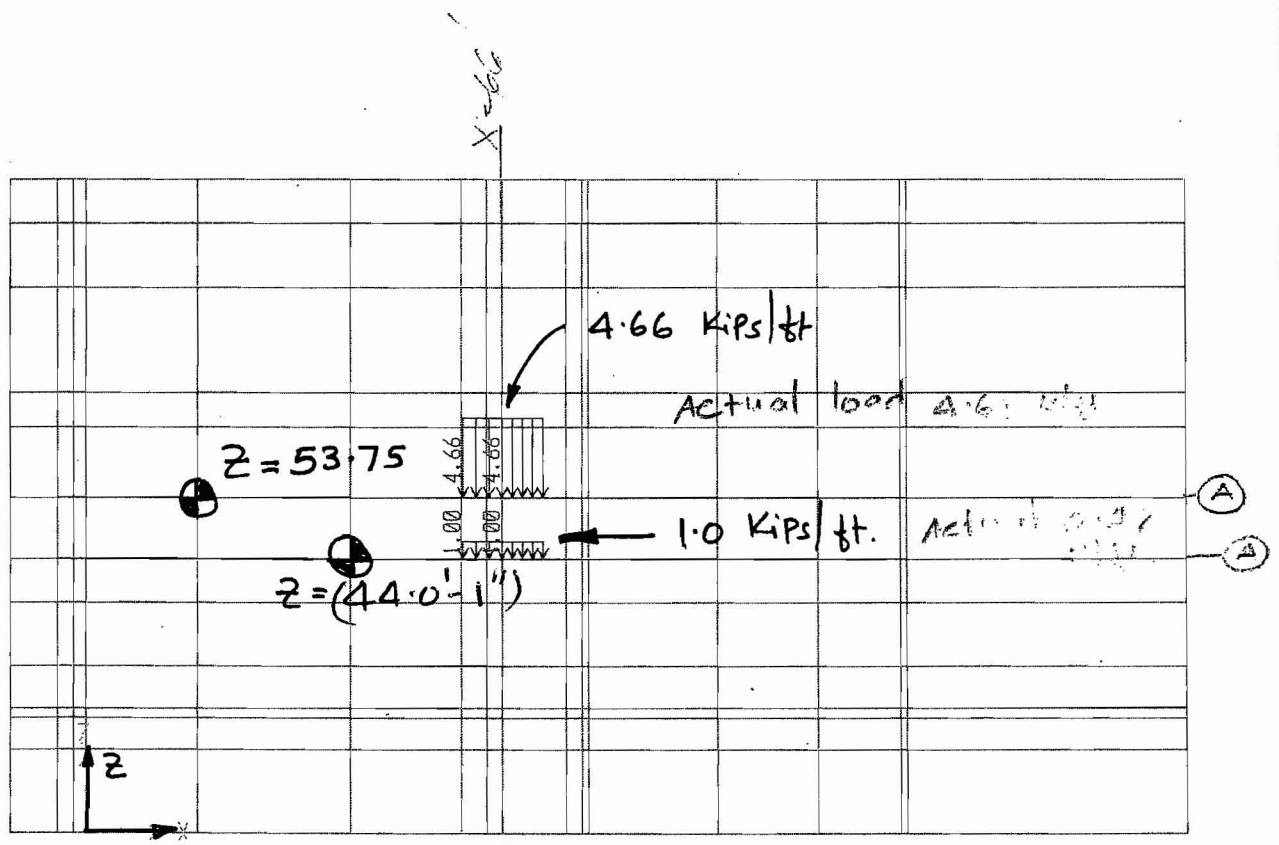
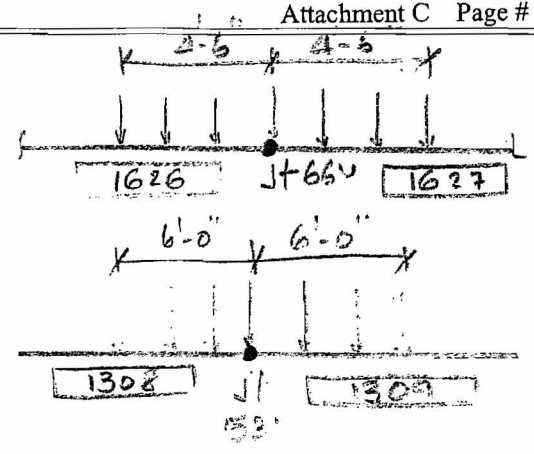
MAC  
2/2/08



@ 53.75' WP closure Room crane.  
 @ 44'-1" Remote handling crane.

y = 127.50

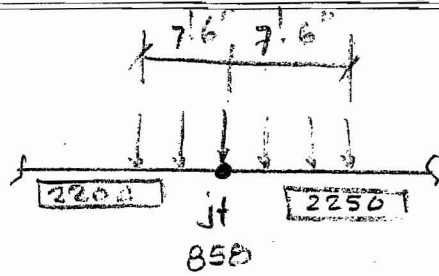
@ 53.9'



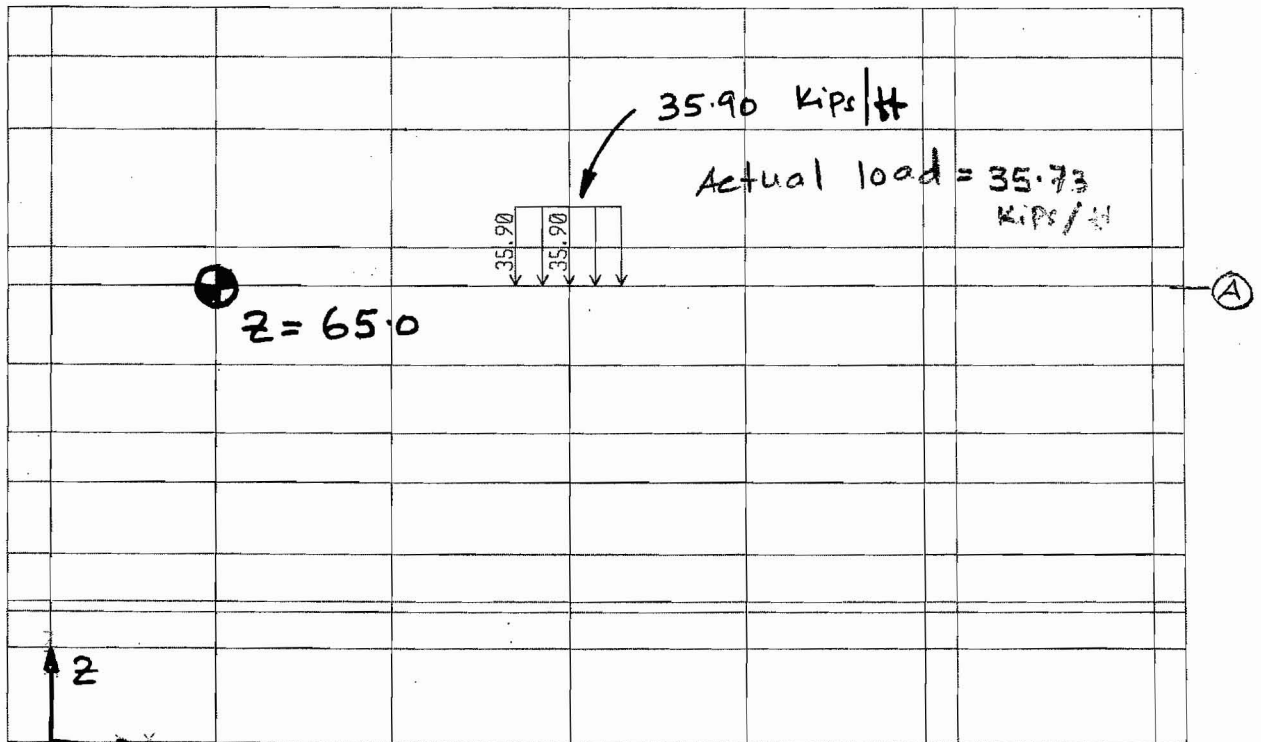
@ 53.75' WP closure Room crane.  
@ 44'-1" Remote handling crane.

Y=127.50'

@ 65.0'



y = 7.5'

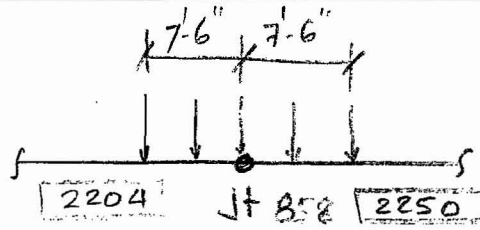


@ 65' canister transfer machine crane.

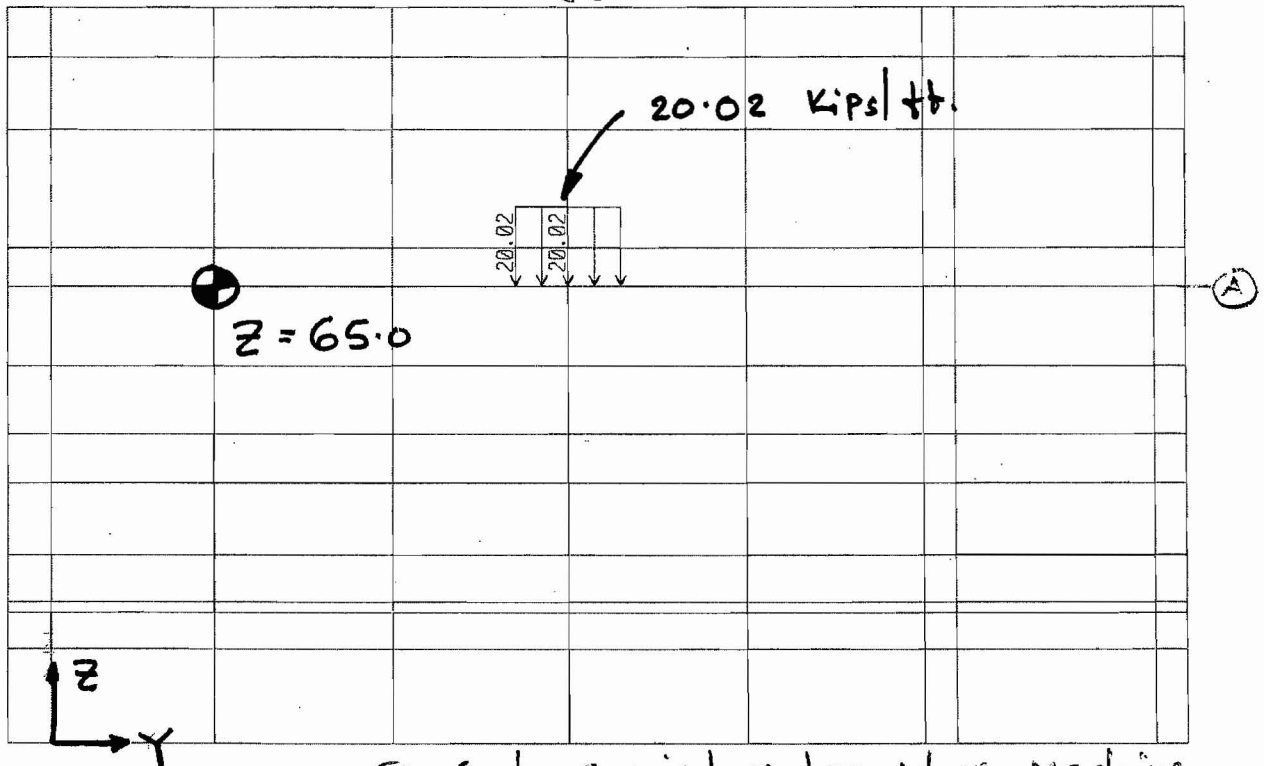
x = 79.75'

MAA  
2/2/08

@ 65'



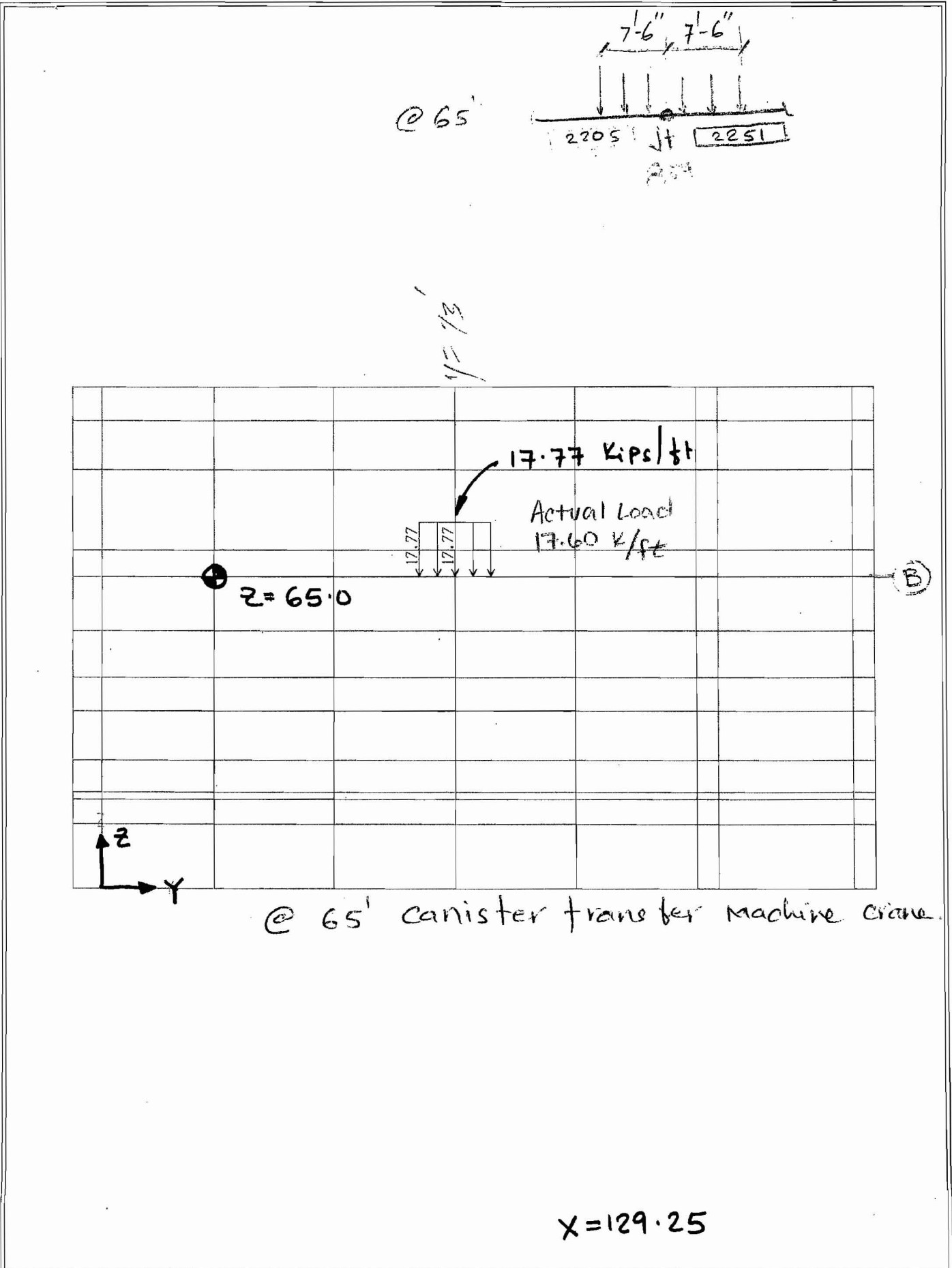
y = 79.75'



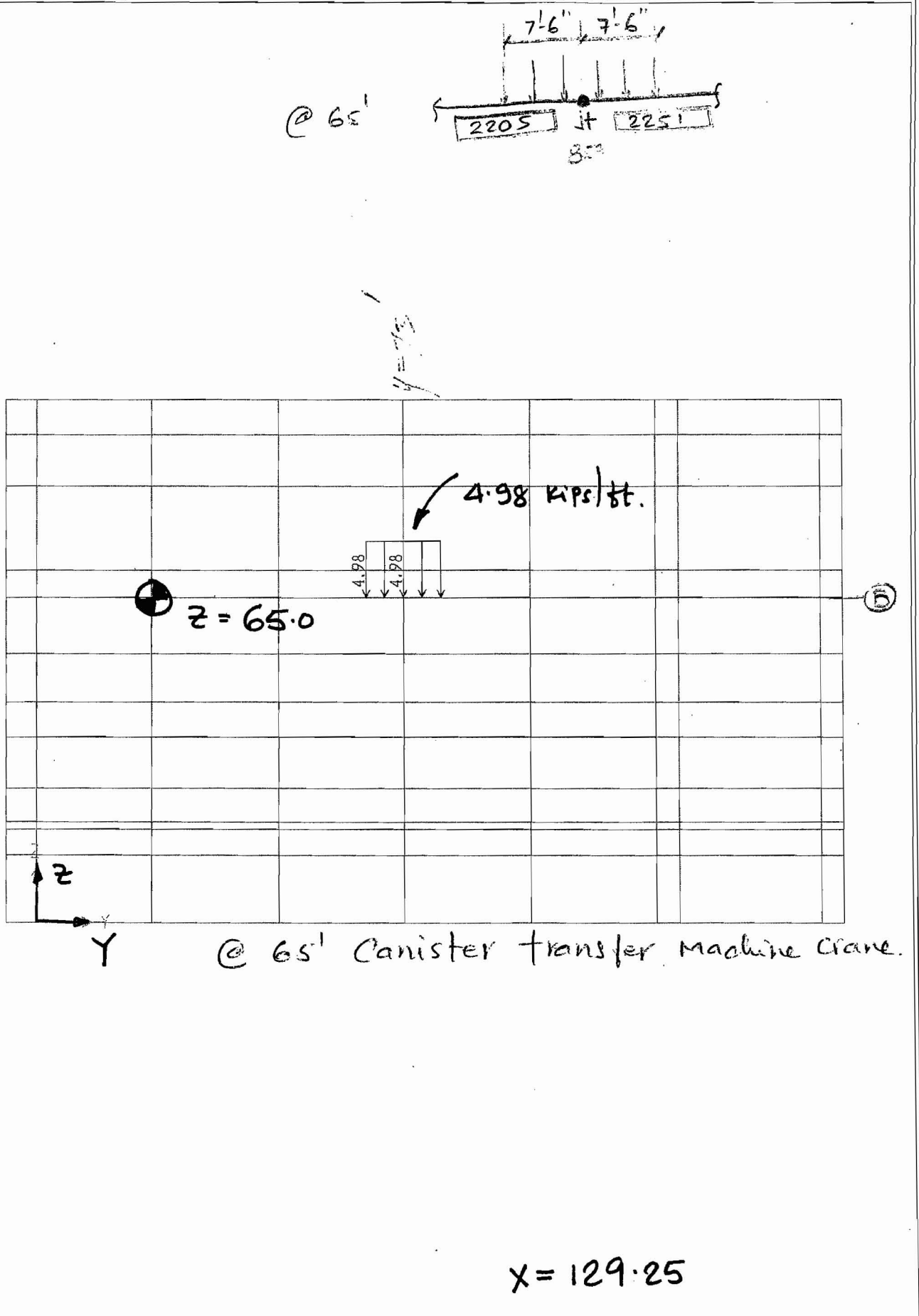
@ 65' canister transfer machine crane.

x = 79.75'

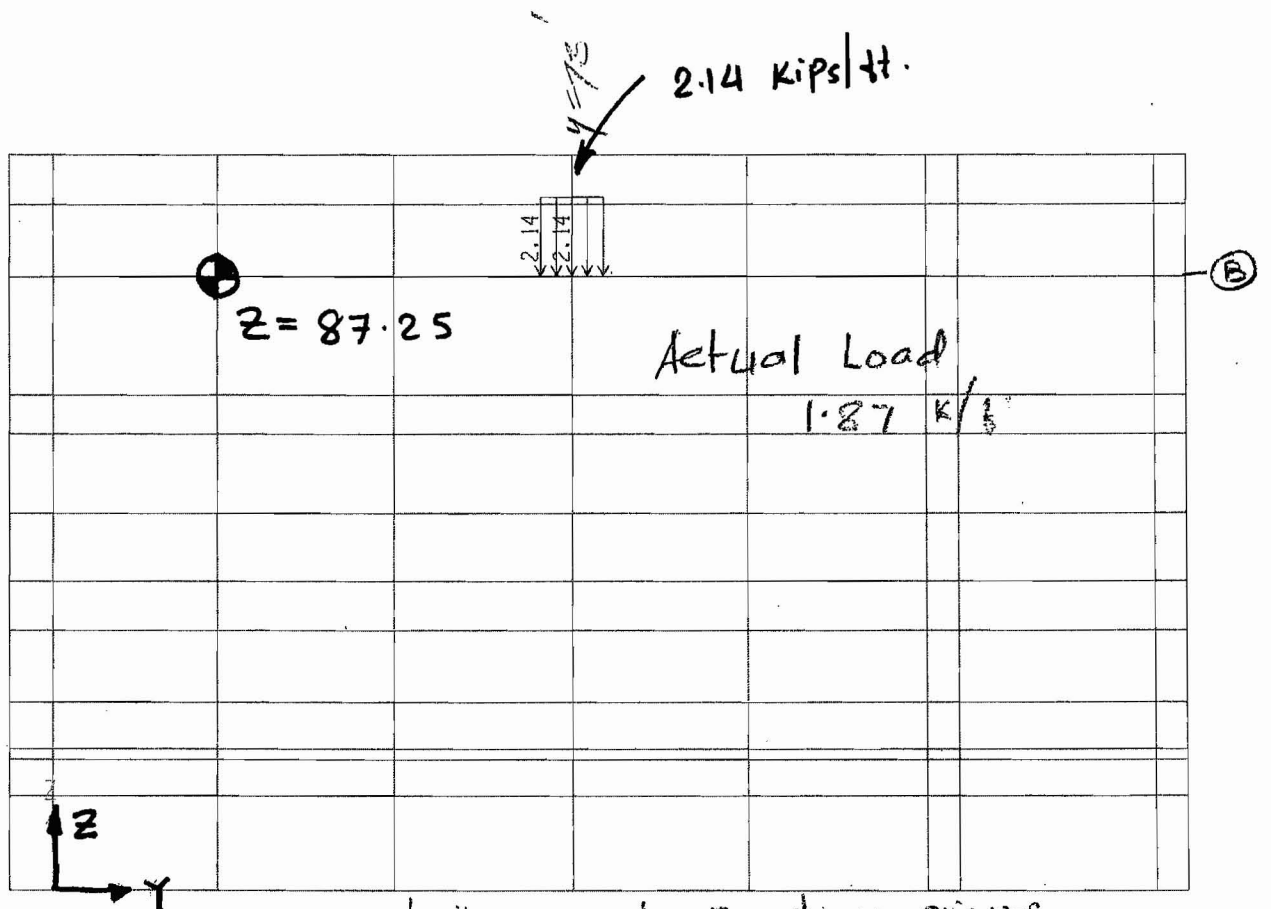
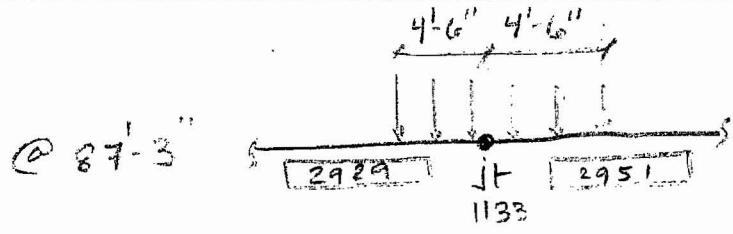
MAA  
2/21/08



MAN  
2/2/08

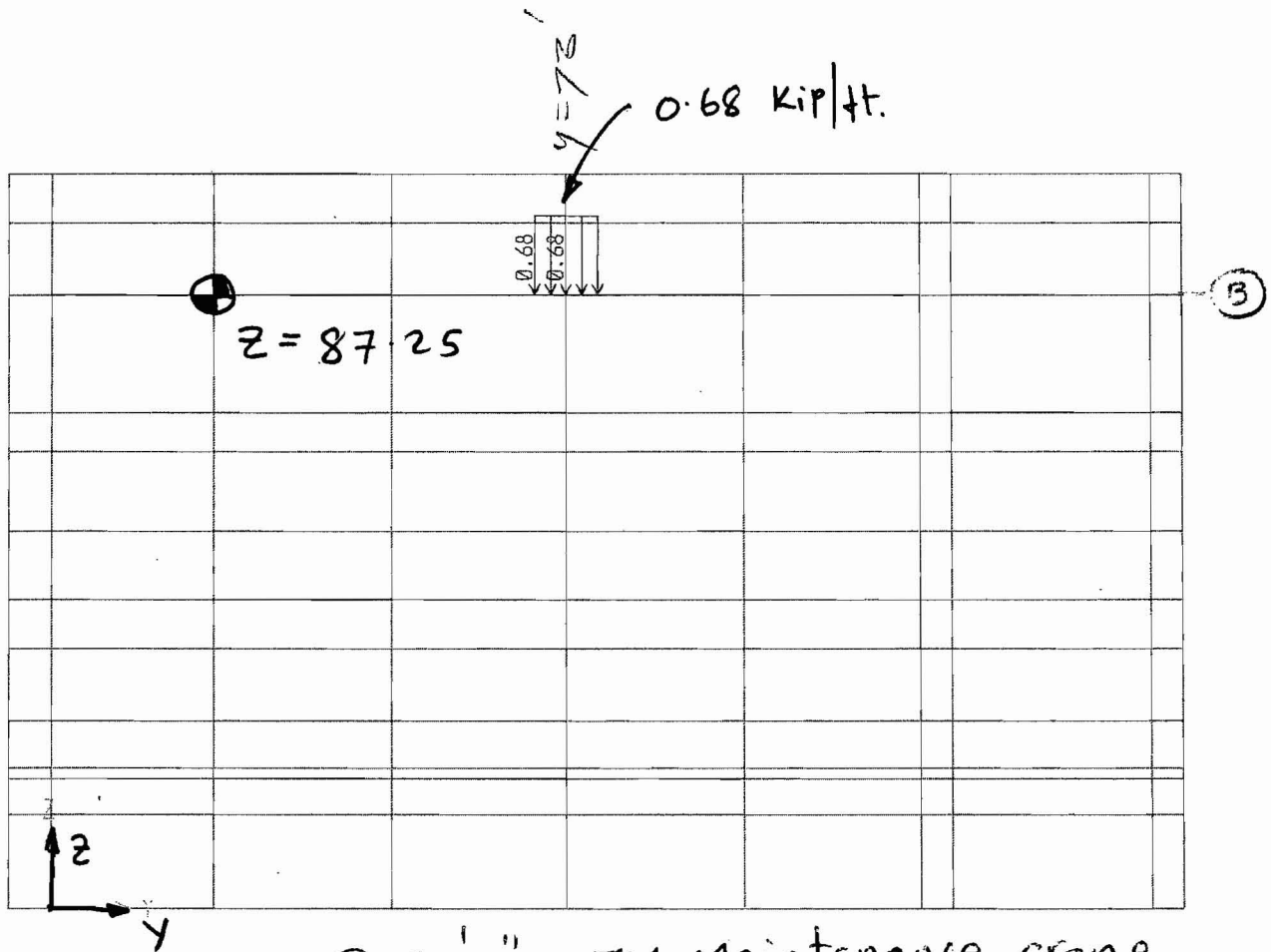
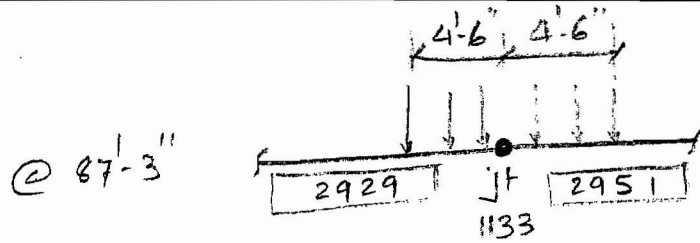


MAN  
2/2/08



@ 87'-3" ~~crane preparation crane.~~  
CTM MAINTENANCE CRANE.  
RJP 10-31-07.

$X = 130.25$  *ok*

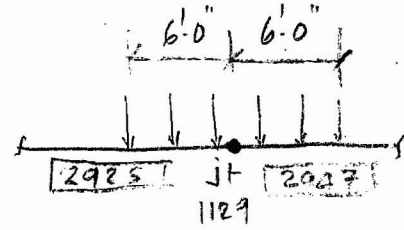


@ 87'-3" CTM Maintenance crane.

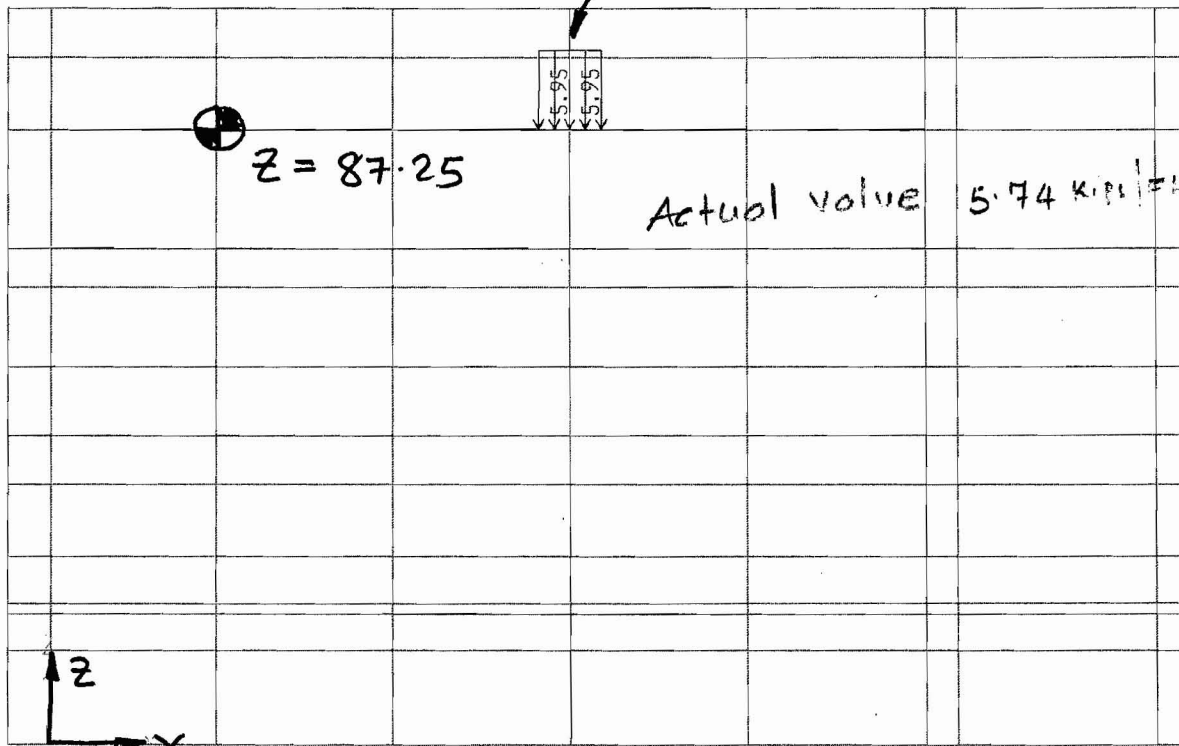
$x = 130.25$



@ 87'-3"



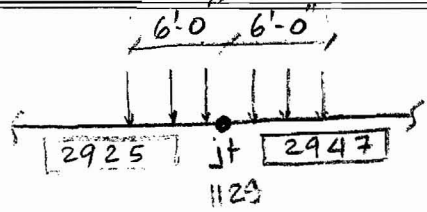
$y = 7.3$   
5.95 kips/ft.



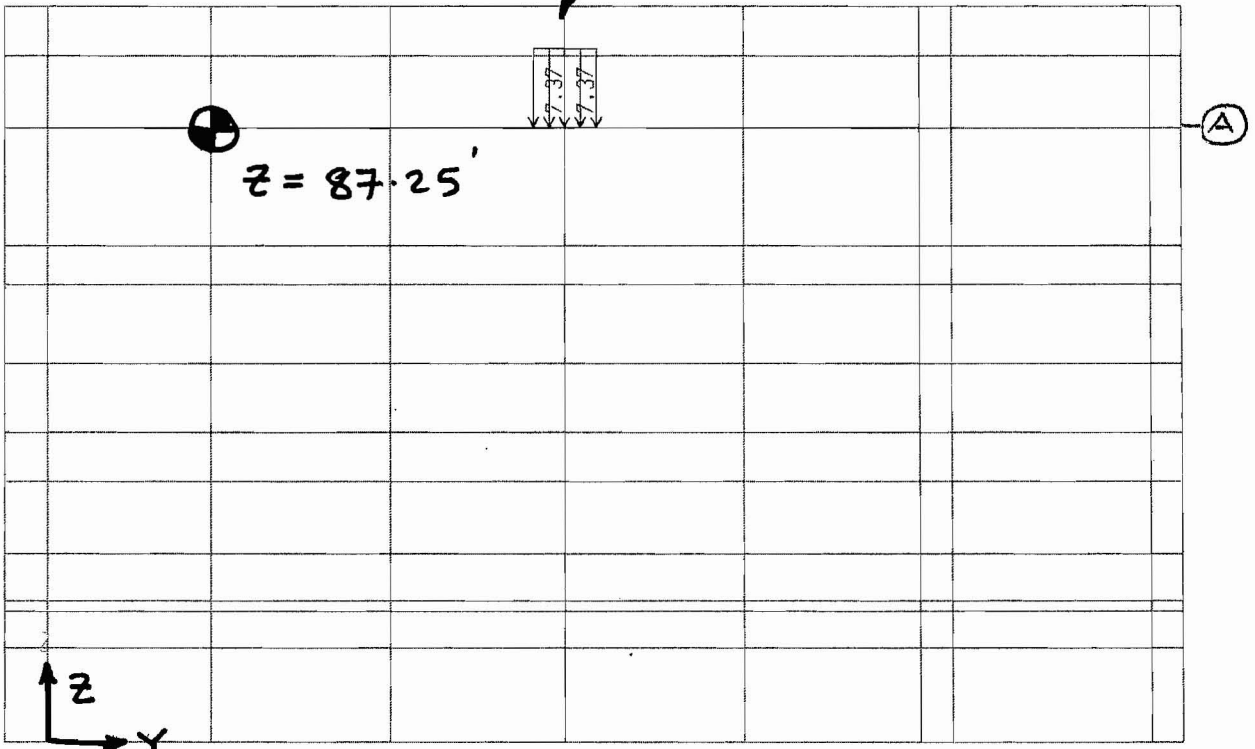
@ 87'-3" cask preparation crane.

$x = 63.50'$

@ 87'-3"

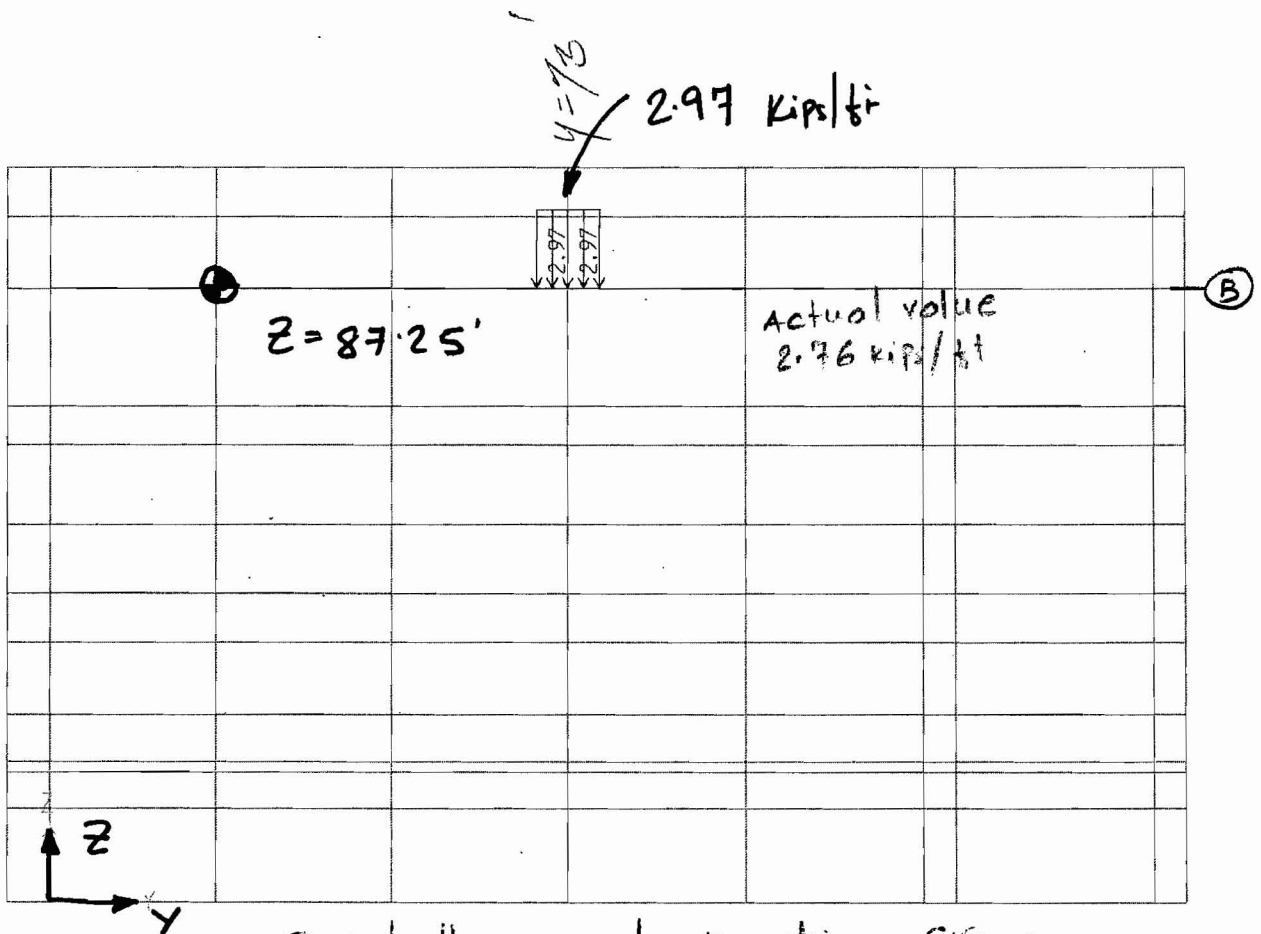
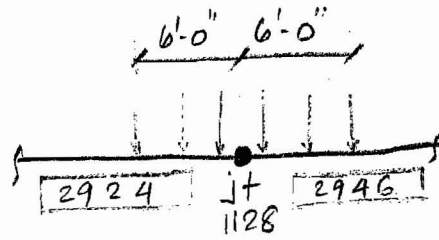


$y = 1/4$   
7.37 kips/ft.



@ 87'-3" basic preparation crane.

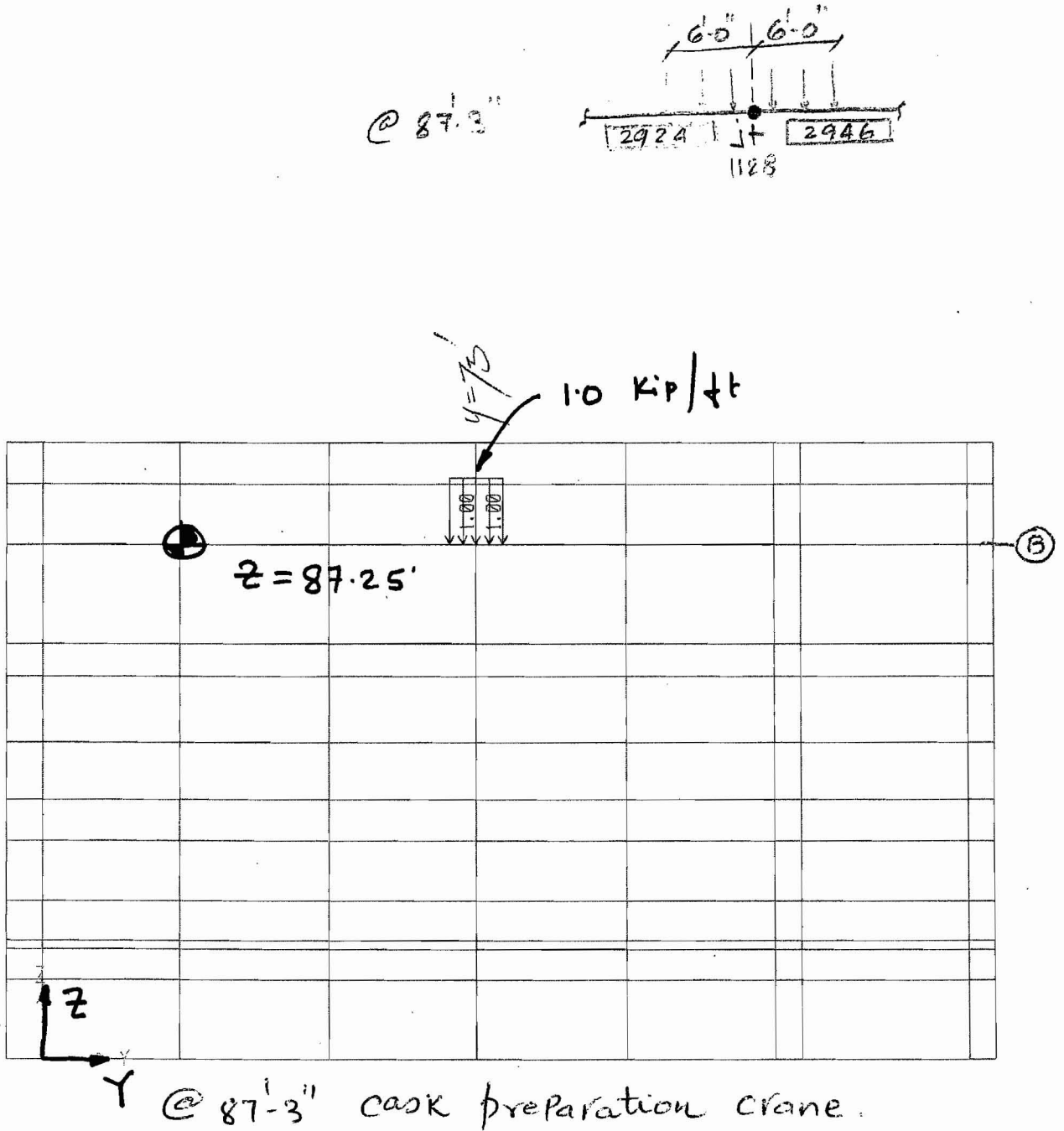
X = 63.50'



@ 87'-3" cask preparation crane.

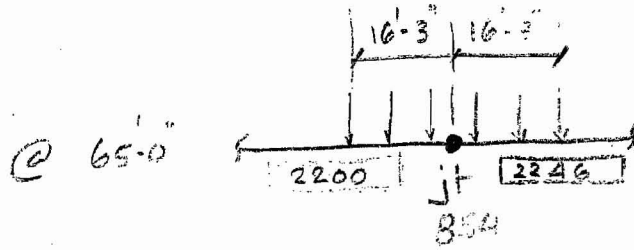
$x = -2.0'$

MMS  
8/22/08

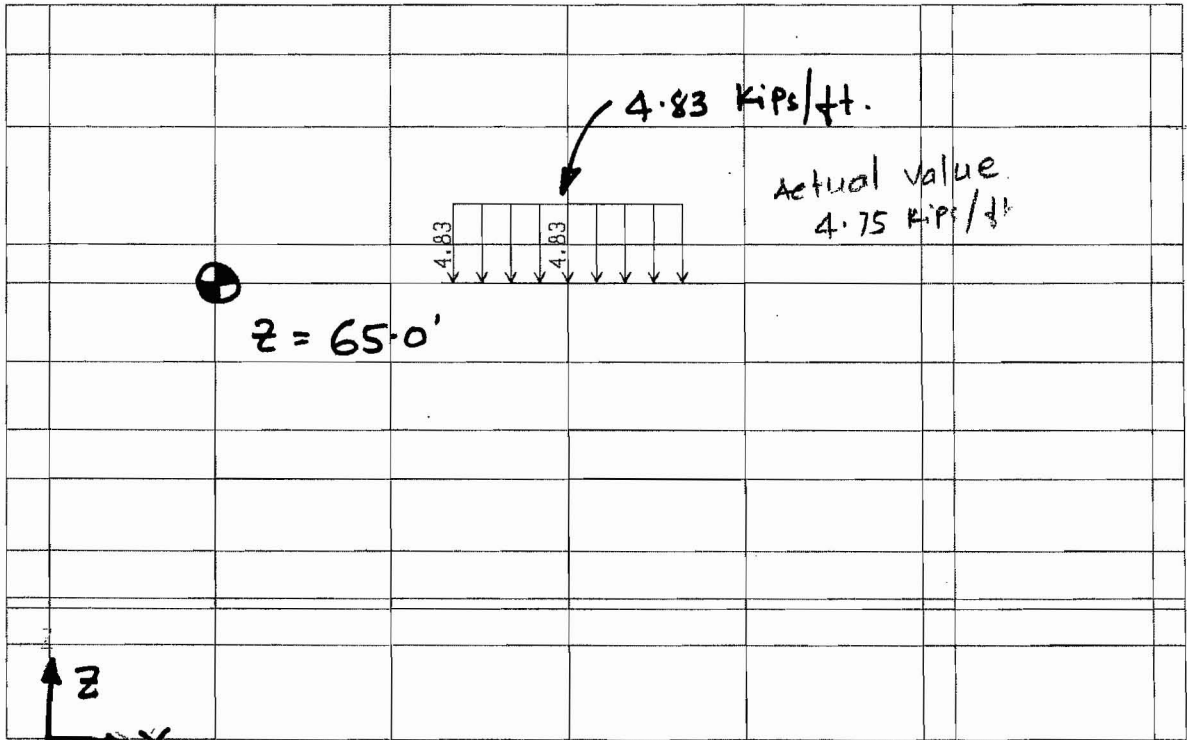


x = -2.0'

MAS  
2/2/08

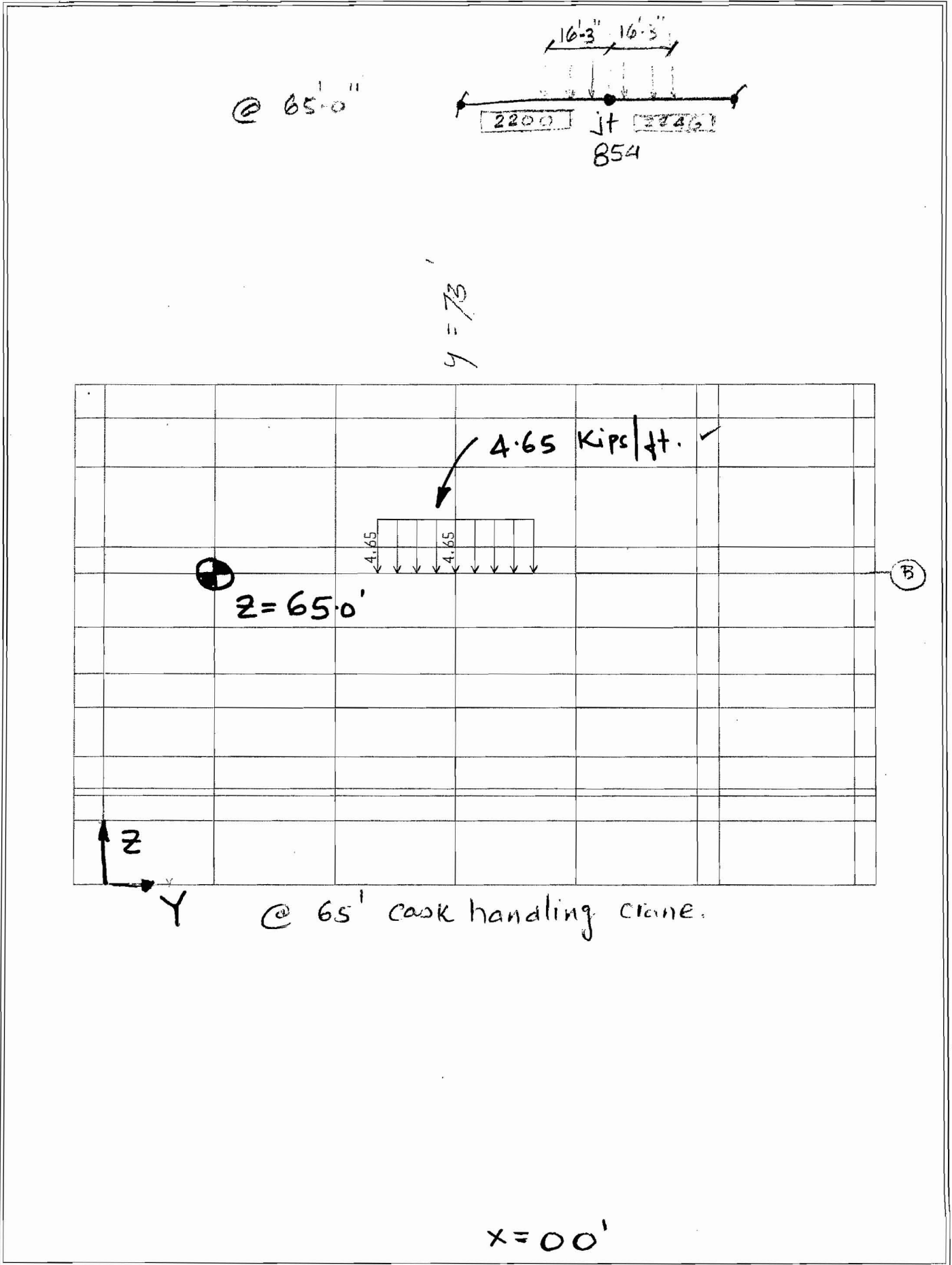


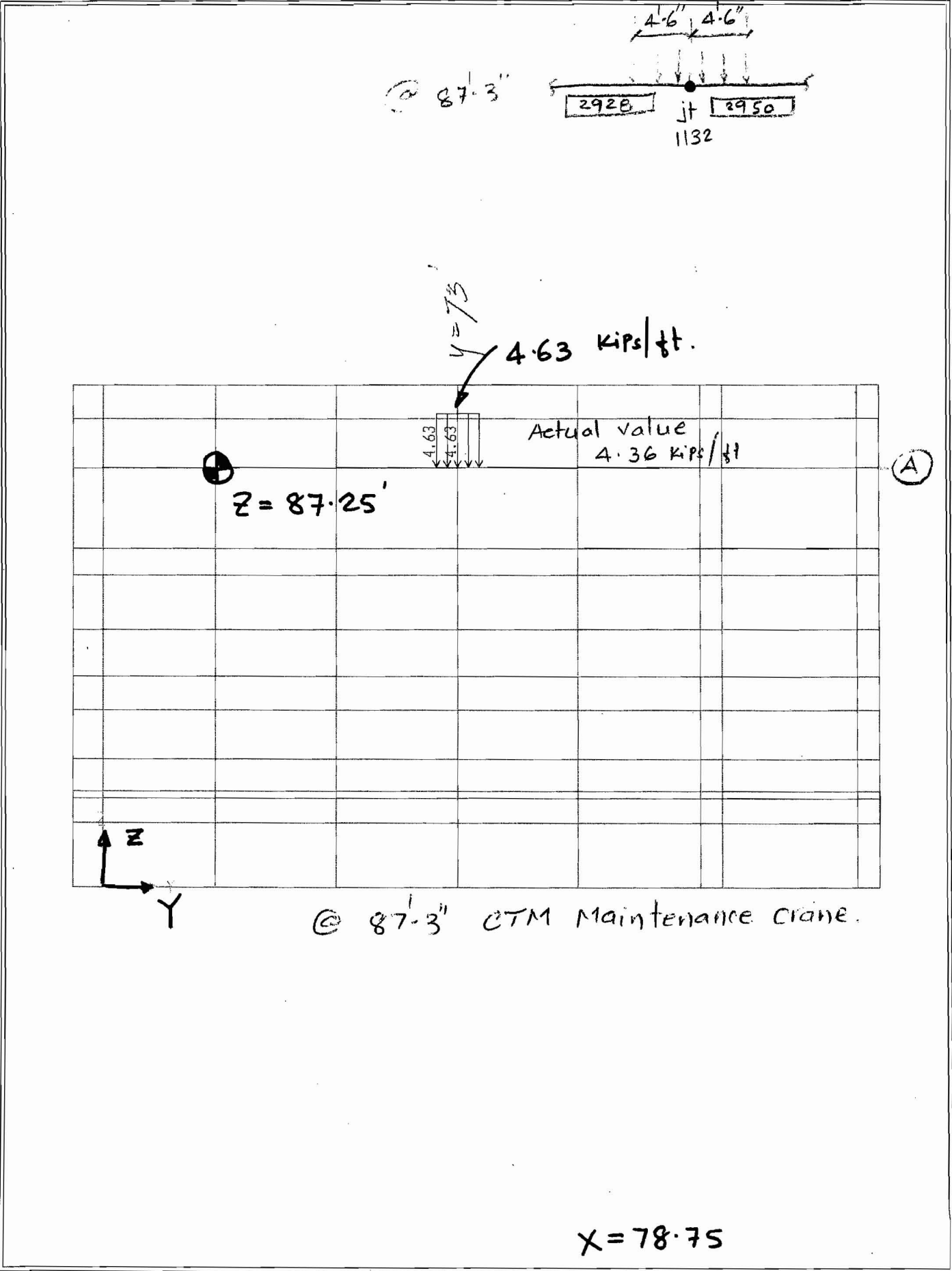
y = 7/3



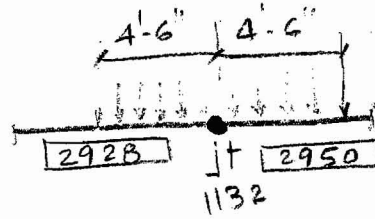
@ 65' cask handling crane

x = 0.0'

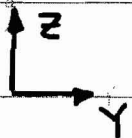
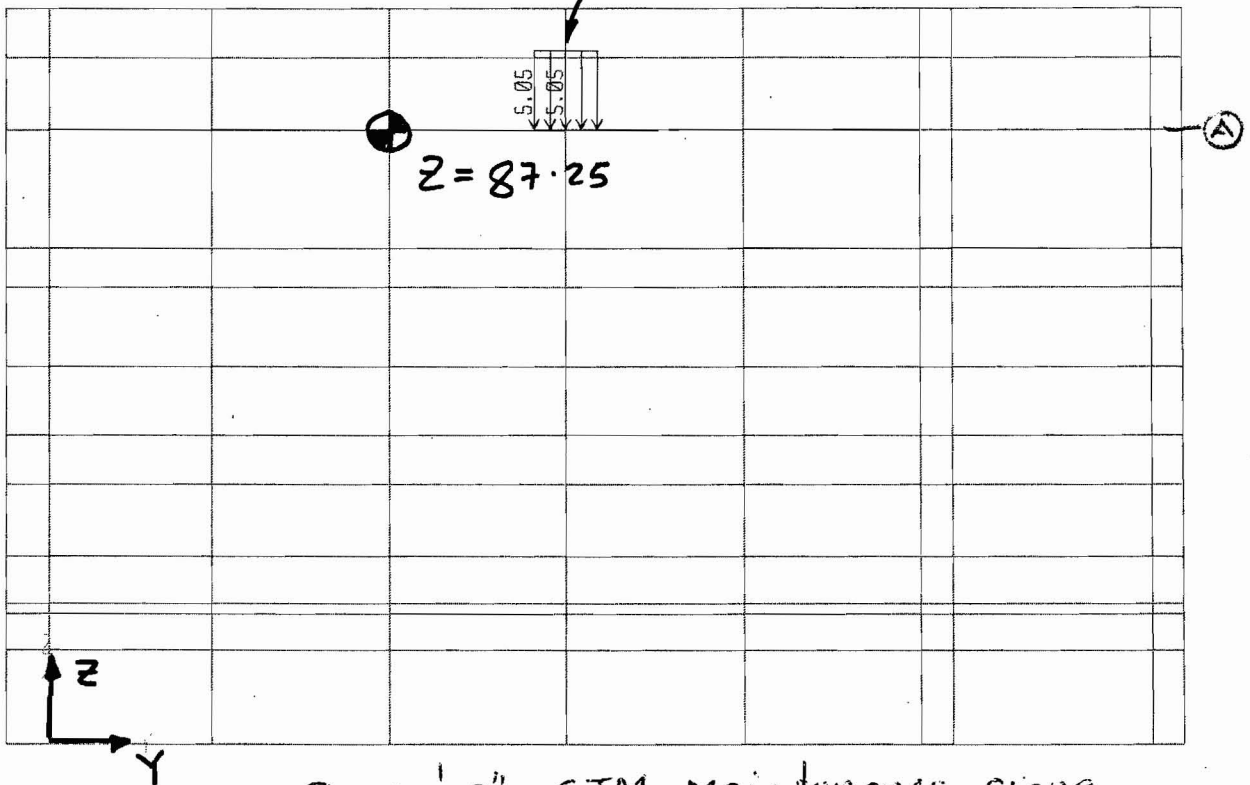




@ 87'-3"



$q = 73$   
5.05 Kips/ft.

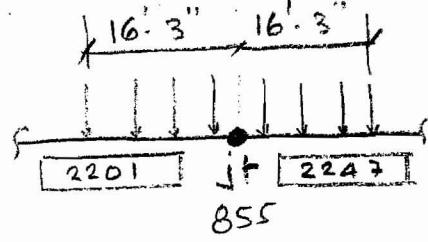


@ 87'-3" ETM maintenance crane.

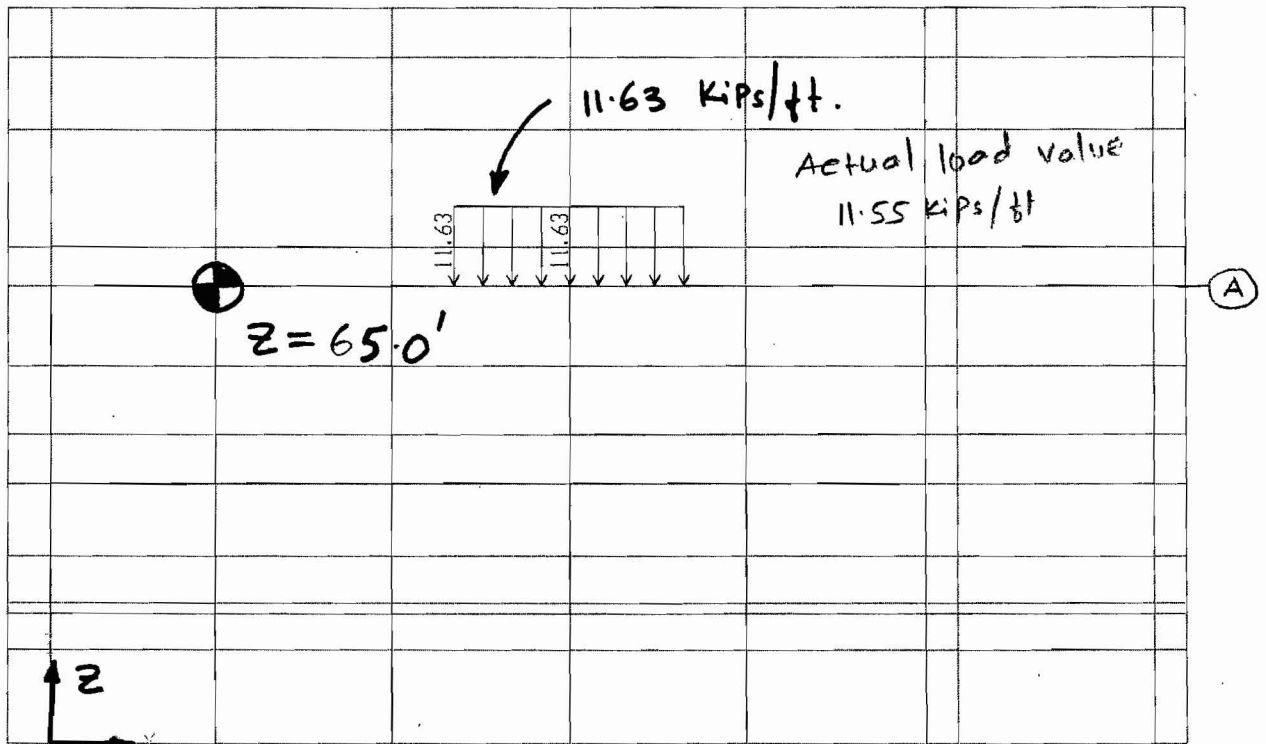
x = 78.75'



@ 65'-0"

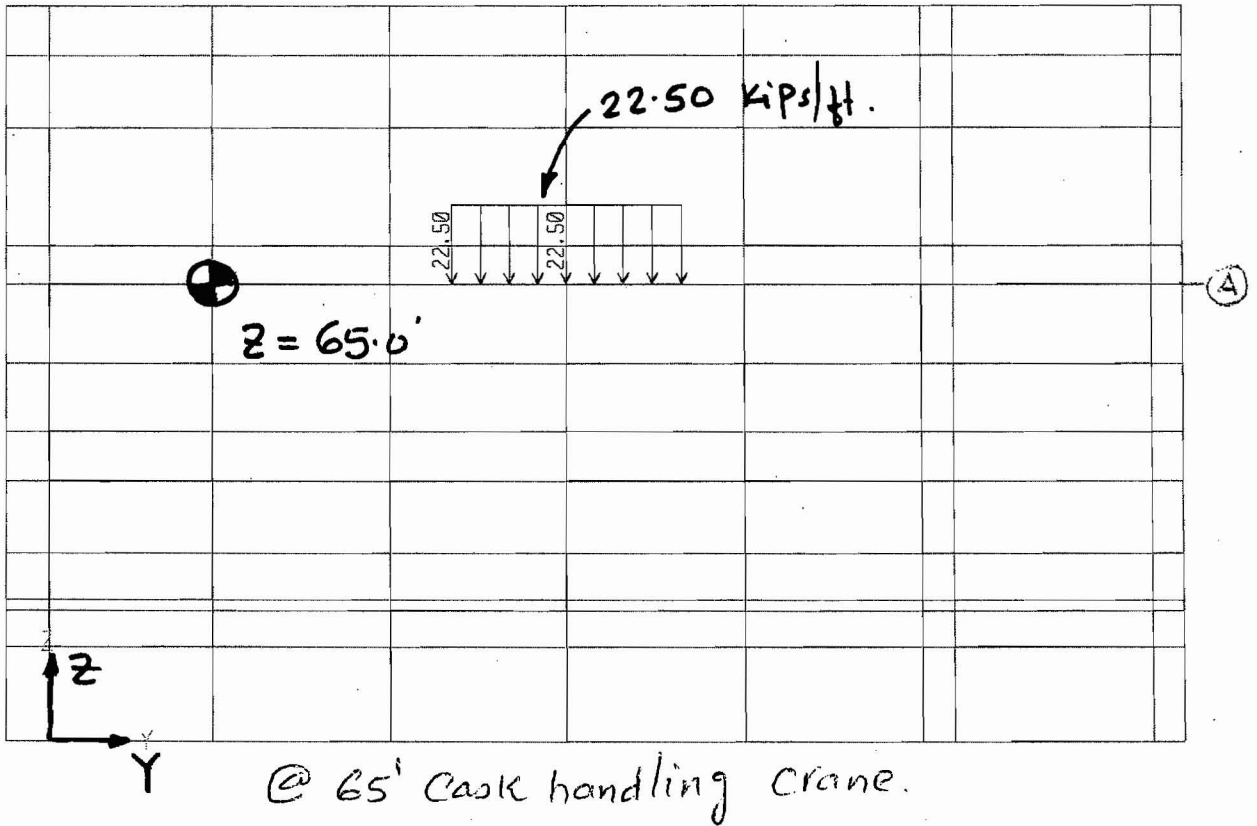
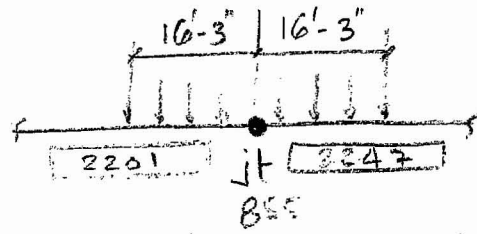


y=73

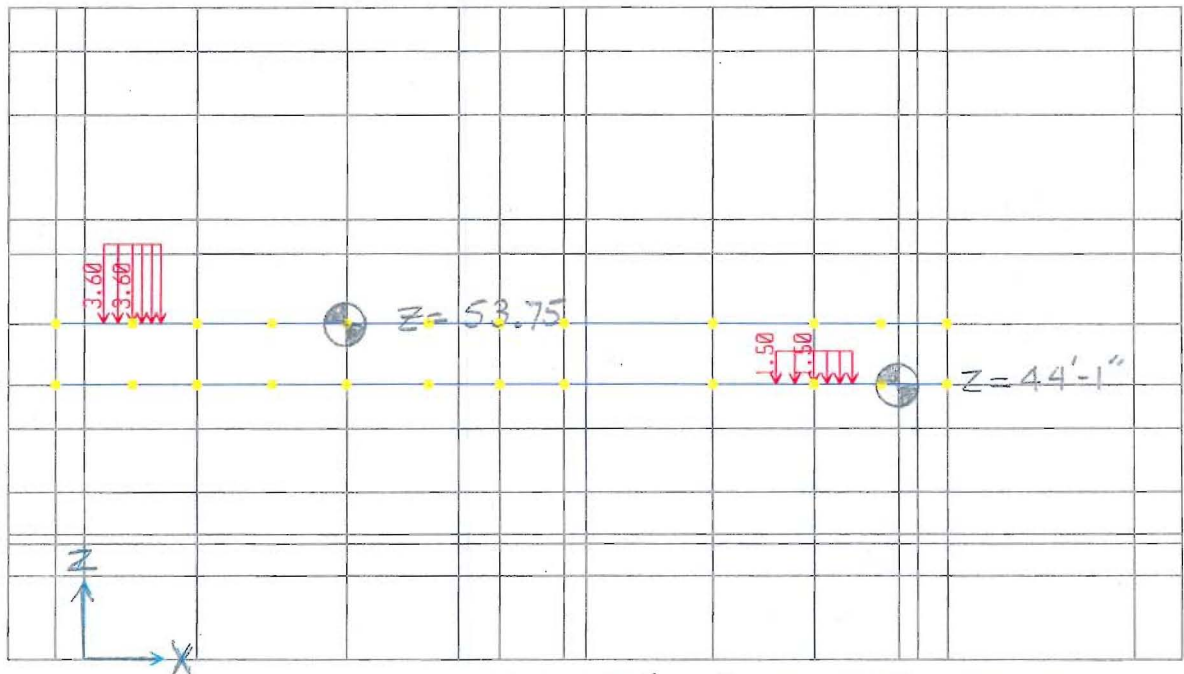
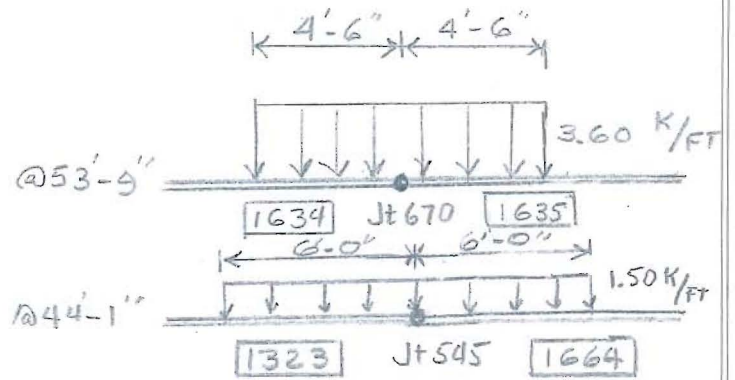


@ 65' cask handling crane.

x = 59.5'

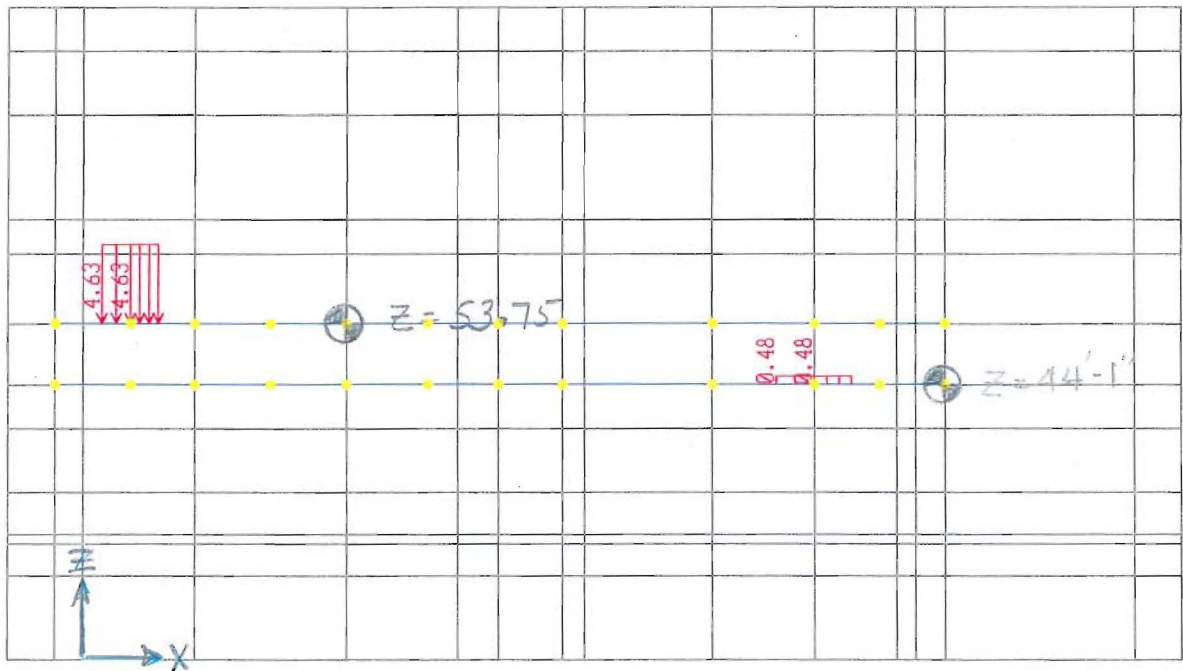
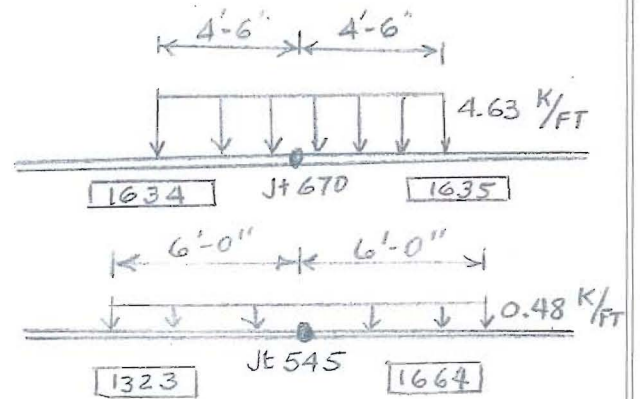


x = 59.50'



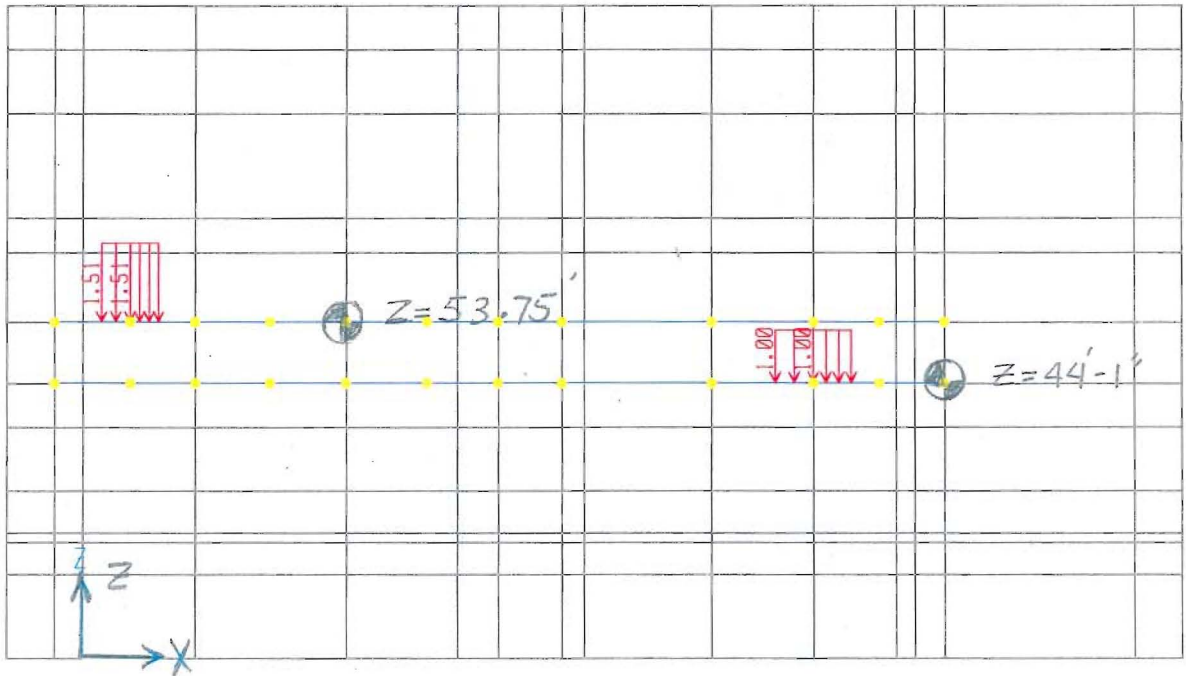
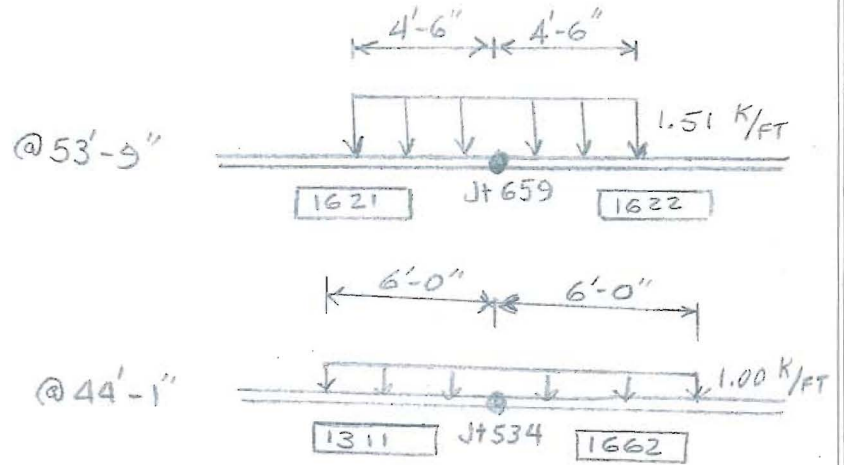
@ 53.75' WP CLOSURE ROOM CRANE  
@ 44'-1" REMOTE HANDLING CRANE

MAA 2/21/08 Y = 155.50'



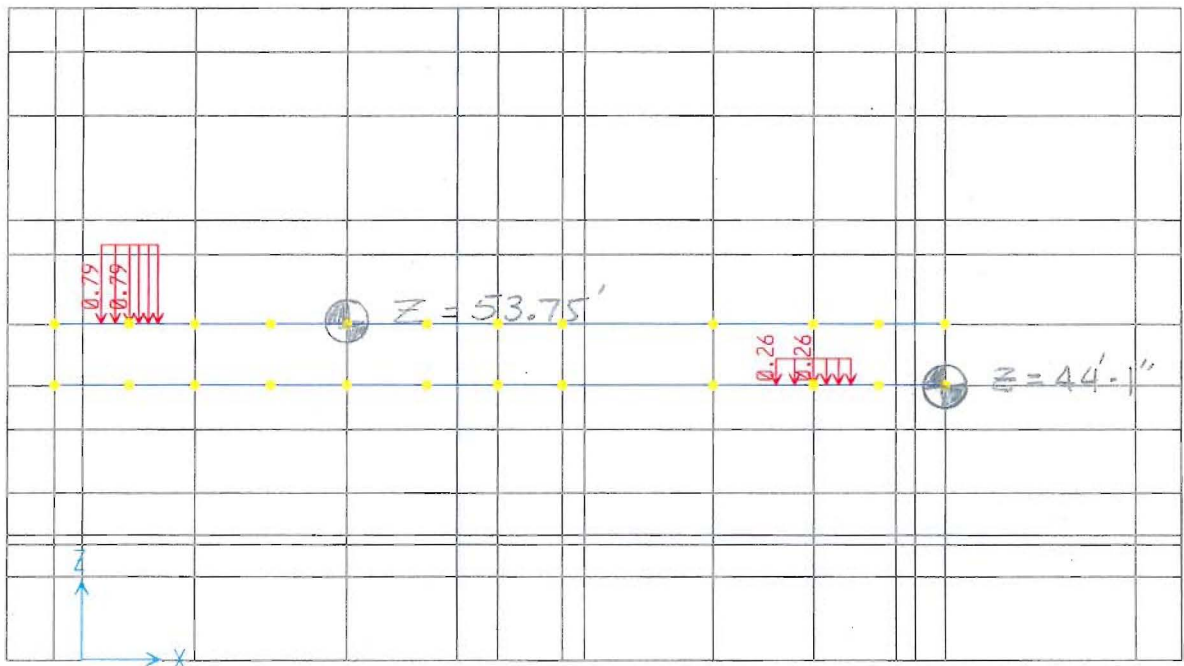
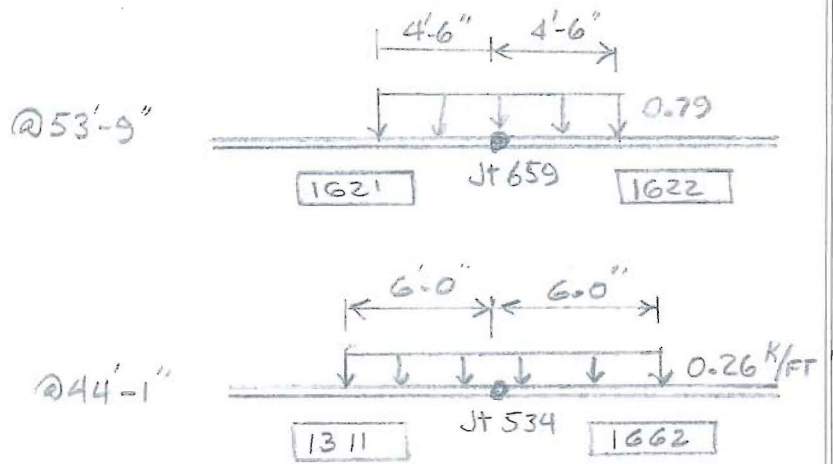
@53.75 WP CLOSURE ROOM CRANE  
@44'-1" REMOTE HANDLING CRANE

Y = 155.50'



@ 53.75' WP CLOSURE ROOM CRANE  
@ 44'-1" REMOTE HANDLING CRANE

$y = 127.50'$

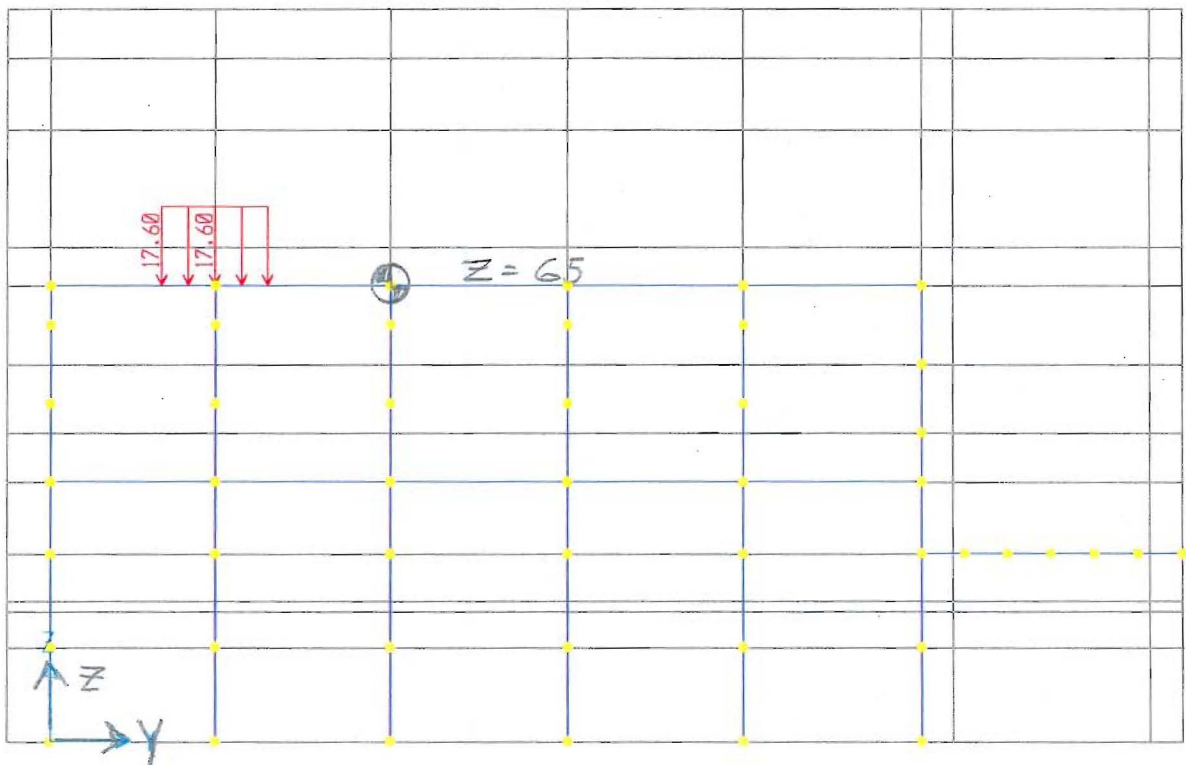
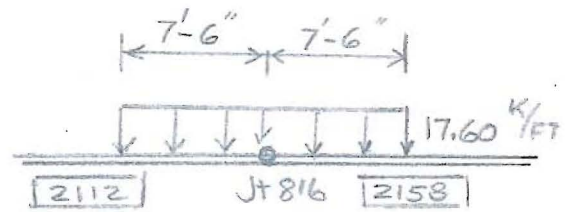


@ 53.75' WP CLOSURE ROOM CRANE  
@ 44'-1" REMOTE HANDLING CRANE

Y = 127.50



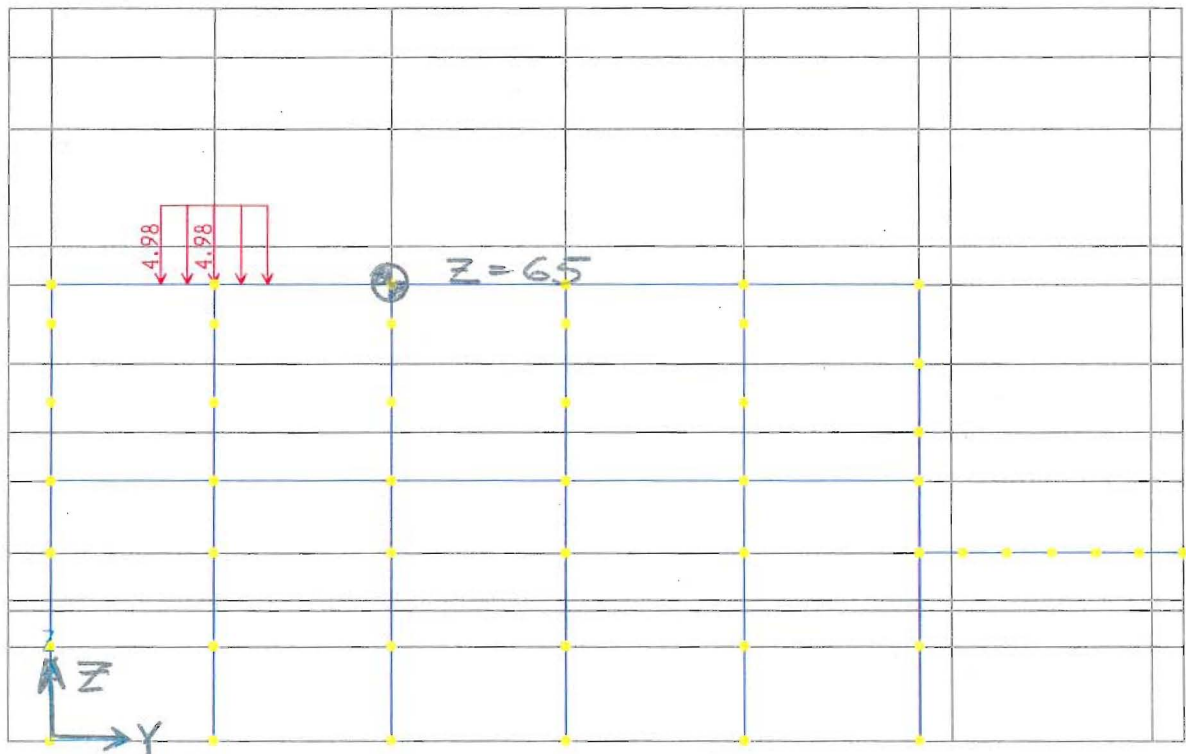
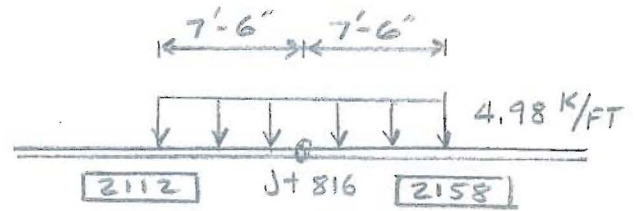
@ 65'



@ 65' CANISTER TRANSFER MACHINE CRANE

X = 79.75'

@ 65'

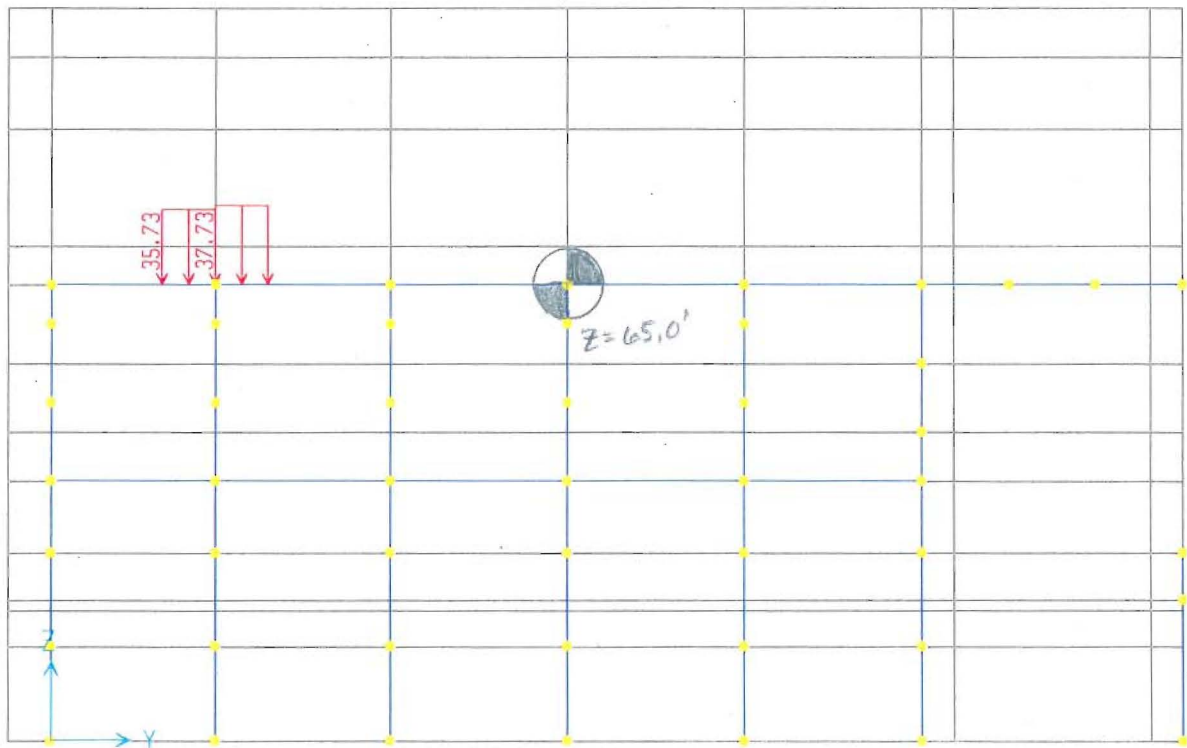
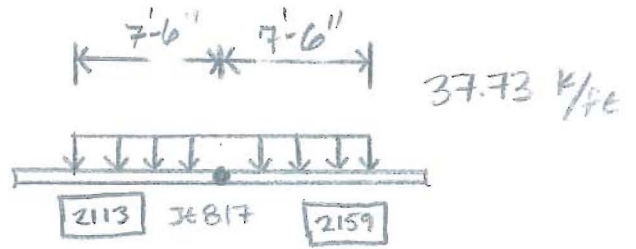


@ 65' CANISTER TRANSFER MACHINE CRANE

X = 79.75'



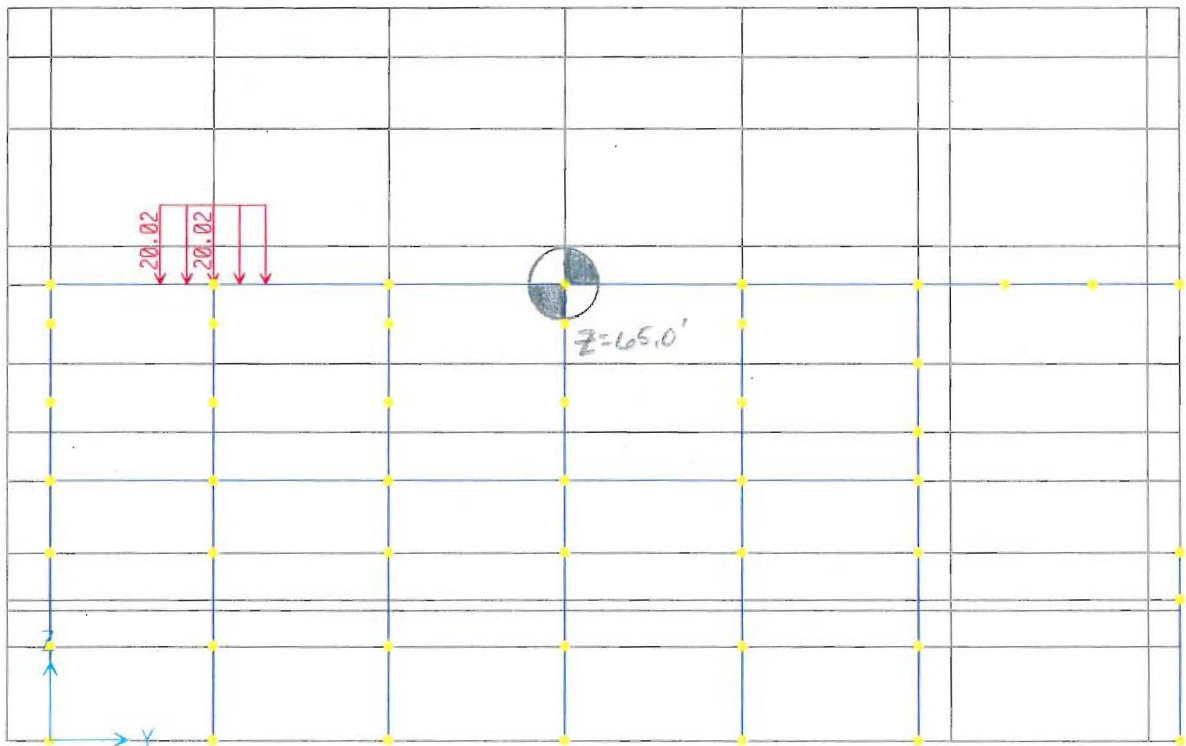
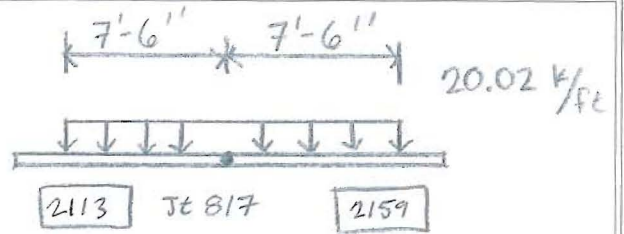
@ 65':



@ 65': Canister Transfer Machine crane.

$$X = 129.25'$$

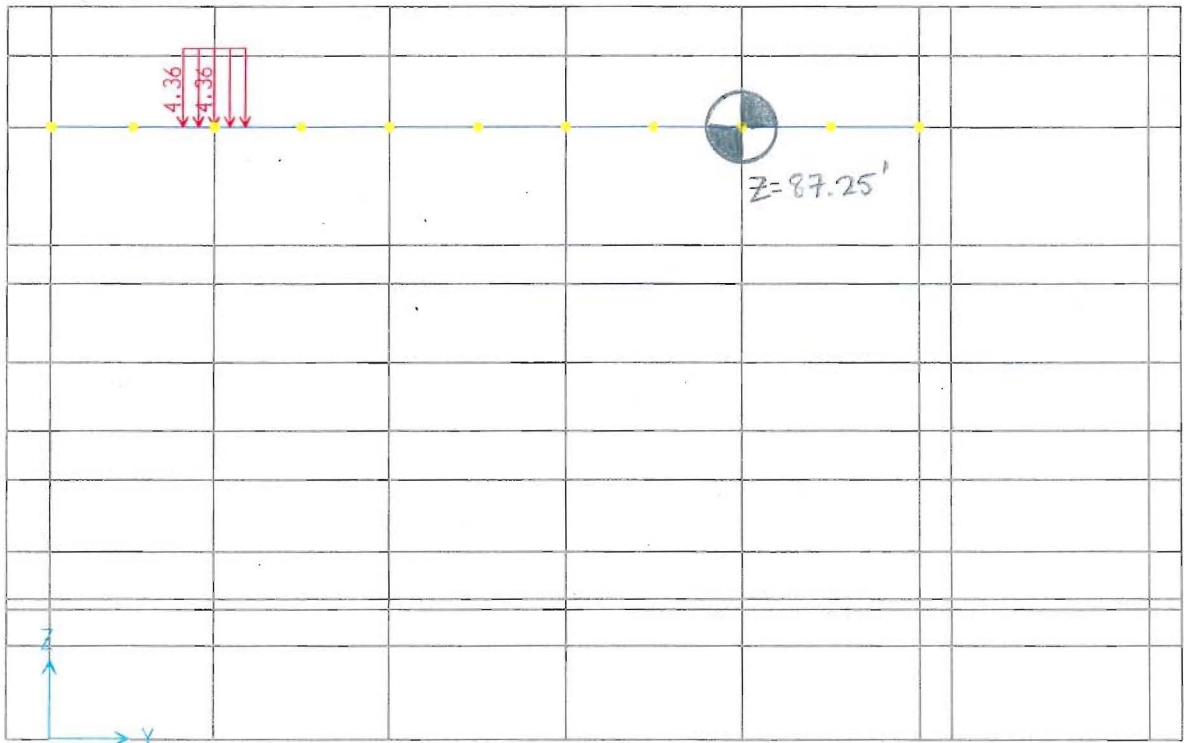
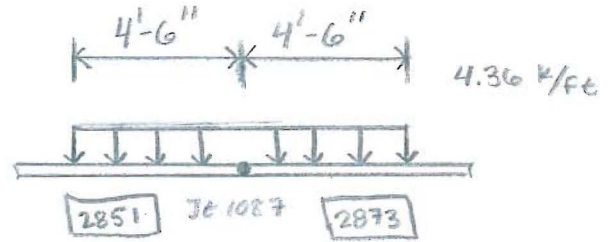
@ 65':



@ 65': Canister transfer Machine  
Crane

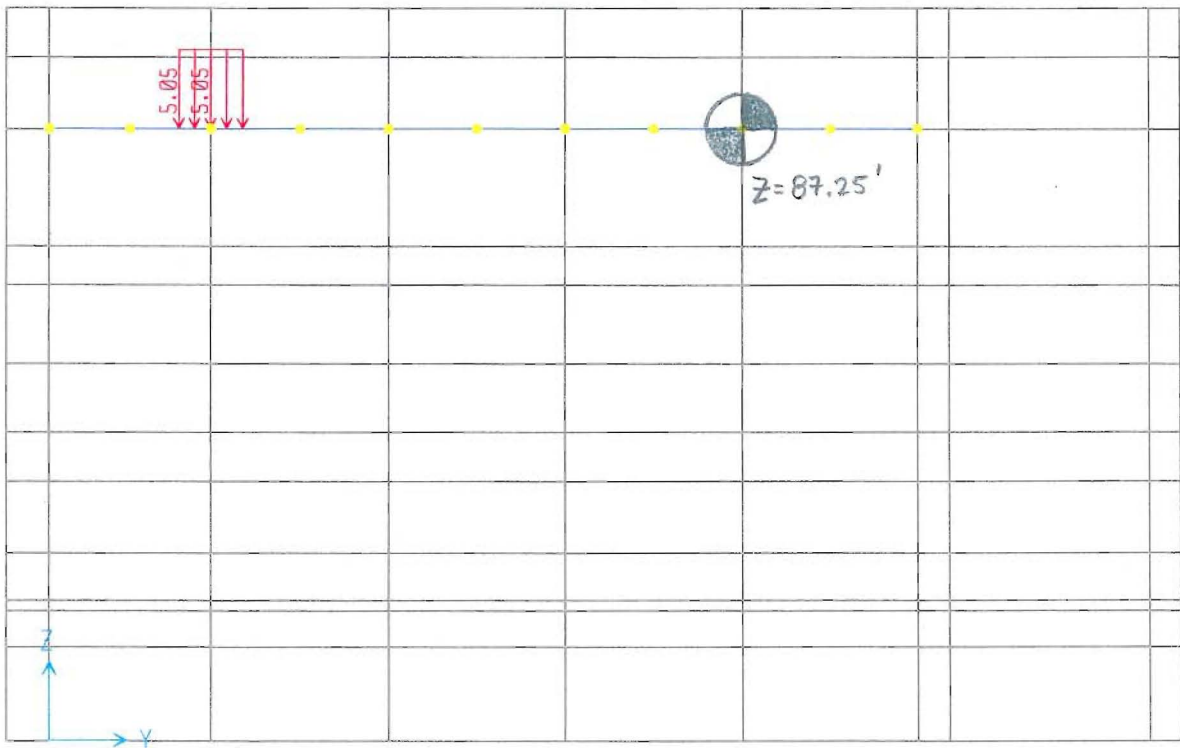
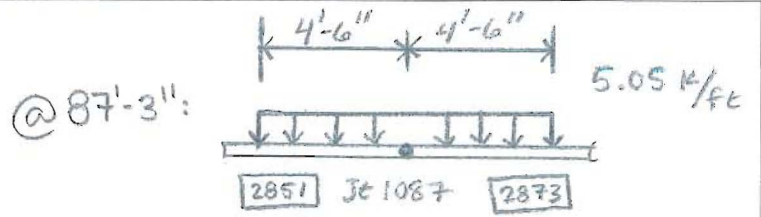
x = 129.25

@ 87'-3"



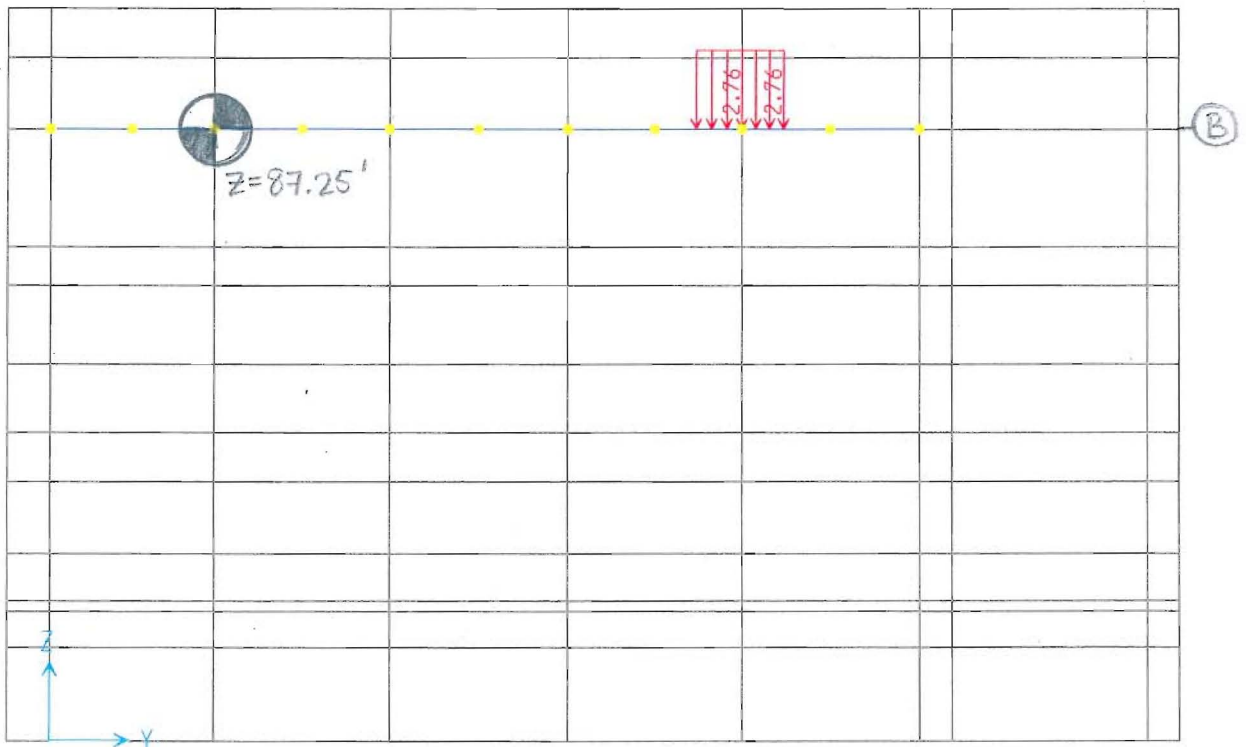
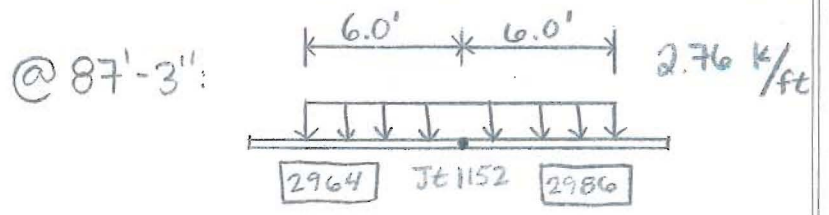
@ 87'-3": CTM Maintenance crane

X=130.25'



@ 87'-3": CTM Maintenance crane

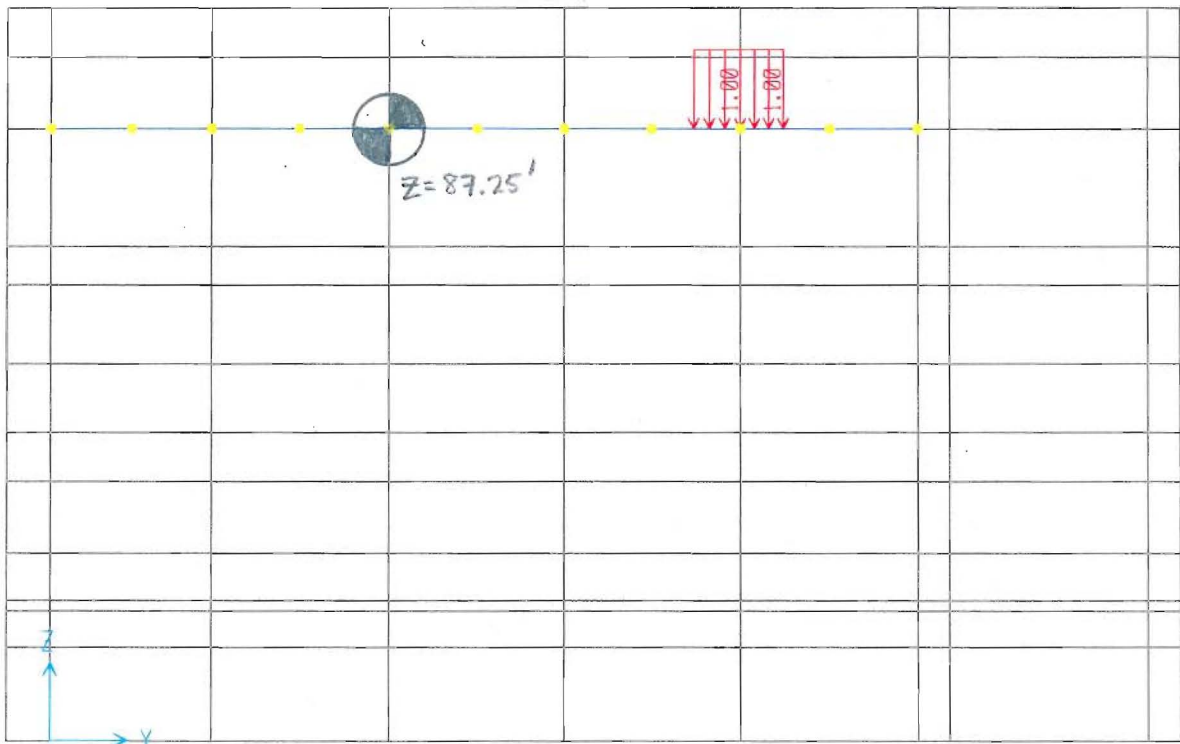
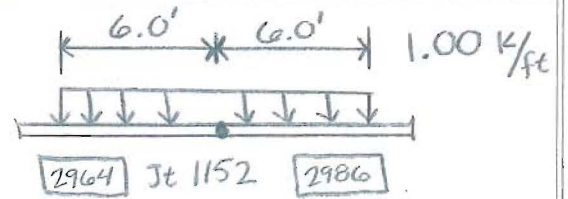
$x = 130.25'$



87'-3": Cask Preparation Crane

$X = 63.50'$

@ 87'-3":

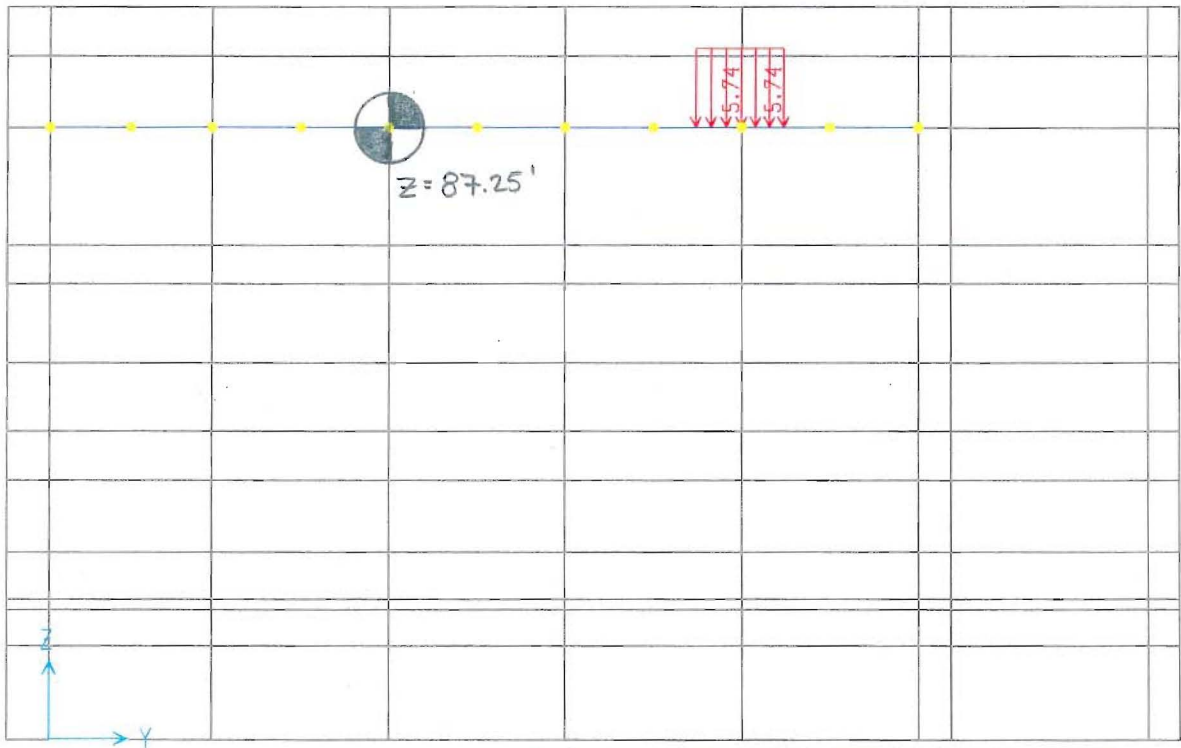
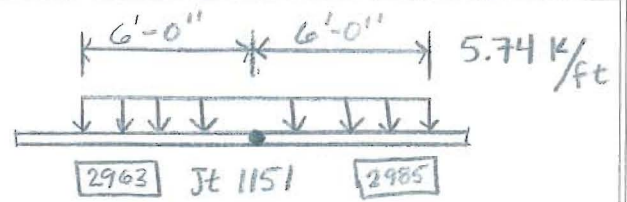


@ 87'-3": Cask preparation crane

$X = 63.50'$



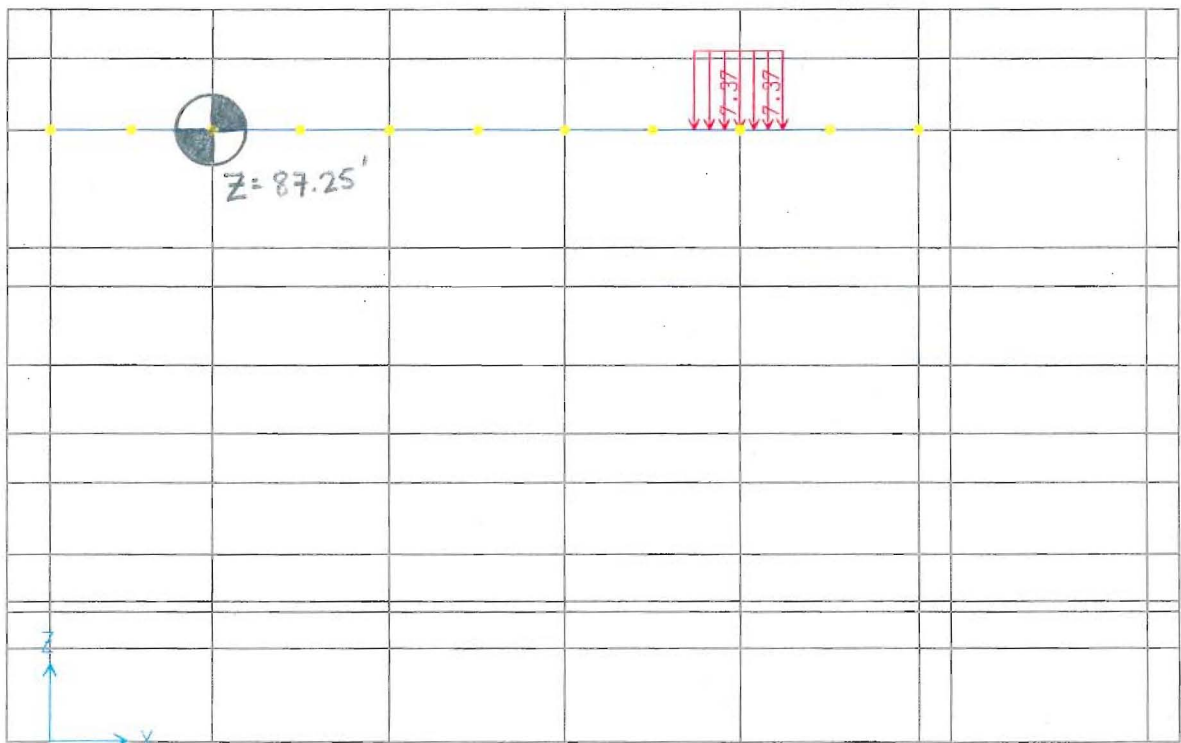
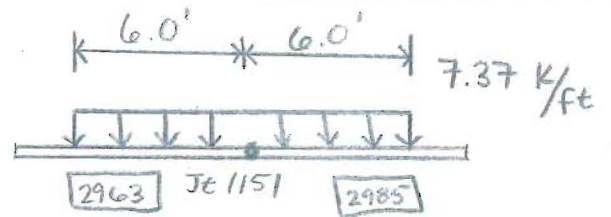
@ 87'-2":



@ 87'-3": CASK preparation crane

$x = -2.0$

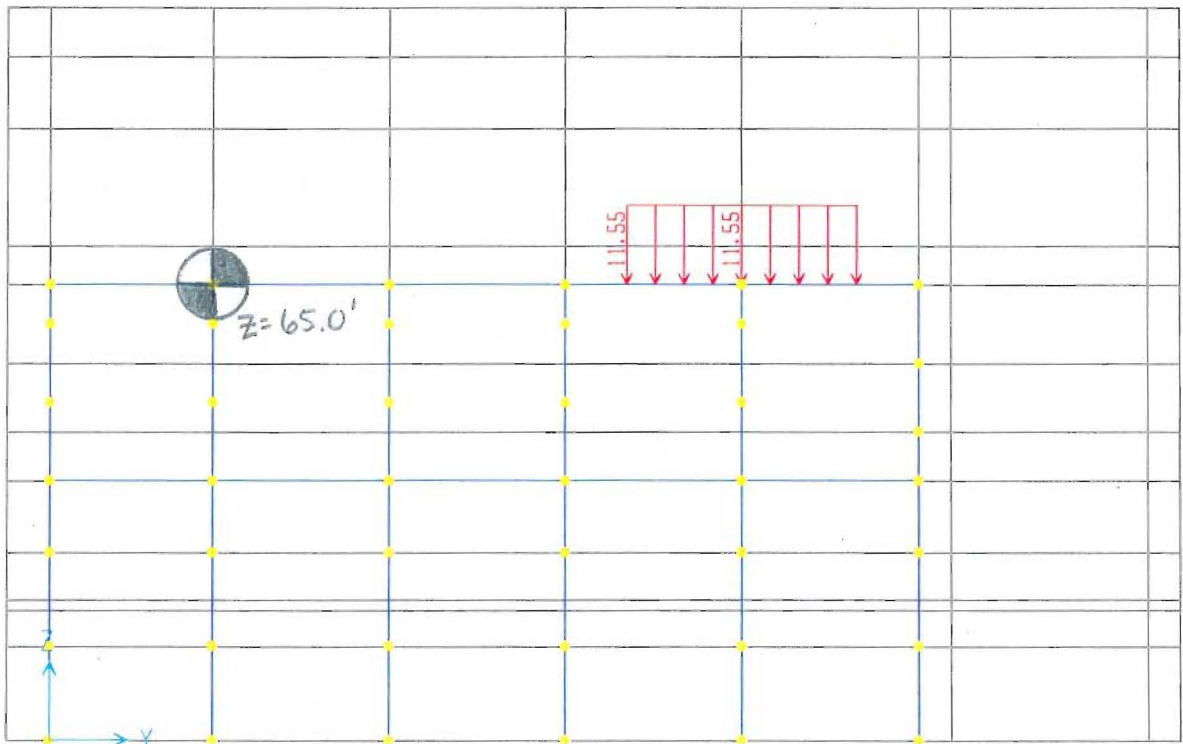
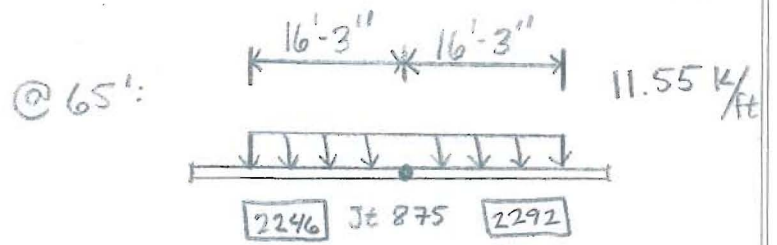
@ 87'-3"



@ 87'-3" : Cask preparation Crane

X = -2.0

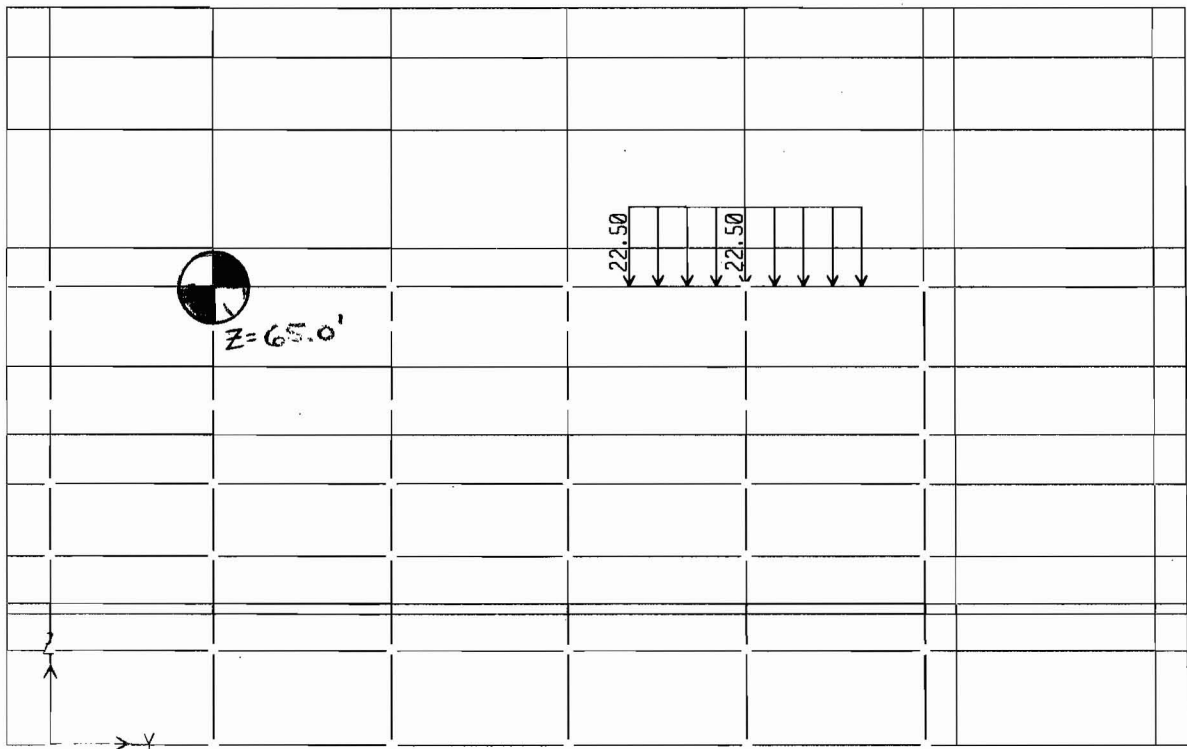
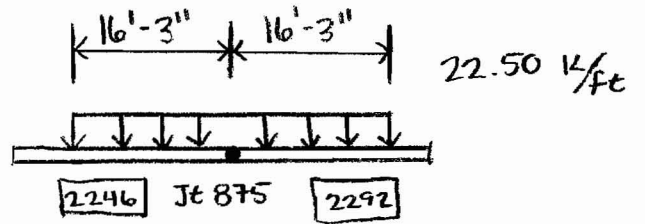




@ 65': Cask handling crane

x=0

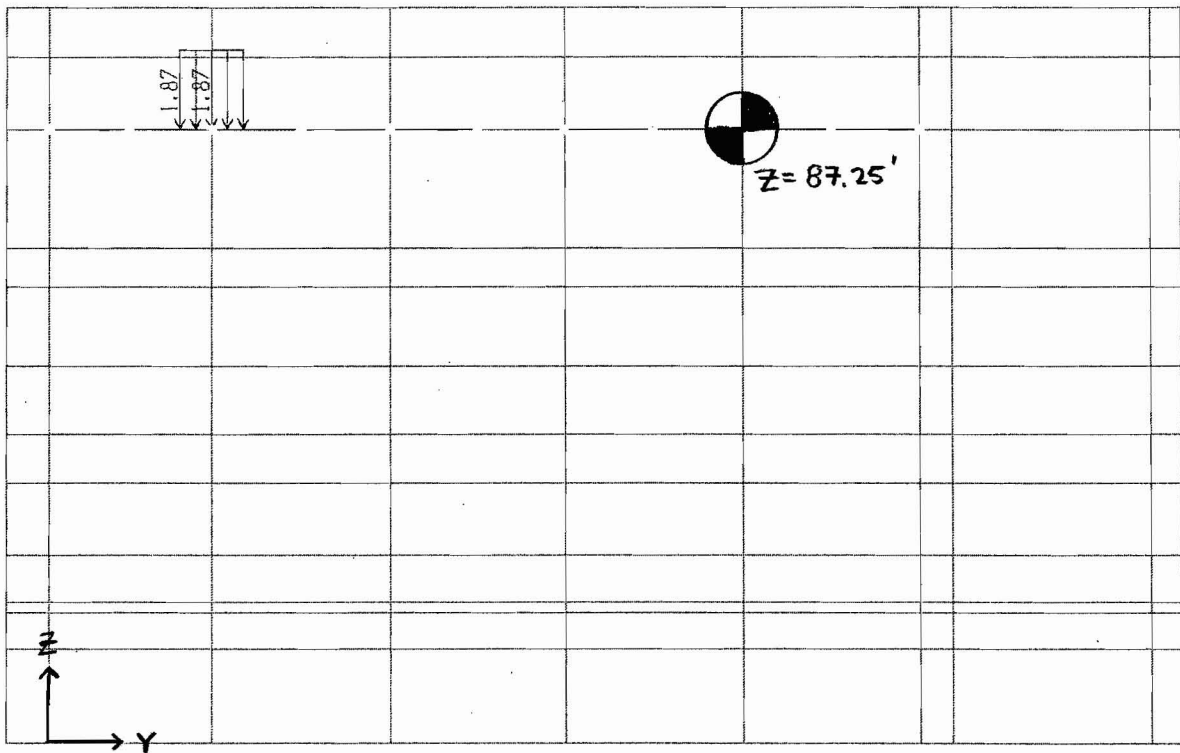
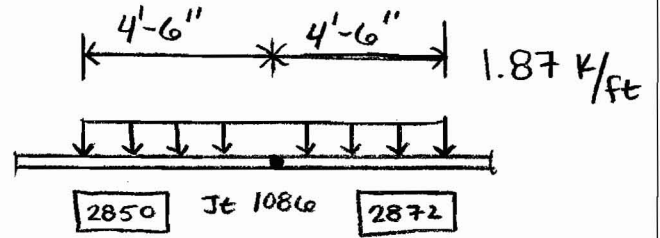
@ 65':



@ 65': Crank handling crane

X = 0.0'

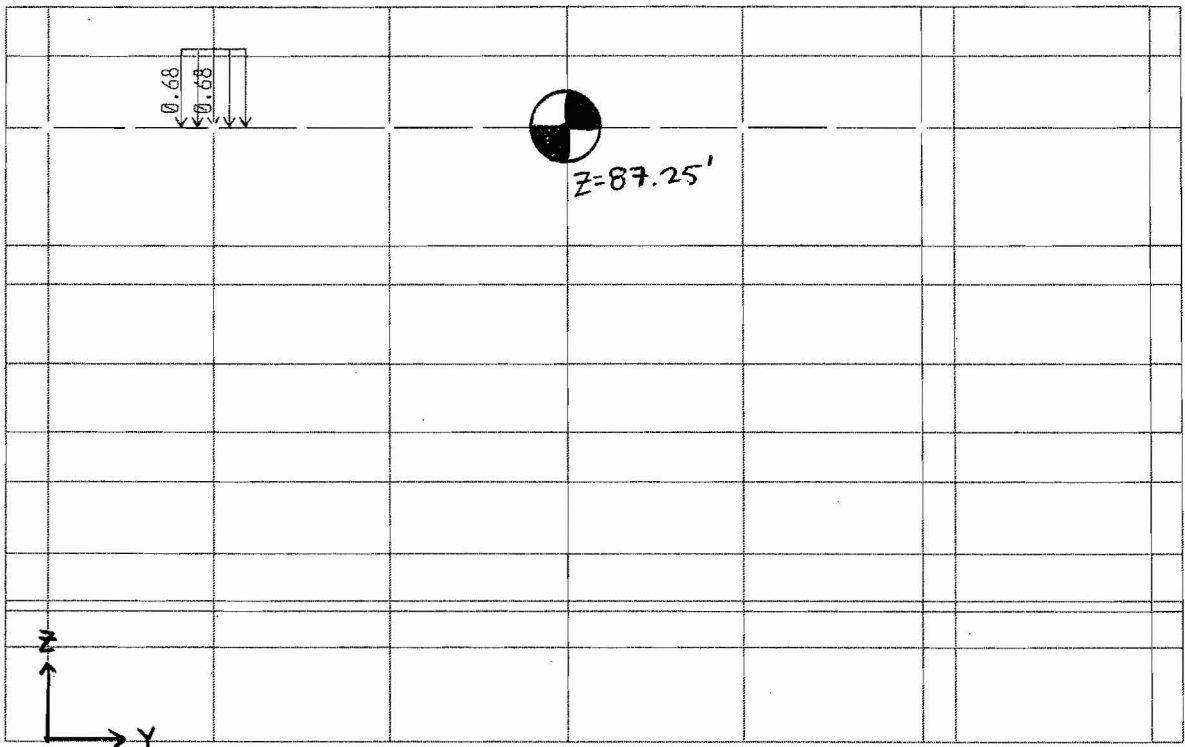
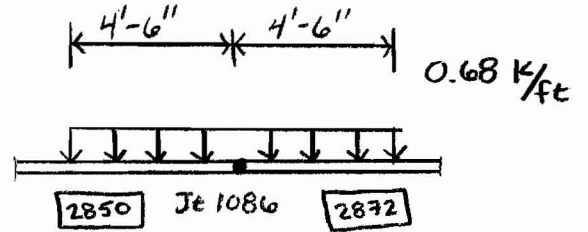
@ 87'-3":



@ 87'-3": CTM Maintenance Crane

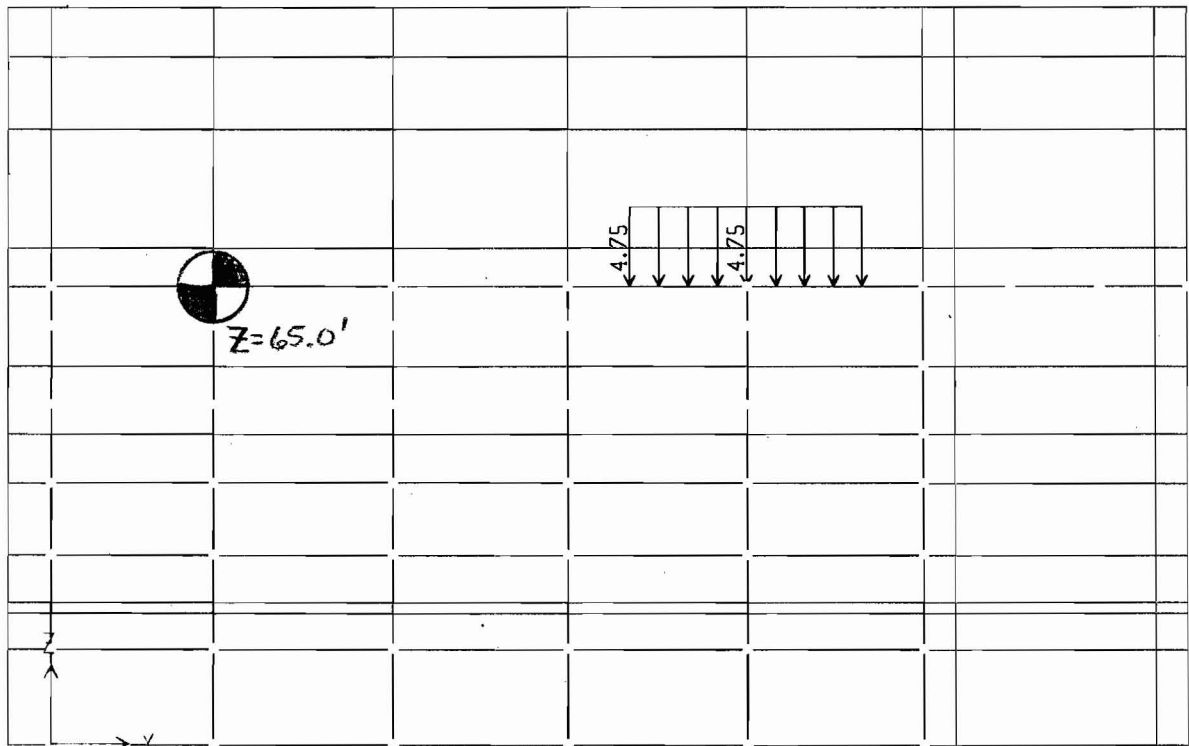
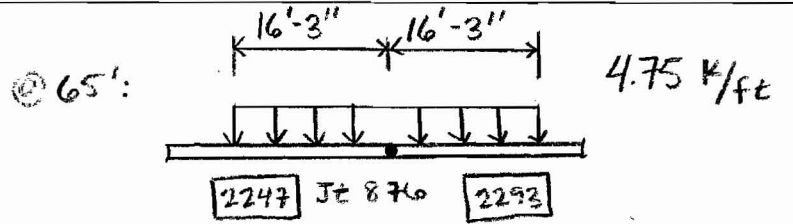
X = 87.75'

@ 87'-3":



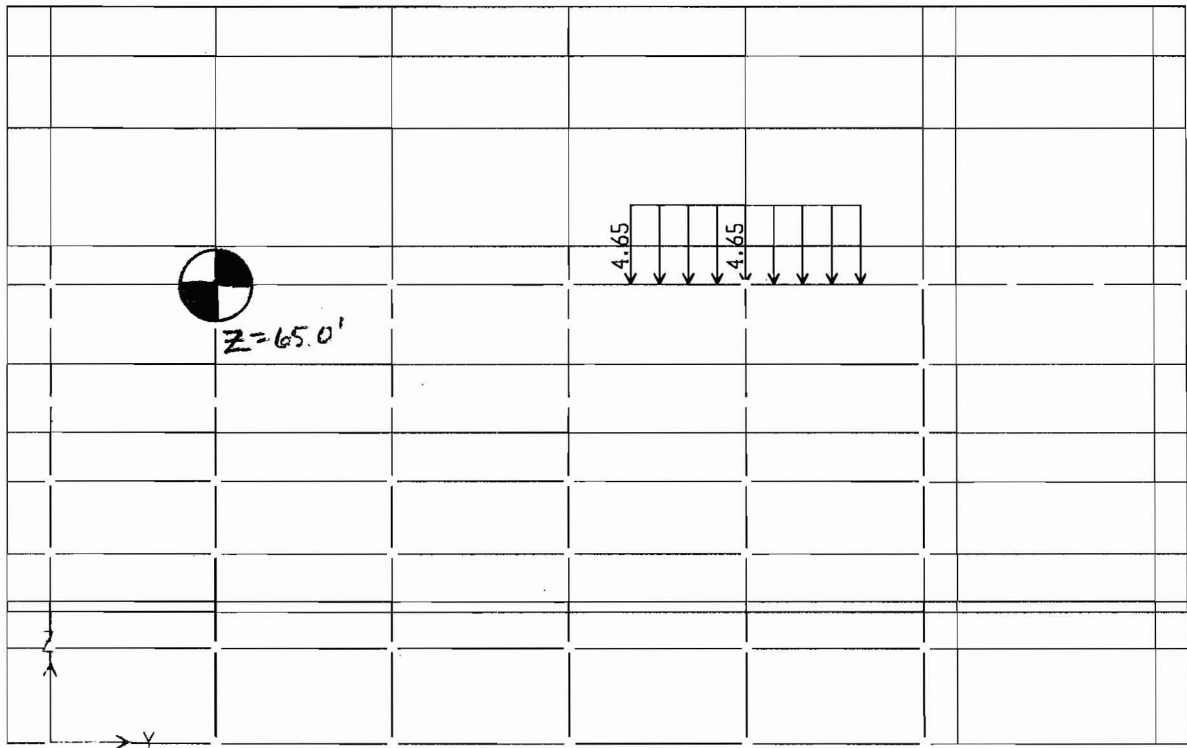
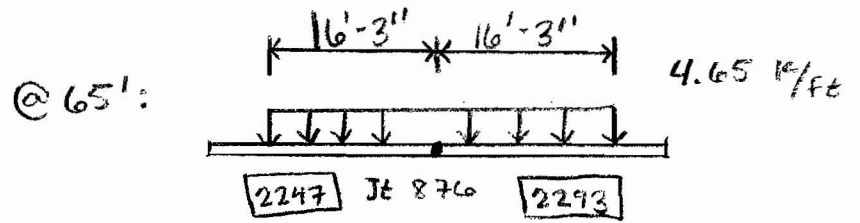
@ 87'-3": CTM Maintenance crane

$X=87.70$



@ 65': Cast handling crane

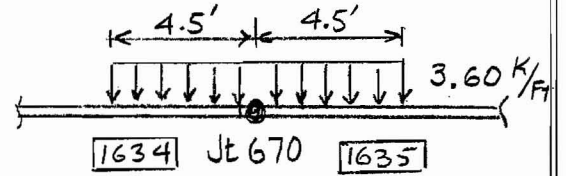
X = 59.50



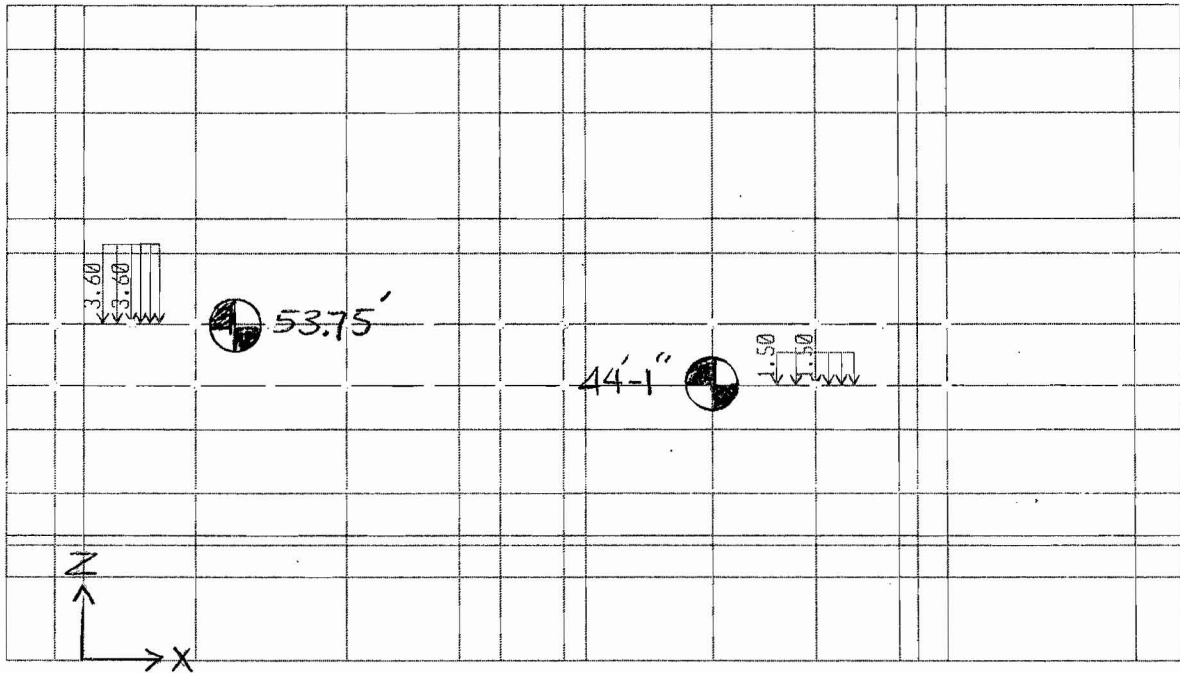
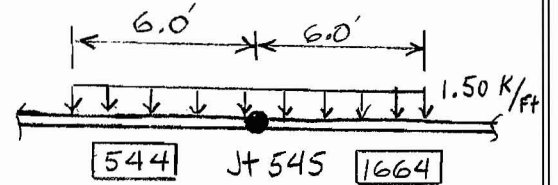
@ 65': Crk handling Crane

X = 59.50'

@ EL 53.75:



@ EL 44'-1"

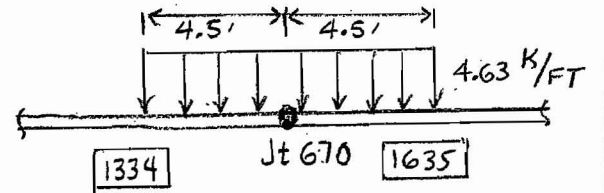


@ 53.75' WP CLOSURE ROOM CRANE  
@ 44'-1" REMOTE HANDLING CRANE

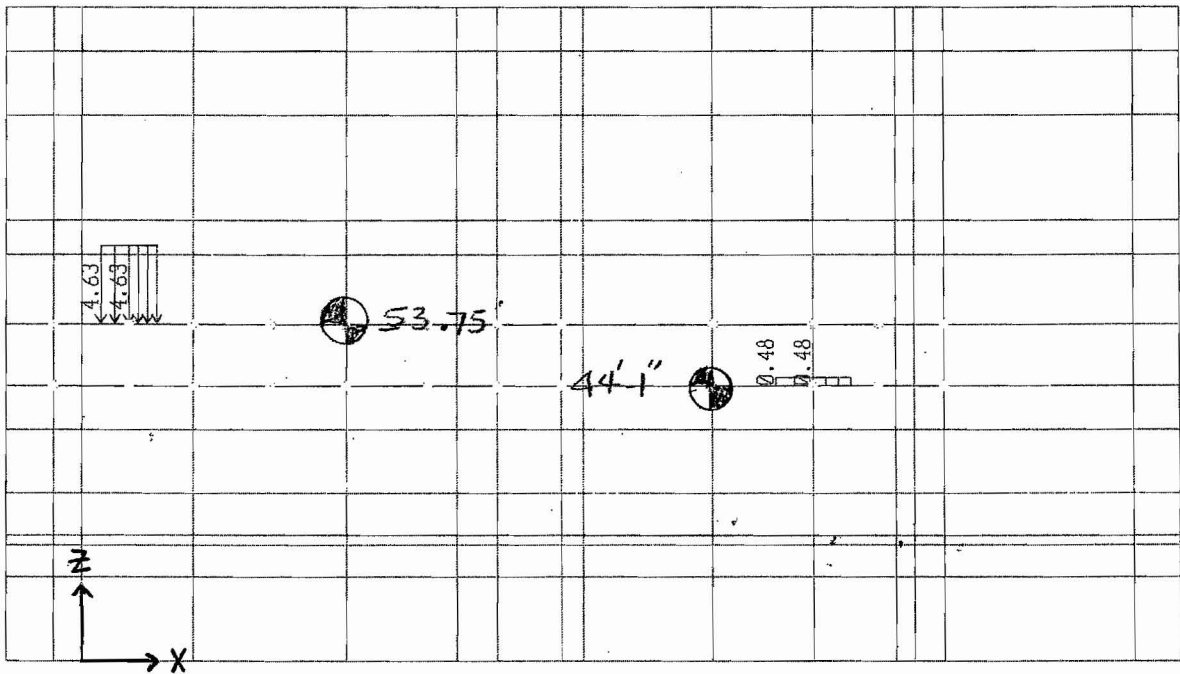
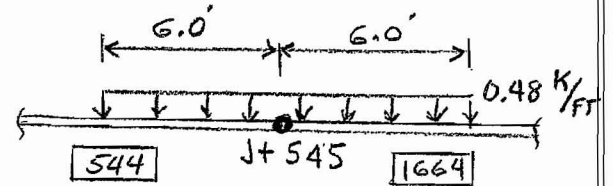
$$Y = 155.50'$$

MAD  
2/22/08

@ EL 53.75'



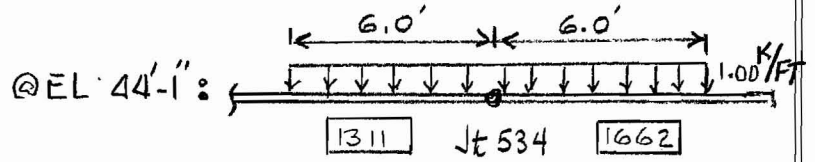
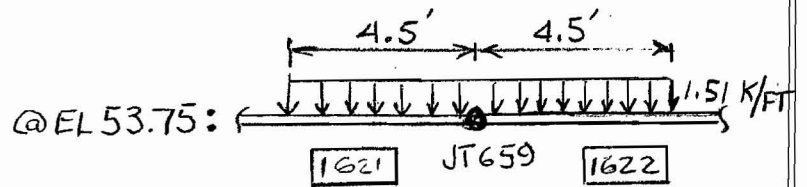
@ EL 44'-1"



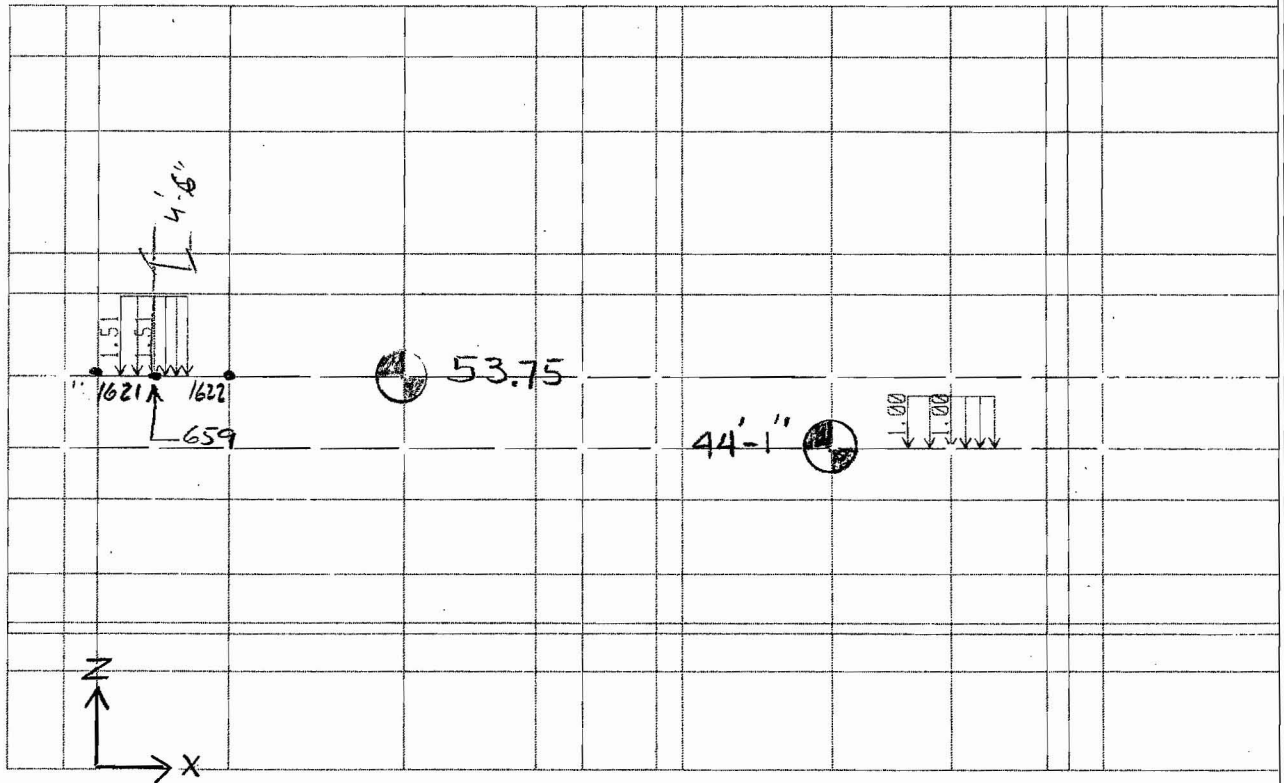
@ 53.75' WP CLOSURE ROOM CRANE  
@ 44'-1" REMOTE HANDLING CRANE

$$y = 155.50'$$





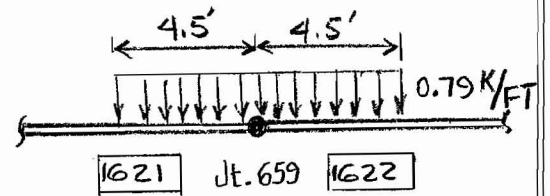
● JOINT  
 ◻ MEMBER  
 FOR ALL LOAD CASES  
 ON ALL FOLLOWING PAGES



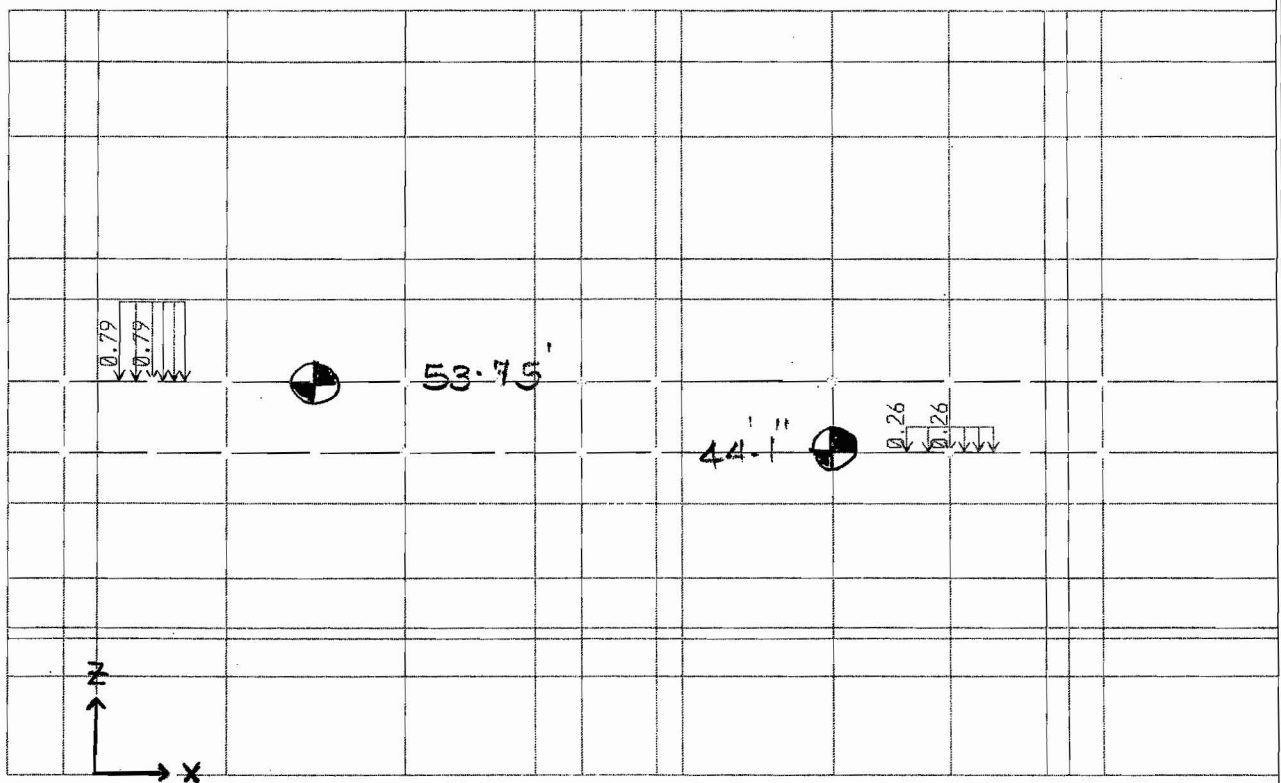
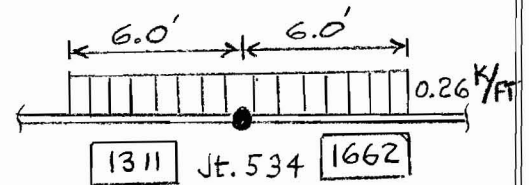
53.75' WP CLOSURE ROOM CRANE  
 44'-1" REMOTE HANDLING CRANE

$$Y = 127.50'$$

@ EL 53.75':



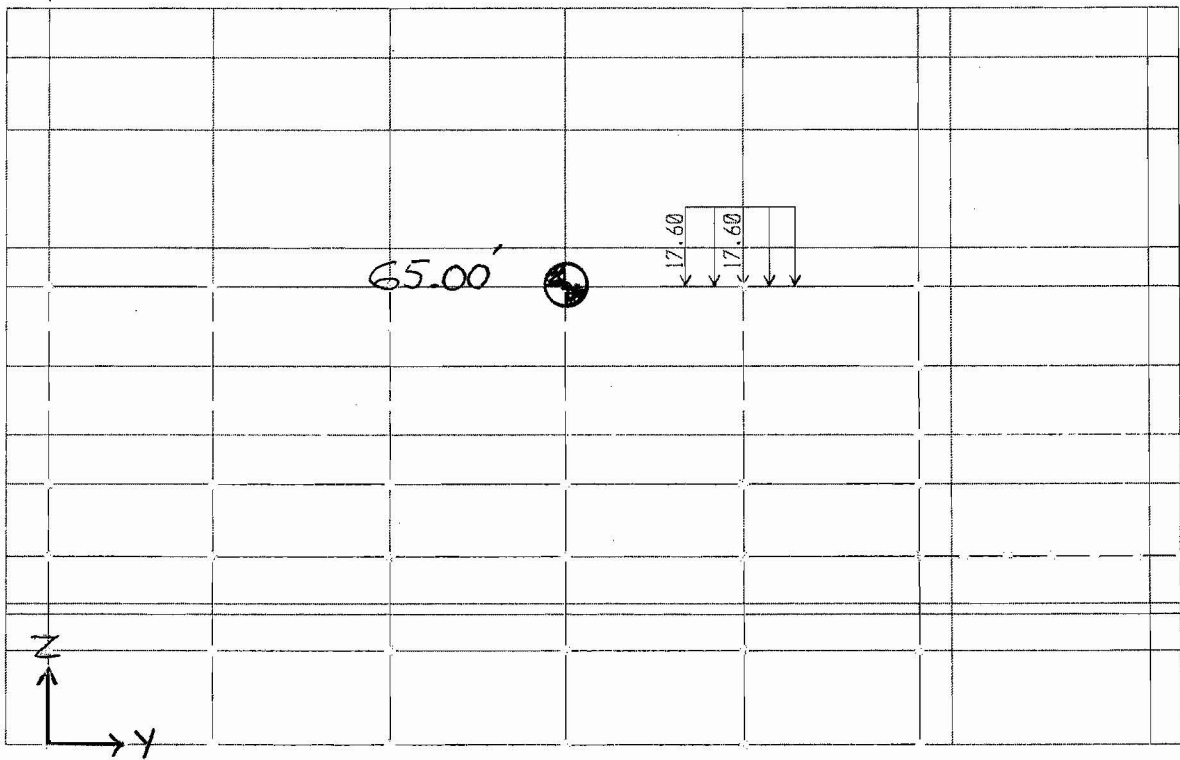
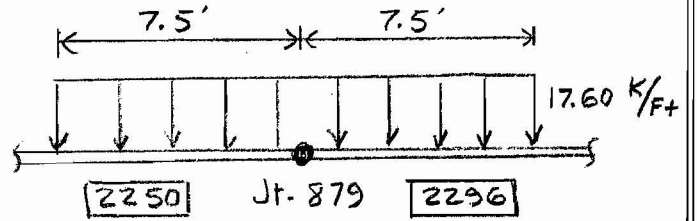
@ EL 44'-1":



53.75' WP closure room crane  
44'-1" Remote handling crane.

$$Y = 127.50'$$

@ 65.00'

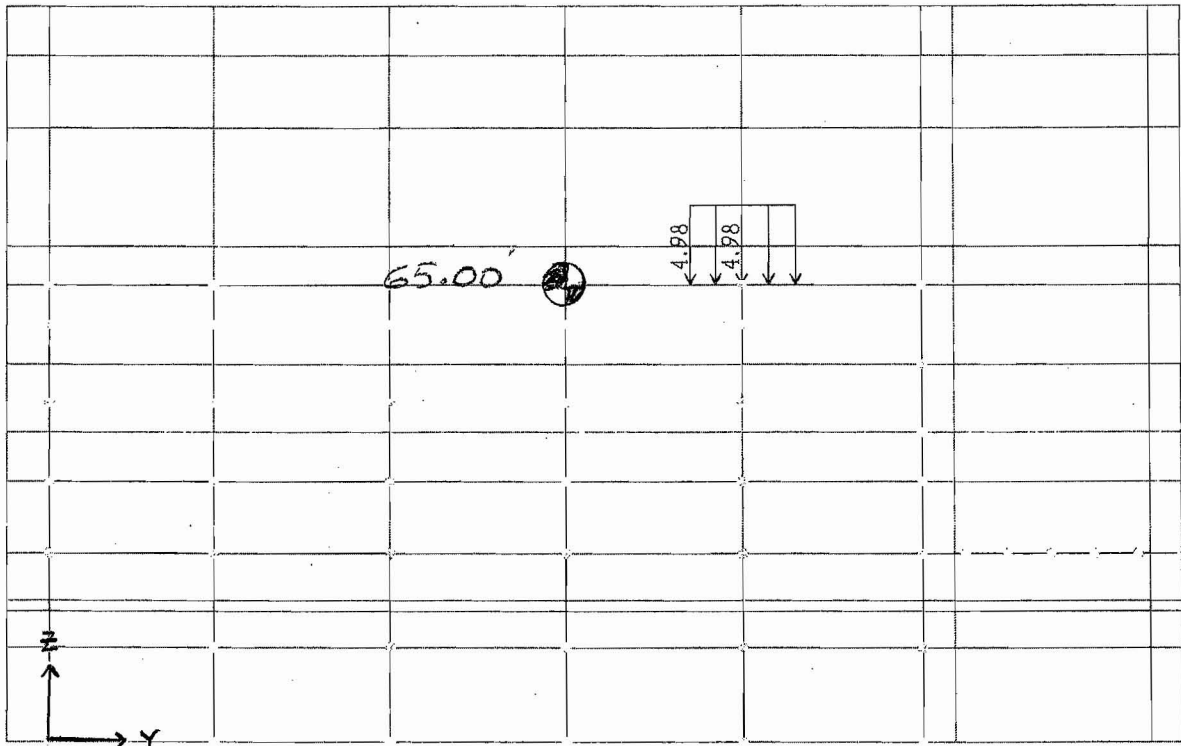
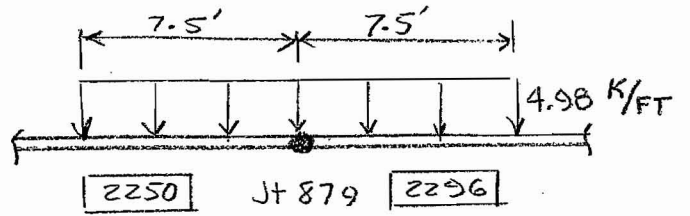


@ 65.0' CANISTER TRANSFER MACHINE CRANE

X = 79.75

MMS  
2/22/08

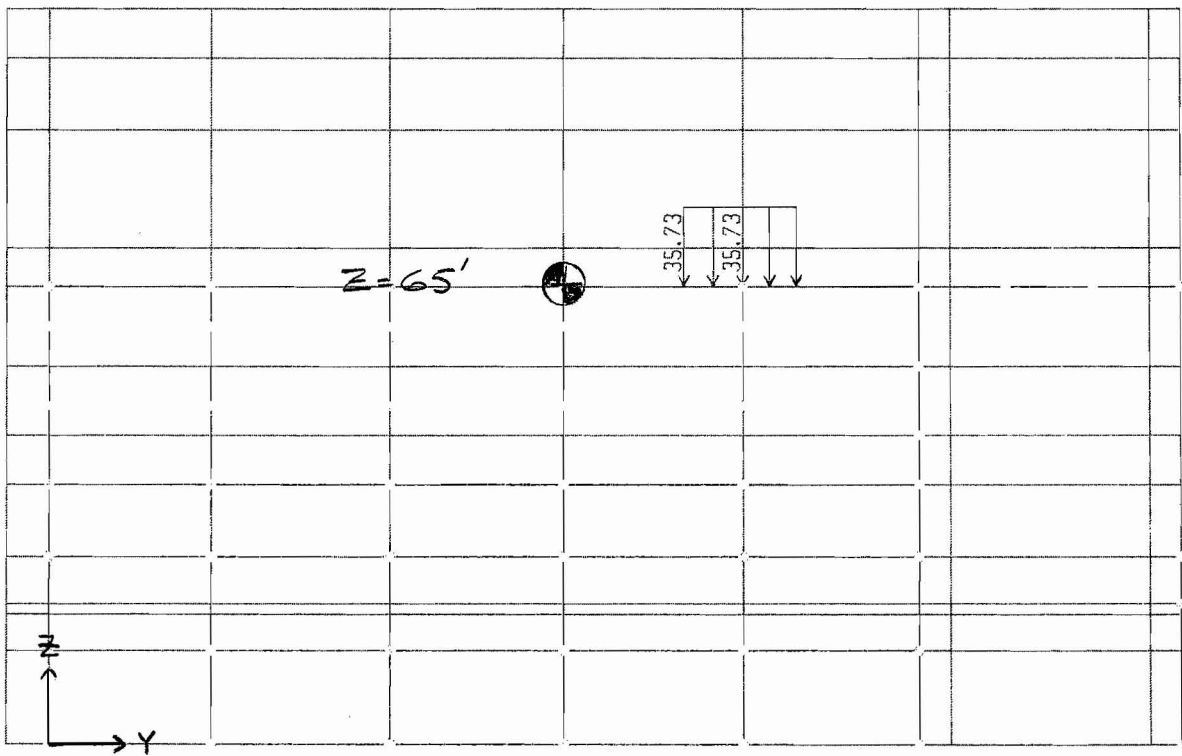
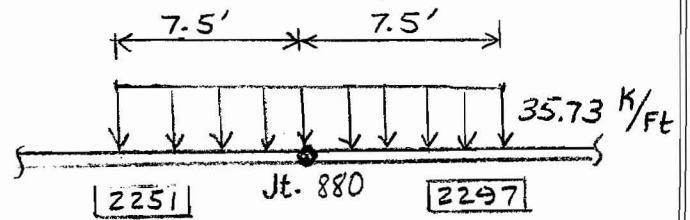
@ 65.00'



@ 65.00' CANISTER TRANSFER  
MACHINE CRANE

X = 79.75'

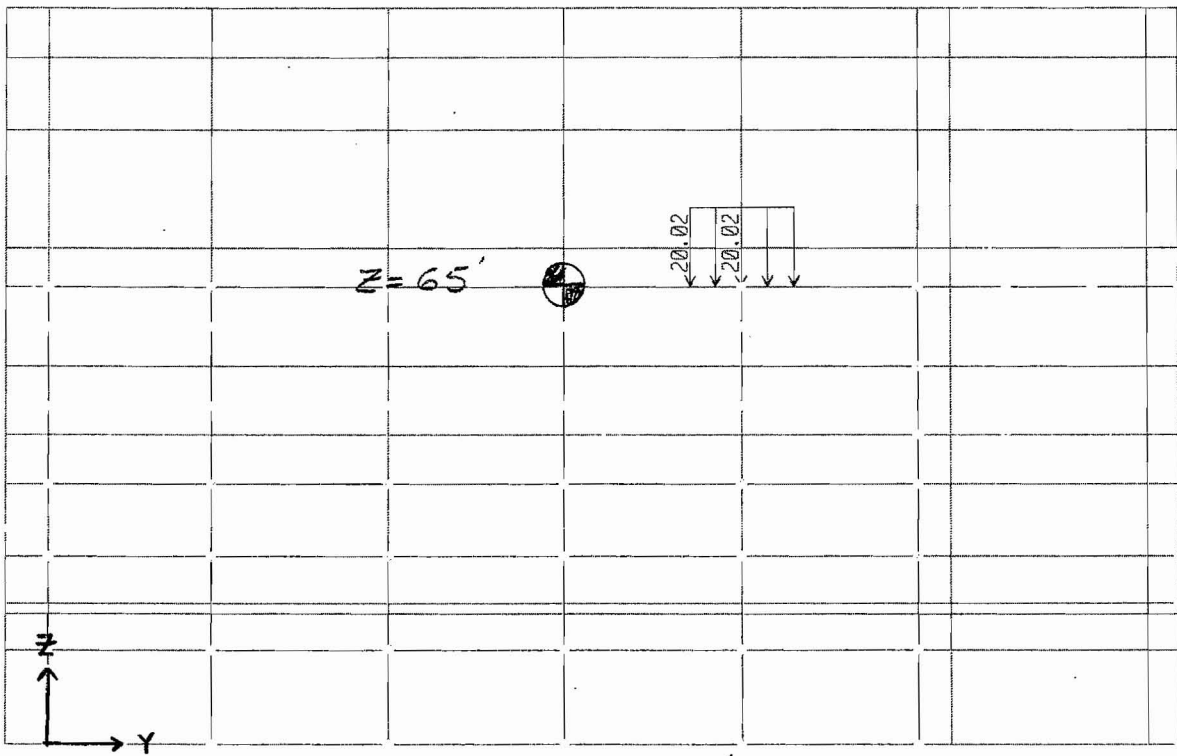
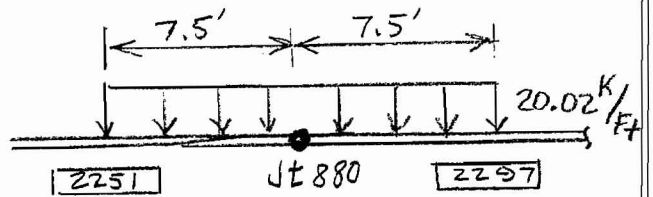
@ 65'



@ 65' CANISTER TRANSFER MACHINE CRANE

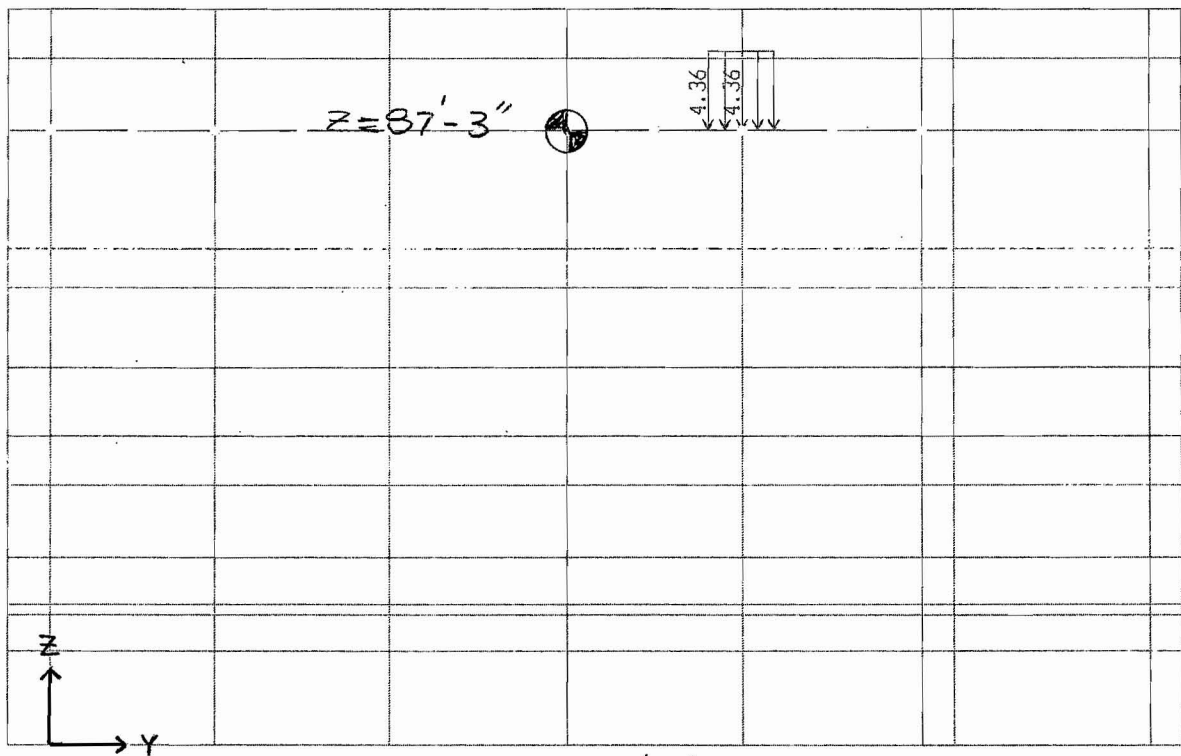
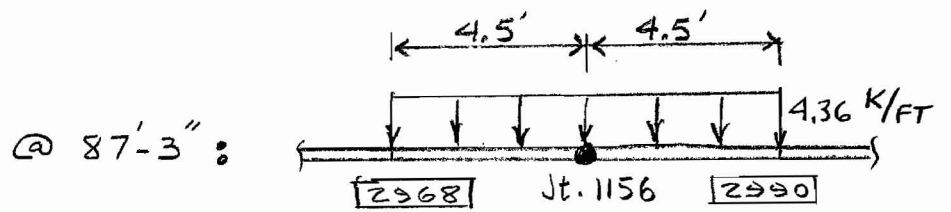
X = 129.25'

@ 65':



@ 65' CANISTER TRANSFER MACHINE CRANE

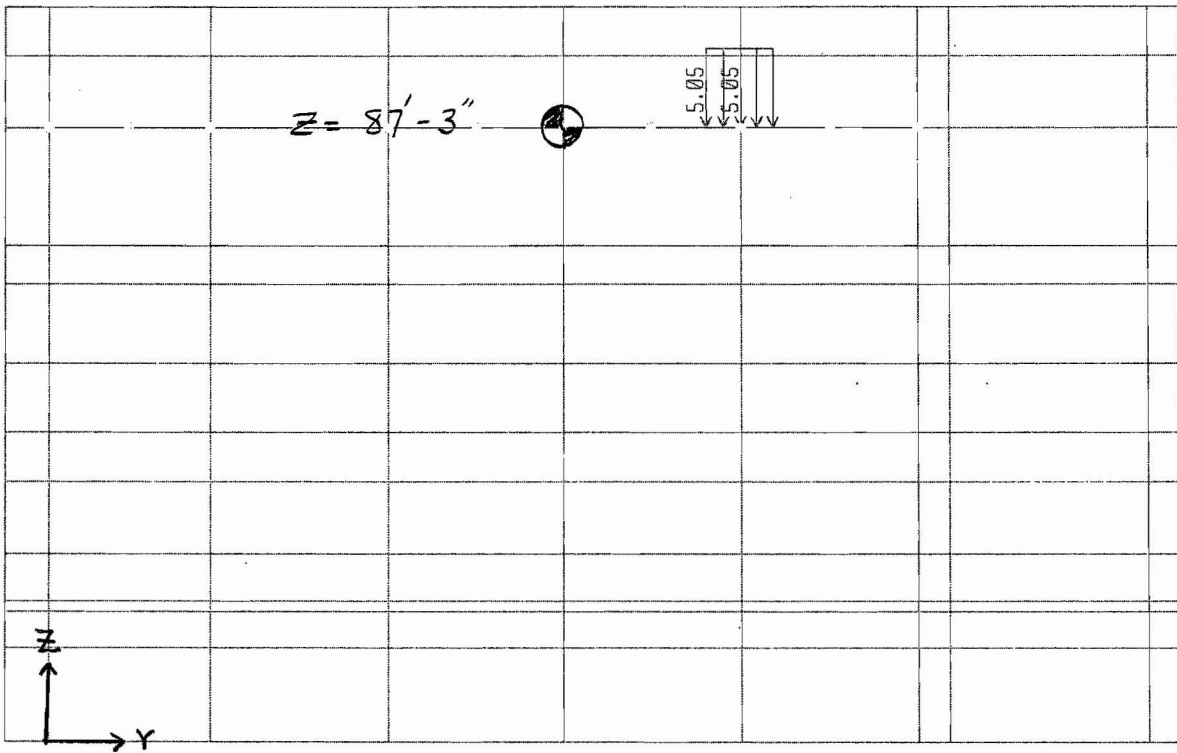
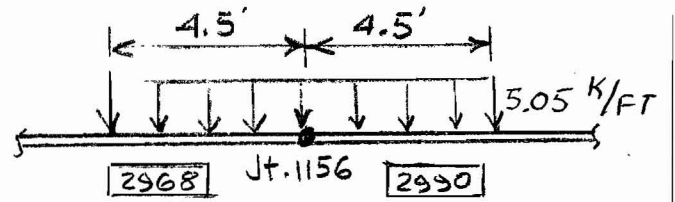
X = 129.25'



@ 87'-3" CTM MAINTENANCE CRANE

$X = 130.25'$

@ 87'-3" :

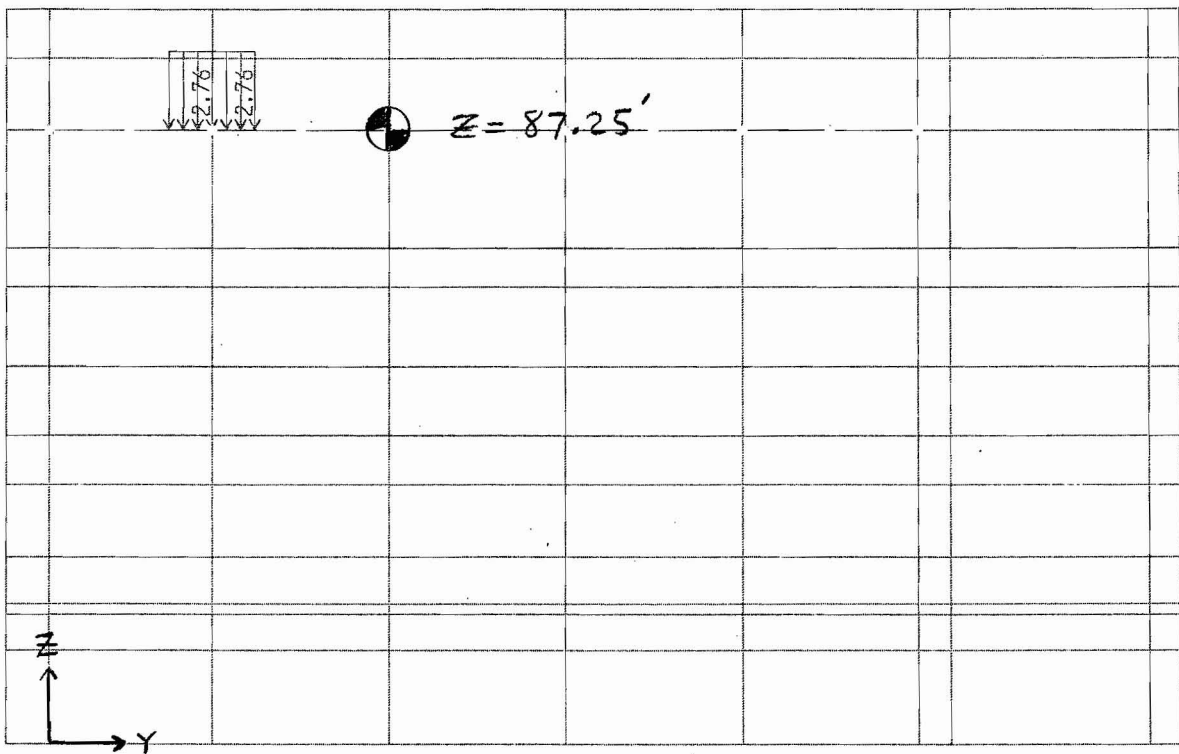
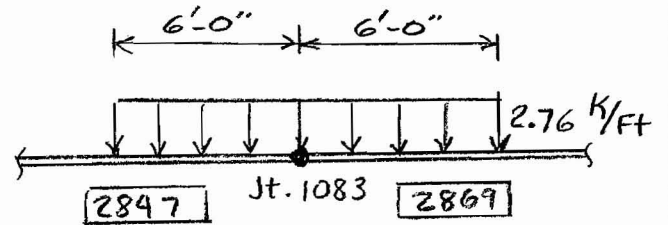


@ 87'-3" CTM MAINTENANCE CRANE

X = 130.25'



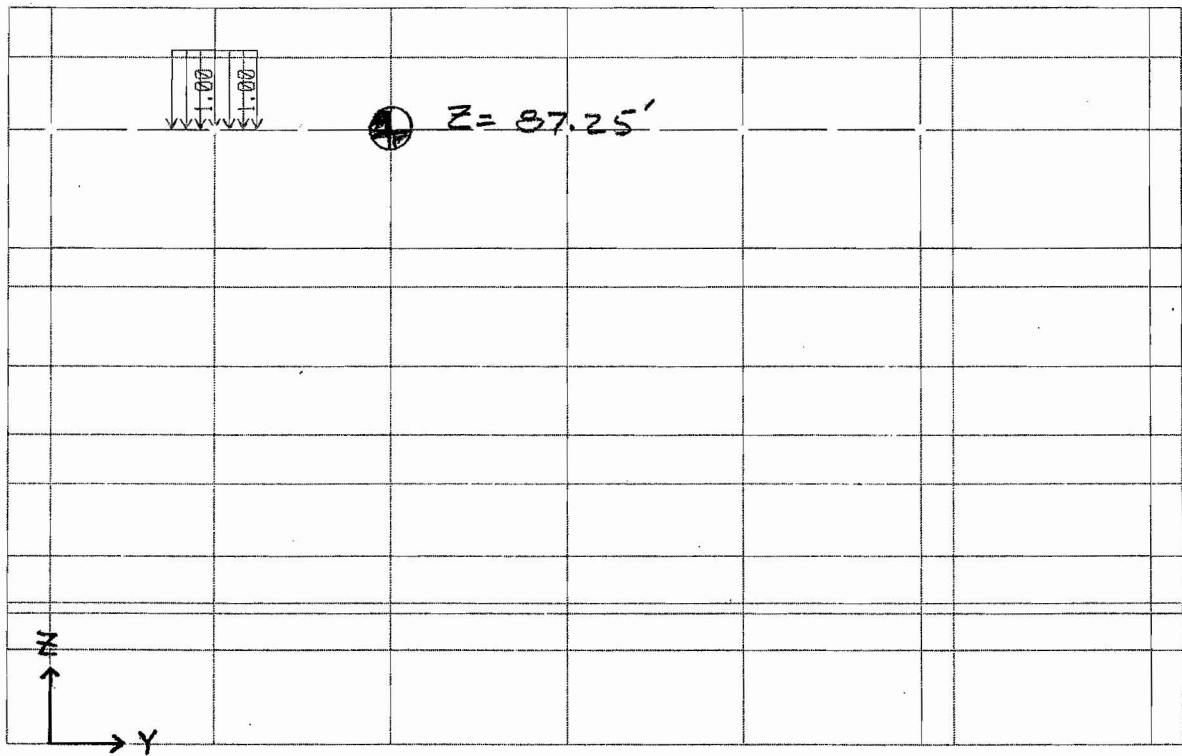
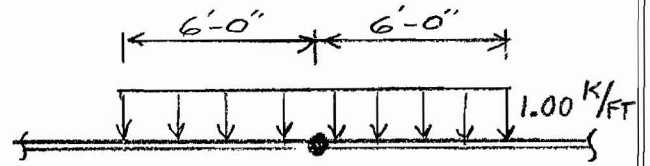
Ø 87'-3"



@ 87'-3" CRANE PREPARATION CRANE

$X = 63.50$

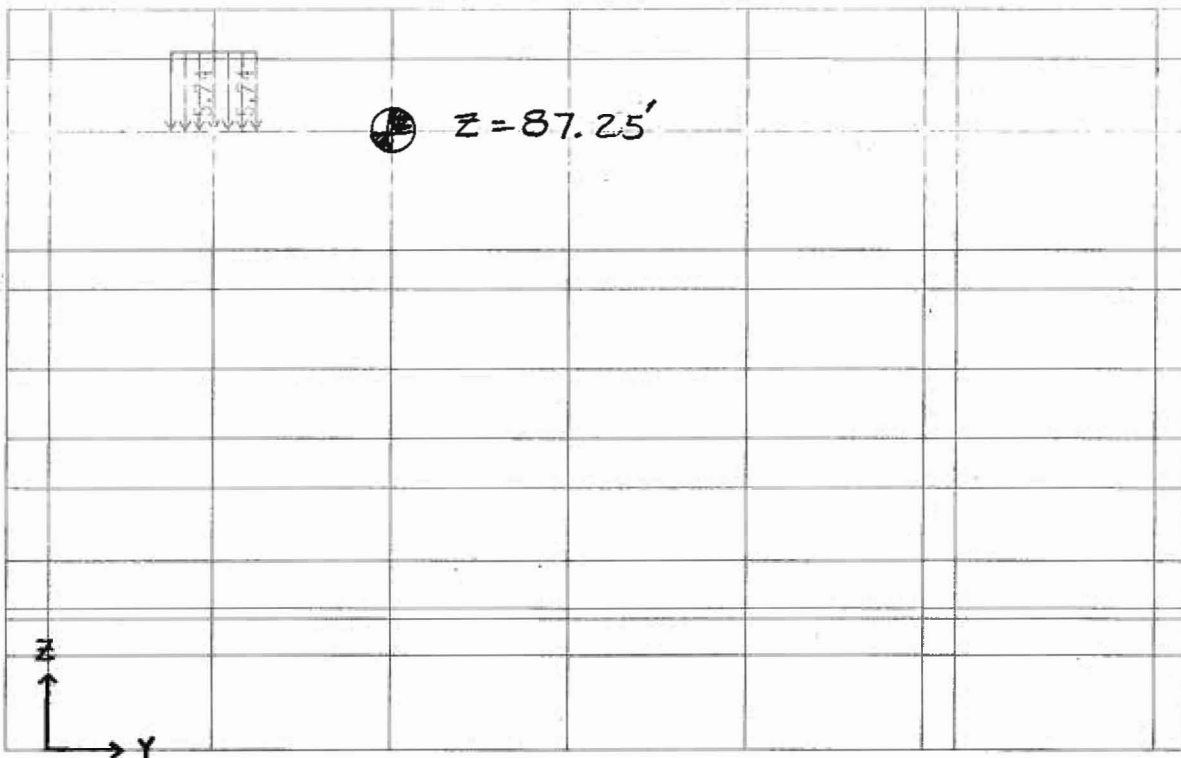
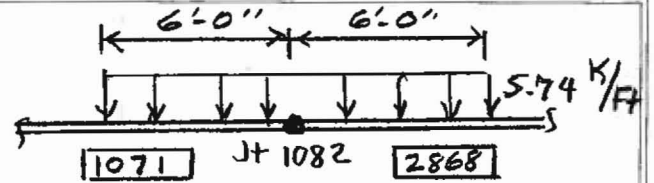
@ 87'-3" :



@ 87'-3" CRANE PREPARATION CRANE

X = 63.50

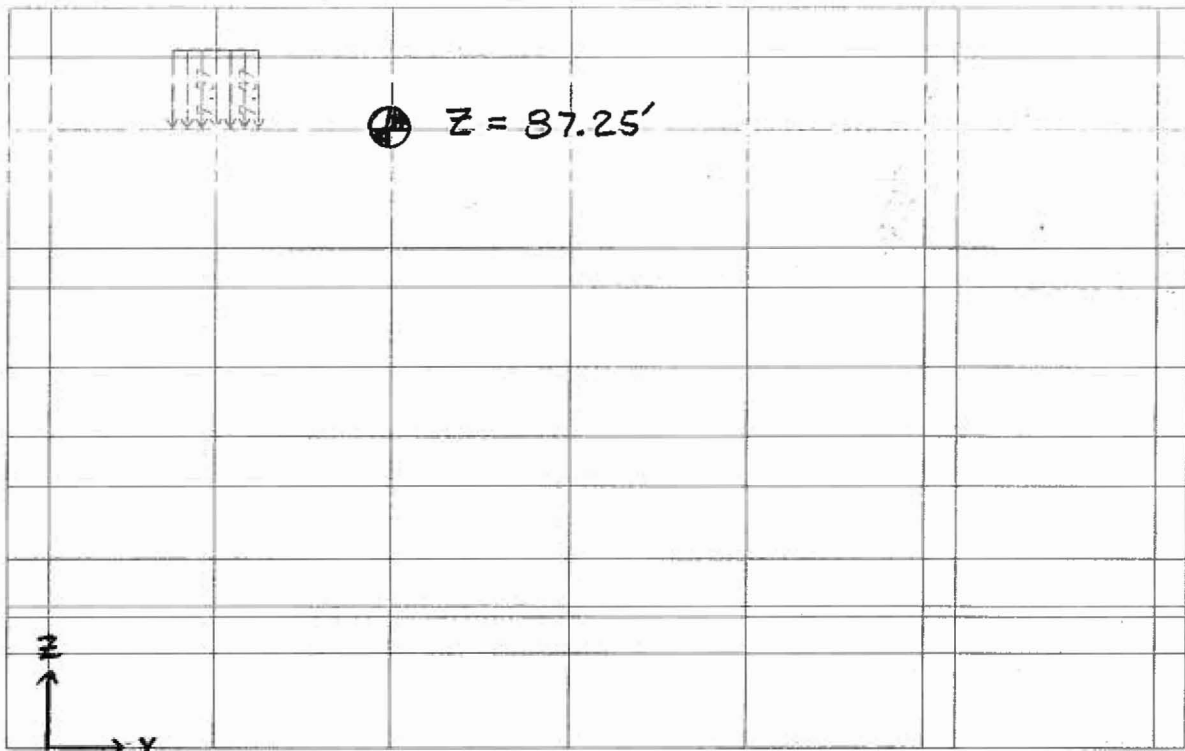
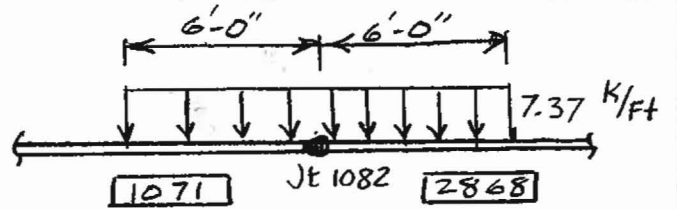
@ 87'-3" :



@ 87'-3" CASK PREPARATION CRANE

$x = -2.0$

@ 87'-3" :

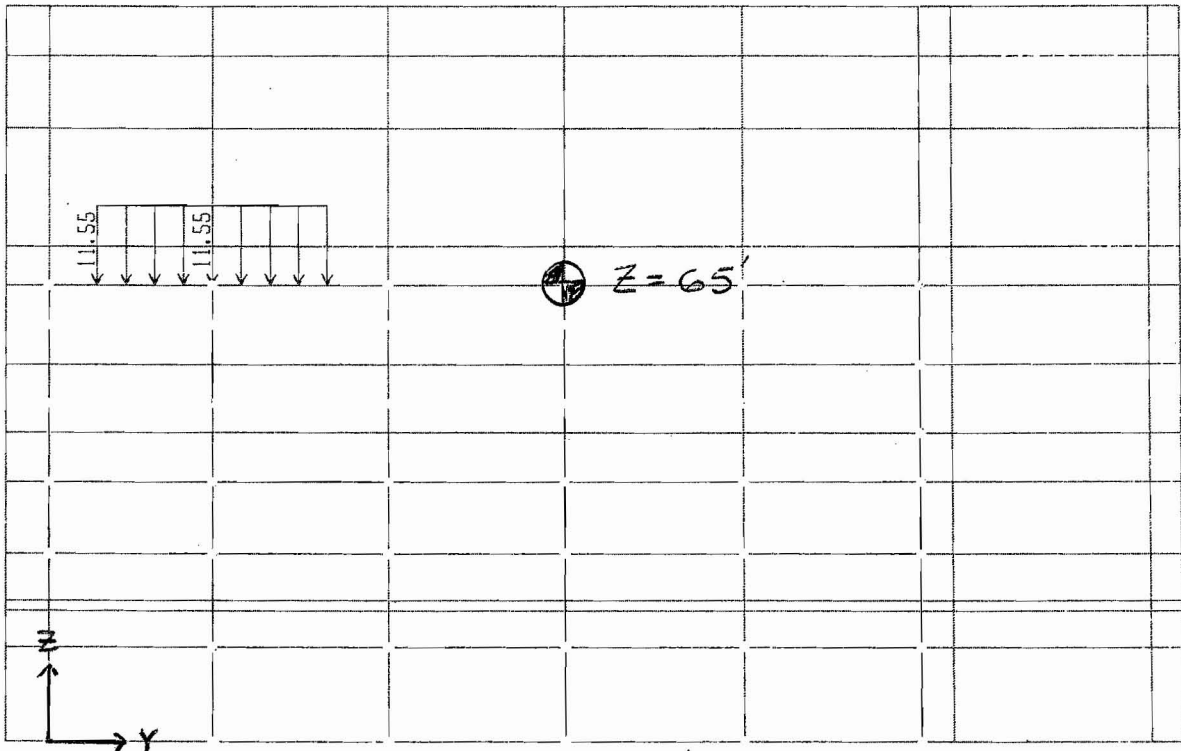
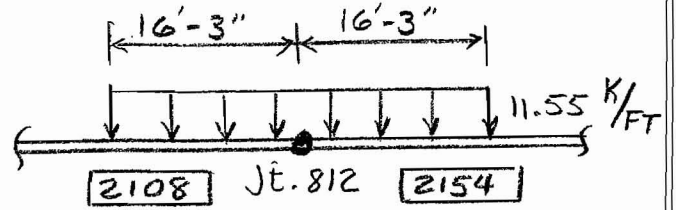


@ 87'-3" CASK PREPARATION CRANE

X = -2.0

MAN  
2/22/08

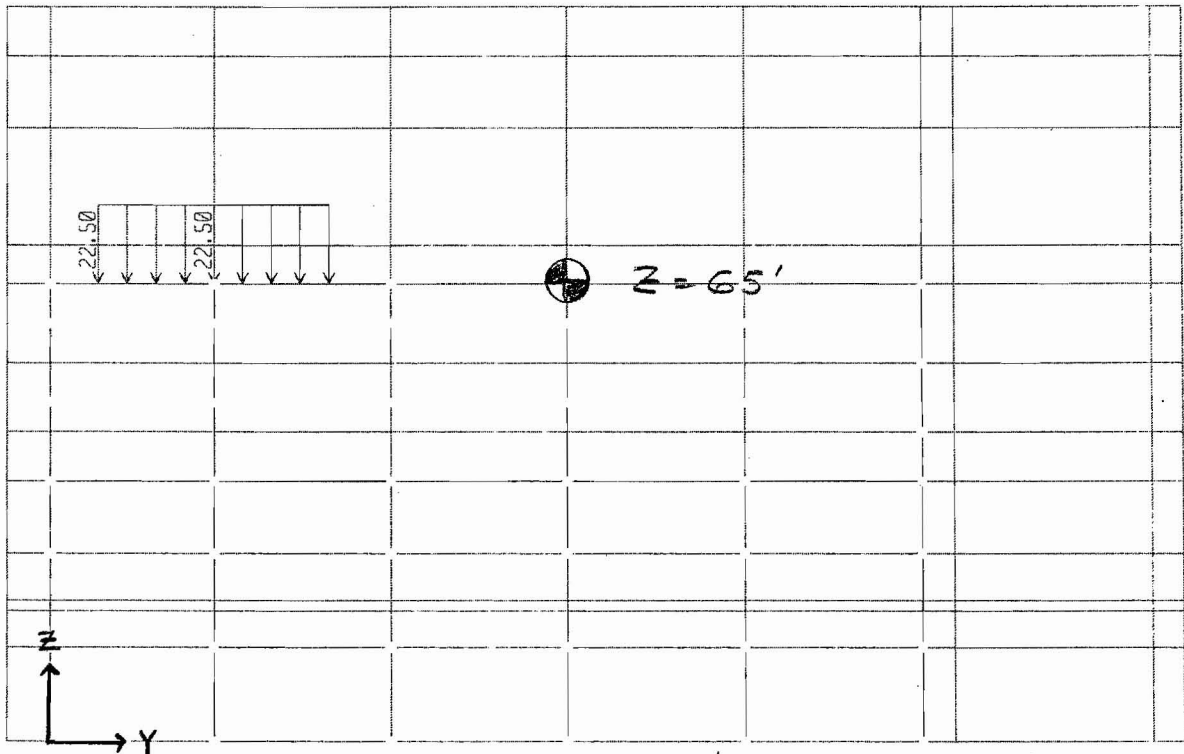
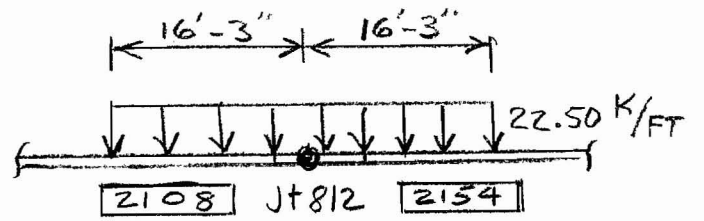
@ 65'



@65' CASK HANDLING CRANE

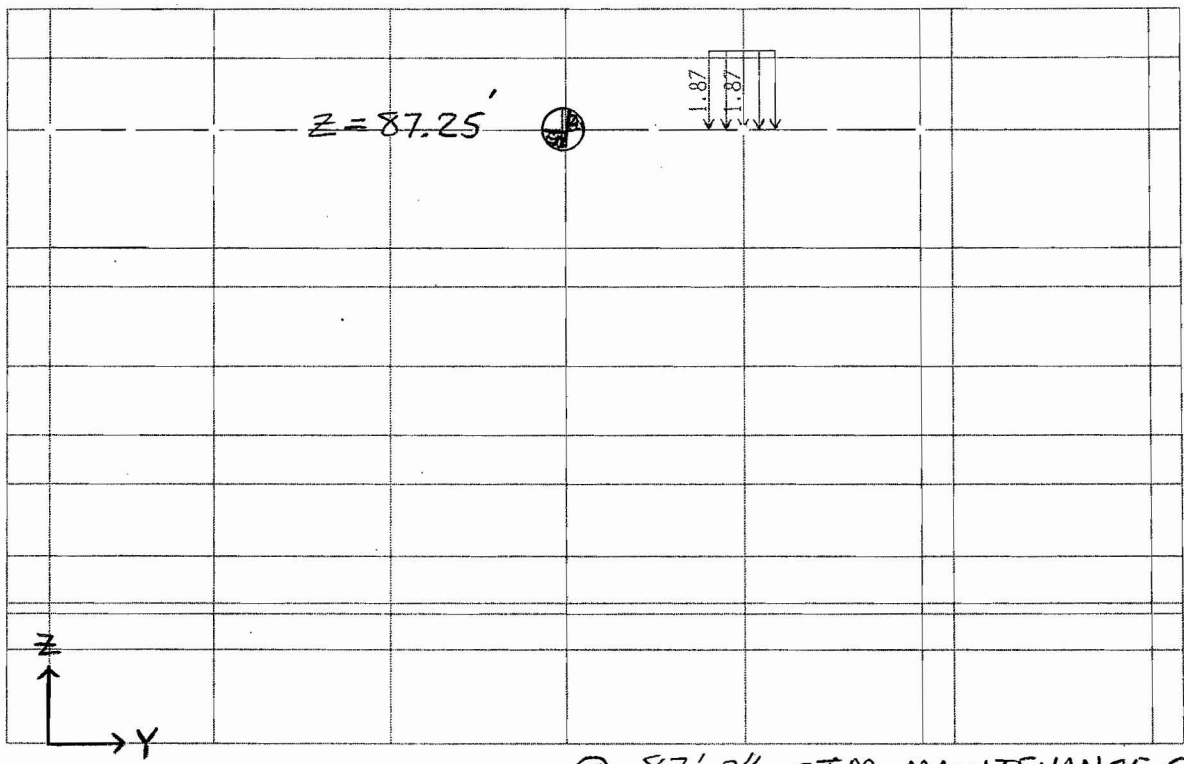
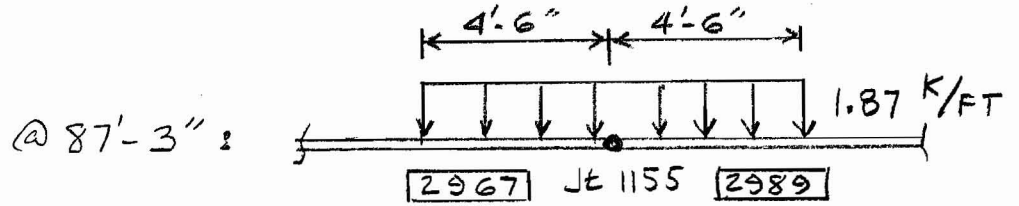
X = 0'

@65'



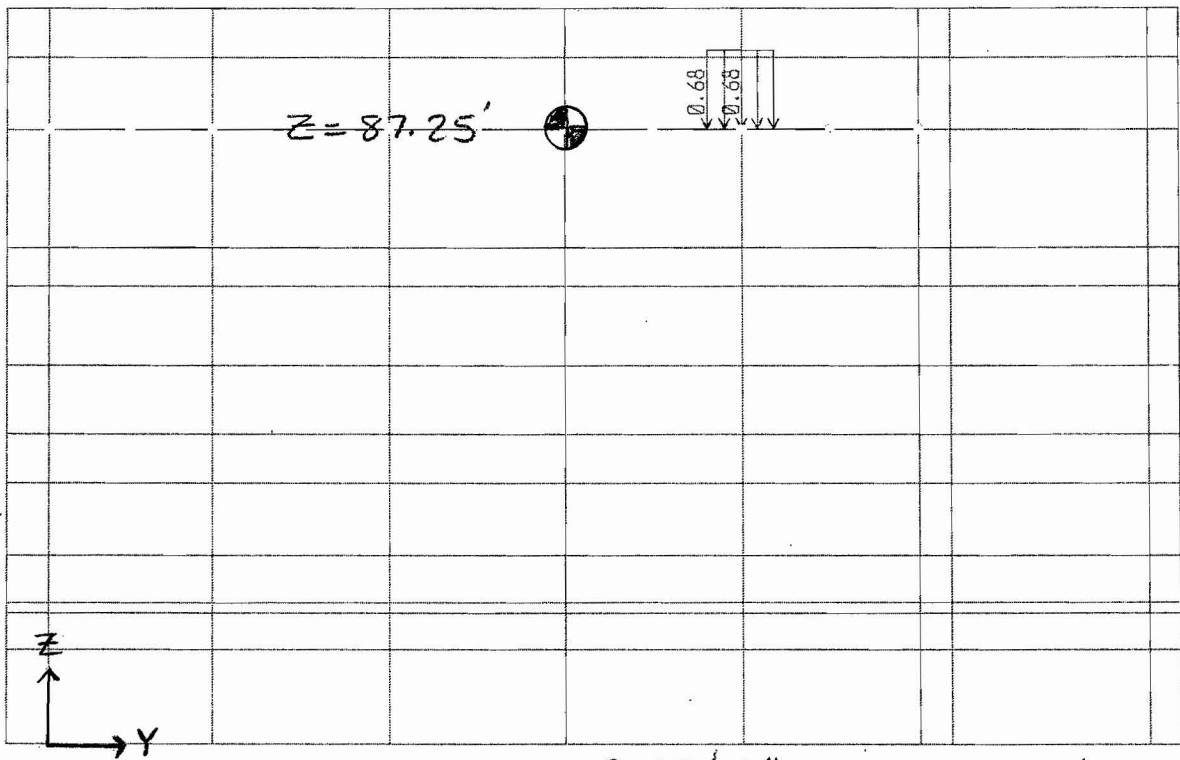
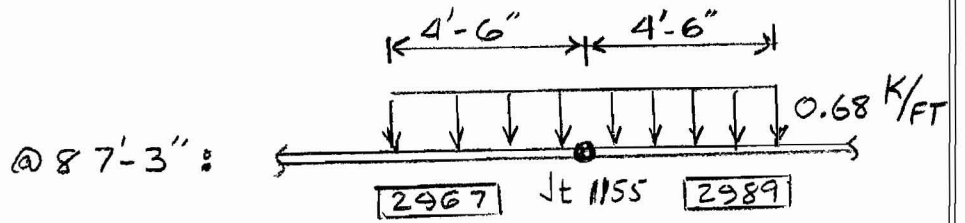
@65' CASK HANDLING CRANE

X=0'



@ 87'-3" CTM MAINTENANCE CRANE

X = 78.75'



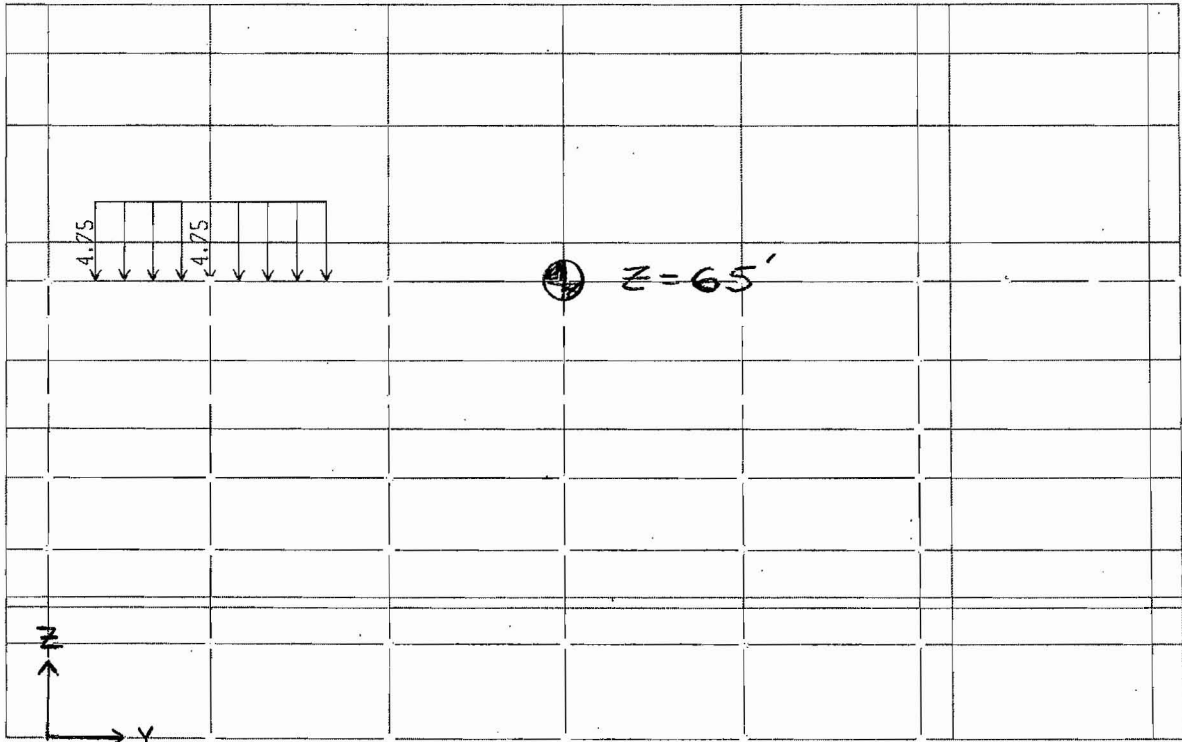
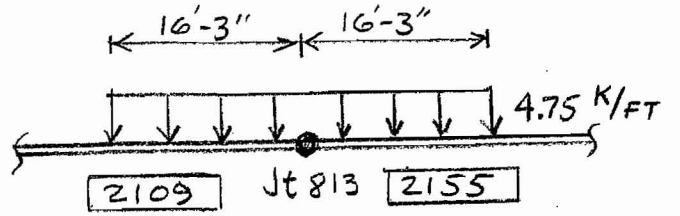
@ 87'-3" LTM MAINTENANCE CRANE

X = 78.75'



MDS  
2/22/08

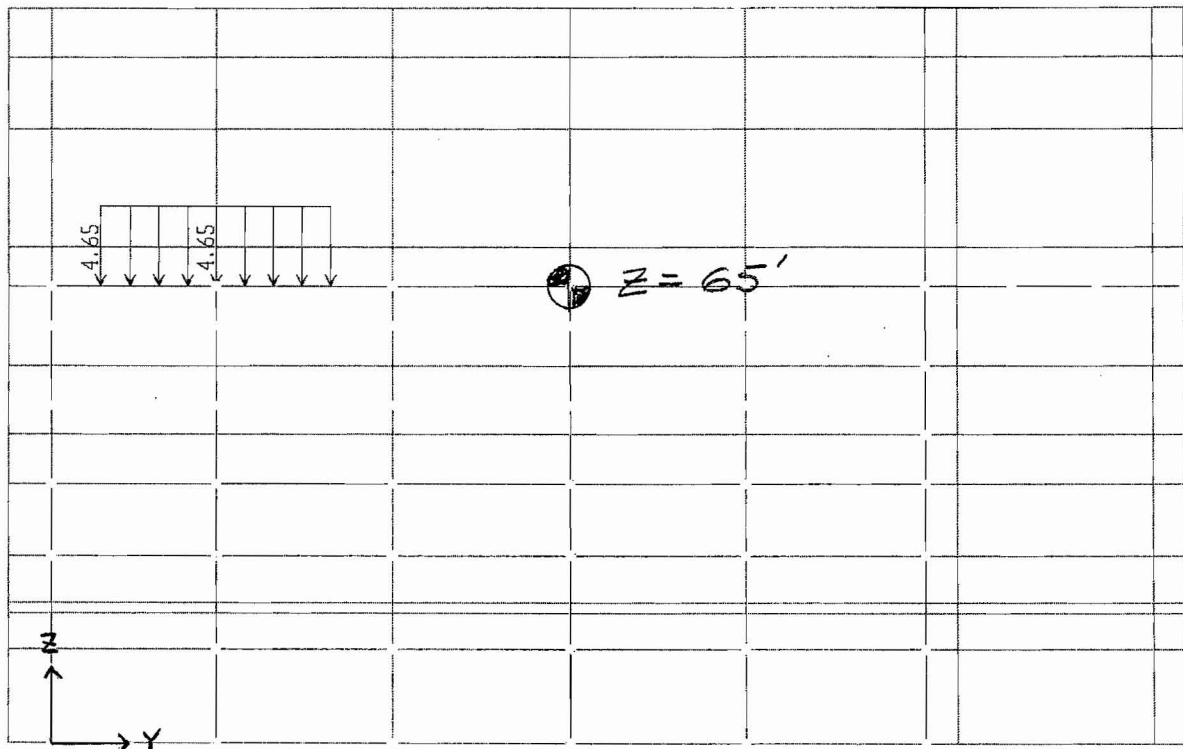
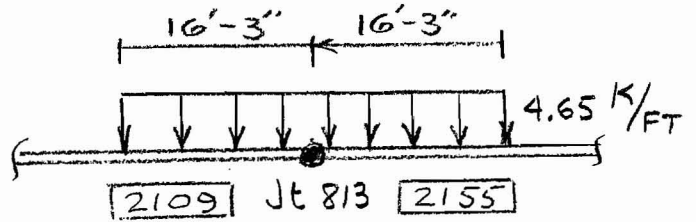
@ 65' :



@ 65' CASK HANDLING CRANE

X = 59.50'

@65'



@65' CASK HANDLING CRANE

X = 59.50'

**ATTACHMENT D**

**Crane Load Case (CLC) Input and Output files**

refer to CD

**ATTACHMENT E**

**Foundation Loads**

refer to CD

**ATTACHMENT F**

**Groups D/C Ratios, Info for LA, Max. Joint Displ & Accel**

refer to CD

**ATTACHMENT G**

**Not Used**



IHF STEEL STRUCTURE SEISMIC ANALYSIS <sup>MAN</sup> 2/22/08  
AND STEEL MEMBER DESIGN

51A-SSC-IH00-00600-000-00B



Salvador Macias  
11/05/2007 01:10 PM

To: Alan Ketin/YM/RWDOE@CRWMS, Jason Paredes/YM/RWDOE@CRWMS, Luis  
Aires/YM/RWDOE@CRWMS  
cc: Maijia Lin/YM/RWDOE@CRWMS, Ray Chou/YM/RWDOE@CRWMS, Kiritkumar  
Parikh/YM/RWDOE@CRWMS, Hsien-Hsiu Ko/YM/RWDOE@CRWMS  
Subject: Fw: Loads & Load Combination Meeting Notes

LSN: Not Relevant - Not Privileged  
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Alan / Luis / Jason;

Here is the updated document on the "Loads & Load Combination Meeting Notes".

Please include the meeting notes in the calculations.

Thanks,  
Sal Macias

----- Forwarded by Salvador Macias/YM/RWDOE on 11/05/2007 01:00 PM -----



Salvador Macias  
11/05/2007 12:59 PM

To: Orhan Gurbuz <ogurbuz@bechtel.com>, Raj Rajagopal/YM/RWDOE@CRWMS, Thomas  
Frankert/YM/RWDOE@CRWMS  
cc:  
Subject: Fw: Loads & Load Combination Meeting Notes

LSN: Not Relevant - Not Privileged  
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Orhan / Raj / Tom,

Here is the updated document with all your comments incorporated "Loads & Load Combination Meeting Notes".



Meeting Notes on BDBGM & DBGGM-2 Loads Clarification.doc

Thanks,  
Sal Macias

----- Forwarded by Salvador Macias/YM/RWDOE on 11/05/2007 12:12 PM -----



"Gurbuz, Orhan" <ogurbuz@bechtel.com> on 09/24/2007 04:54:28 PM

To: "Gurbuz, Orhan" <ogurbuz@bechtel.com>, "Macias, Salvador" <salvador\_macias@ymp.gov>, "Rajagopal,  
Raj" <raj\_rajagopal@ymp.gov>, "Frankert, Thomas" <thomas\_frankert@ymp.gov>  
cc:  
Subject: RE: Loads & Load Combination Meeting Notes

LSN: Not Relevant - Not Privileged

MAN H-2  
2/22/08  
MAN



MAA  
2/22/08 I/F STEEL STRUCTURE SEISMIC ANALYSIS  
AND STEEL MEMBER DESIGN

51A-SSC-IH00-00600-000-00B

User Filed as: Excl/AdminMgmt-14-4/QA.N/A

Sending again, with attachment!

**Orhan Gurbuz**  
**Bechtel Fellow & Senior Principal Engineer**  
**Tel: 714-625-0656**  
**Fax: 714-846-1501**

---

**From:** Gurbuz, Orhan  
**Sent:** Monday, September 24, 2007 3:29 PM  
**To:** Macias, Salvador; Rajagopal, Raj; Frankert, Thomas  
**Subject:** RE: Loads & Load Combination Meeting Notes

Sal,

I have reviewed and marked-up you meeting notes. Please see the attached. It is a good idea to document this as part of the calculations.

If you have any questions, please let me know.

Orhan Gurbuz  
Bechtel Fellow & Senior Principal Engineer  
Tel: 714-625-0656  
Fax: 714-846-1501

-----Original Message-----

**From:** Macias, Salvador  
**Sent:** Thursday, September 20, 2007 6:11 PM  
**To:** Gurbuz, Orhan; Rajagopal, Raj; Frankert, Thomas  
**Subject:** Loads & Load Combination Meeting Notes

Orhan / Raj / Tom,

Here are the notes taken for the "Loads & Load Combination" meeting held on Wednesday 9-19-07.

(See attached file: Meeting Notes on BDBGM & DBG M-2 Loads Clarification 9 19 07 SAL.doc)

These notes were reviewed by Luis, Alan, Jason and Sal, and their comments have been incorporated so as to make the meeting minutes as complete as possible.

My intent is to attach the final meeting into our calculations. Therefore, as soon as the comments are received, I will revised the meeting minutes accordingly & re-send them to each one of the meeting participants.

As such, any additional clarification/additions/deletions to the meeting minutes is very important and is very much, appreciated.

Thanks,



Sal Macias Meeting Notes on BDBGM & DBG M-2 Loads Clarification 9 19 07 SAL.doc

MAA  
2/22/08 H-3  
H-2

Minutes of Meeting: Meeting held on September 19, 2007

Subject: BDBGM/DBGM-2 Loading and Load Combination Clarifications

**Attendees:**

Raj Rajagopal  
Tom Frankert  
Orhan Gurbuz (by phone)  
Salvador Macias  
Jason Paredes  
Alan Ketin  
Luis Alires

**Discussion Topics:**

**1. Hierarchy of Design Documents:**

- Raj stated that 10 CFR-63 is the primary document for YMP, but it is not used for reference in our design calculations. Our Basis of Design document, BOD, is essentially based on 10 CFR-63.
- The Project Design Criteria, PDC, is the primary document and should be referenced in our design calculations.
- The SADA documents supplements the PDC for design calculations.
- We should only reference PDC since it filters out the pertinent information for the YMP from ANSI/AISC N690-1994 and NUREG-0800-1996.

**2. Loads and Load Combinations:**

- Per PDC Section 4.2.11.4.6 Structural Steel Load Combinations: Load Combinations for ITS SSCs structural steel shall be based on ANSI/AISC N690-1994, Table Q1.5.7.1 and NUREG-0800, (NRC 1996, Paragraphs II.3.c.i(a), II.3.c.ii(a), and II.5.b of Section 3.8.4).
- PDC does not cover impact loads but N690 Section Q1.3.2 does, therefore, omit referring to ASCE 7-05, per PDC 7-98 is our code of reference.
- In regards to crane loads, Orhan stated that that impact loads do not need to be included during seismic events.
- The crane load should be identified as Crane Lifted Load, or Payload but not as a Live Load.
- It was noted that adding 50 psf for additional loading is in NUREG-0800, Section 3.7.2-9, item D, Rev 3 March 2007, but we are not committed to this version of NUREG. It was recommended to add some reasonable load into the structure that would represent the miscellaneous weights intended in the NUREG-0800 referenced in the PDC.
- For the steel structure, we mainly are concerned with load combinations #9 and #10 identified in the PDC, and choose the one that governs from these two cases (Snow or Roof Live Load).
- For certain members (e.g., the foundation design or corner columns), we need to address load combination  $0.9D + E$ , which is stated in PDC Section

4.2.11.4.4. We can address this case by either re-running the model or by providing justification.

- The loading combinations were discussed, Orhan recommended and Raj concurred that for the IHF group to continue with the following load combinations:

**DBGM-2:**

**100%D + 25%L + 25%Crane Payload + E (100%D + 25%L + 25%Crane Payload)**

- The 25%L stated in the SADA document comes from an approximation of what the expected live load is during an earthquake ( $\alpha L$ ) and we are to use it when combining the D+L+Seismic
- The Crane Lifted load 25% is to be kept for Tier-1 Analysis but during Tier-2, we need to change it to use the same philosophy as in the BDBGM analysis.

**BDBGM:**

**100%D + 25%L + 100%Crane Payload + E (100%D + 25%L + 100%Crane Payload)**

- Orhan stated that as previously agreed with the Project, we are to use 100% mass from crane lifted load, included in the vertical direction and a negligible horizontal seismic effect due to a pendulum action for the Cask Handling Crane. The pendulum effect may be included by the project.
- Also, for the CTM crane, Orhan stated that as previously agreed with the Project, to use 100% mass from the crane lifted load in all directions for the seismic load.
- It was stated that for the CTM Crane, there is documentation from P&H Crane Manufacturer stating that the pendulum effect may be present inside the bell. Orhan stated that he would like to see the documentation and that if it supports the pendulum effect, then He would recommend to only use the vertical mass for the CTM Crane. This change would occur during Tier-2 analysis & this philosophy would apply to both BDBGM & DBGM-2.
- Also, He re-iterated not to include impact loads for seismic cases.

**3. Model of the Crane Coupled into the structure:**

- Orhan will research & help the team to find out how to model the crane vertical stick for lifted loads. He stated that he could provide an email providing the recommendation on how to model the vertical stick. This e-mail would be included in the calculations as an assumption requiring verification. (Action completed: Orhan reviewed the model developed by the project and concurred with the way both cranes were modeled. The CTM cable is assumed to be 15' long and 3.8 inches in diameter. The Cask Handling Crane cable is also 15' long and 5 inches in diameter. These are approximate dimensions and the actual values are not expected to make much difference in response calculations. However, this subject will be re-visited during Tier-2).



- The DBGGM-2 model has the cranes lumped as mass at the joints and is to be finalized for Tier-1 analysis in this manner.
- The BDBGGM model & the San Francisco model for the SASSI and the In-structure Response model should be the same with the cranes coupled into the structure as previously discussed.

**4. Accidental Torsion discussion:**

- SADA requires “accidental” torsion must be considered in the design.
- For steel structures we must address accidental torsion and how to incorporate the effects of accidental torsion.
- One method is to perform a calculation to determine the accidental torsion factors (This is time consuming).
- Recommend to use the easier method for “accidental” torsion, that is to increase the D/C ratios by 15% at outer columns and 0% at center columns, then linearly interpolate factor for remaining columns.
- Accidental torsion need not be considered in the case of the BDBGGM as the structure will behave in the nonlinear range and the effect of any torsion will be to increase the required energy dissipation demands slightly in some areas and decrease it in other areas. Such variations will not significantly affect the overall behavior of the structure.

**5. Crane Positions discussion:**

- Orhan stated that it appears that 6-crane positions are too many cases to consider for Tier-1 analysis.
- He recommended for us to include in the calculation, a written reason/rationale on how we arrived at the crane loading positions, and this statement could help reduce the 6-crane load cases to 3-or-4 cases only.

Comments by Orhan Gurbuz

Minutes of Meeting: Meeting held on September 19, 2007

Subject: BDBGM/DBGM-2 Loading and Load Combination Clarifications

Attendees:

Raj Rajagopal

Tom Frankert

Orhan Gurbuz (by phone)

Salvador Macias

Jason Paredes

Alan Ketin

Luis Alires

**Discussion Topics:**

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- For the steel structure, we mainly are concerned with load combinations #9 and #10 identified in the PDC, and choose the one that governs from these two cases (Snow or Roof Live Load).
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4.2.11.4.4. We can address this case by either re-running the model or writing it off in a way such that we address this case by providing justification.

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- Also, for the CTM crane, Orhan stated that as previously agreed with the Project, to use 100% mass from the crane lifted load in all directions for the seismic load.
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- Also, He re-iterated not to include impact loads for seismic cases.

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#### 4. Accidental Torsion discussion:

- SADA requires “accidental” torsion must be considered into the design.
- For steel structures we must address accidental torsion and how to incorporate the effects of accidental torsion.
- One method is to perform a calculation to determine the accidental torsion factors (This is time consuming).
- Recommend to use the easier method for “accidental” torsion, that is to increase the D/C ratios by 15% at outer columns and 0% at center columns, then linearly interpolate factor for remaining columns.
- ~~It was not clear whether we should do the accidental torsion for BDBGGM as well~~ Accidental torsion need not be considered in the case of the BDBGGM as the structure will behave in the nonlinear range and the effect of any torsion will be to increase the required energy dissipation demands slightly in some areas and decrease it in other areas. Such variations will not significantly affect the overall behavior of the structure.

#### 5. Crane Positions discussion:

- Orhan stated that it appears that 6-crane positions are too many cases to consider for Tier-1 analysis.
- He recommended for us to include in the calculation, a written reason/rationale on how we arrived at the crane loading positions, and this statement could help reduce the 6-crane load cases to 3-or-4 cases only.

#### 6. Other Topic:

- ~~For BDBGGM performance factor we need to write off that further analysis is required to show something in regards to resonance with cranes? Need to clarify this statement.~~ [o2]