

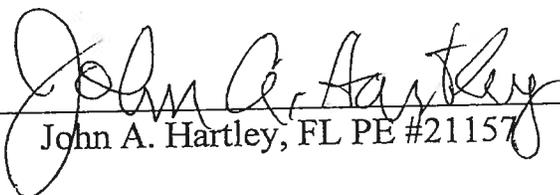
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**STRUCTURAL ENGINEERING INVESTIGATION REPORT  
OF AN EXISTING BUILDING FOR THE SUPPORT  
OF A PROPOSED 25 TON DOUBLE GIRDER CRANE**

**FOR**

**THE US MARINE CORPS  
BLOUNT ISLAND COMMAND  
JACKSONVILLE, FL**

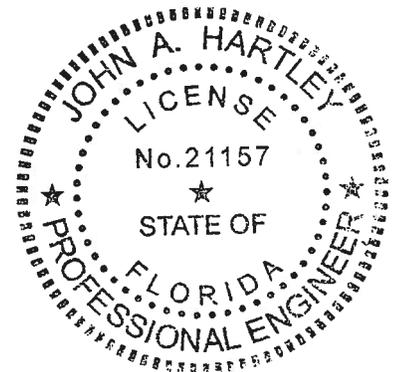
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HAI Project No. 2011-03

March 21, 2011



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**STRUCTURAL ENGINEERING INVESTIGATION REPORT  
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FOR  
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March 21, 2011

**I. INTRODUCTION & SCOPE**

The US Marine Corps provides maintenance and re-habilitation of military vehicles in a building designed in 1973 for Offshore Power Systems. The building is a multi-bay steel structure which has several different overhead cranes of tonnage capacities ranging from 10 tons to 40 tons as noted on the drawings. The building is more completely described below and in appendices where small prints of existing building drawings have been included.

This structural engineering investigation project is limited to the following scope:

1. The evaluation of the existing crane runway support system located in Bay IV of the existing building to determine if the system can safely support a new 25 ton capacity crane; and
2. The design of an access stairway to the new crane.

**II. SUMMARY CONCLUSION**

Based upon the results of this structural investigation of the existing crane support system it is concluded that a new 25 ton capacity crane can be safely supported by the system. In order to not overload the existing 40 lb rail the end truck wheel loads must be spread apart as shown on the crane drawing accompanying this report.

**III. REFERENCE DRAWINGS AND EXISTING INFORMATION**

A new drawing, DWG 1, attached with this report includes Table A and Table B.

Table A is a listing of existing building drawings that were referred to in the development of the structural investigation. These drawings are taken from a set of over 200 drawings that pertain to the existing building. The drawings bear the titleblock of Lockwood Engineering dated 1973.

Table B is a list of three new drawings that show the proposed construction of an access stair to

the new crane.

#### IV. BUILDING DATA

The building has three main longitudinal segments as defined by reference drawings. The north segment includes column lines 1 thru 8. The middle segment includes column lines 9 thru 16. The south segment includes column lines 17 thru 24.

The building width data is also tabulated in **Table 1**.

**Table 1 - Building Width Data**

Bay No.	Col. Lines	Bay Width	Crane Span	Crane Ratings
I	A - Cm	50'	44'	1-30 T (10 T Aux.) 1-10 T
II	Cm-Em	113'	102'	1-40 T (10 T Aux.) 1-30 T (10 T Aux.) 1-20 T
III	Em-Gm	118'	102'	1-30 T (5 T Aux.) 1-20 T (5 T Aux.) 1-20 T (Future)
*IV	Gm-K	79'	68'	1-20 T 1-10 T
		* This is the bay evaluated!!		
Total Width: 360'				

\*Note: There seems to be some conflict regarding the crane capacities proposed for Bay IV. The crane load data table included in the reference drawings show design load values for a 10 ton crane. A building cross section in Bay IV identifies a future 30 ton crane with a 10 ton auxiliary. Based on the results of this study for a future 25 ton crane it may be concluded that it is unlikely that the runway beams could support the 30 ton/10t size crane.

The building longitudinal data is tabulated in **Table 2**.

**Table 2-Building Longitudinal Data**

Segment No.	Col. Lines	Distance	Center To Center Exp.Jt
-------------	------------	----------	-------------------------

North	1 - 8	283'-9"	
Exp.Jt.	8 - 9	2'-6"	285'-0"
Middle	9 - 16	279'-6"	280'-0"
Exp.Jt.	16 - 17	2'-6"	285'-0"
South	17 - 24	283'-9"	
Total Length:		850'-0"	850'-0" the crane.

## V. CRANE INFORMATION

As listed in Table 1 above and as shown on reference drawings the existing crane runway support system in Bay IV was apparently designed for a 10 ton crane which has a bridge span of 68'-0". The top of the existing 40 lb crane rail is shown as 40'-1". See notes in Table 1 above regarding existing and future cranes in Bay IV. A cross section of Bay IV also indicates that a 30 ton crane with a 10 ton auxiliary hoist is to be installed in "the future". A steel fabrication plan drawing of the building shows a 20 ton crane in the Bay IV. A crane design loads sheet gives the wheel load values for a 10 ton crane with an end truck wheel base of 12'-6". There are no wheel loads given for a "future" 30 ton/10t auxiliary hoist crane. Also, there are no wheel loads given for a 20 ton crane.

The proposed new 25 ton crane utilizes boggie end trucks to spread the wheel loads so that the existing 40 lb rail can support the loads. The proposed crane is included in Appendix A.

The existing runway beam is a W36x150 member. It is laterally braced by a truss type framing system. Runway spans vary with a maximum span of 45'-0". The runway beam was evaluated in accordance with the applicable provisions of CMAA, Crane Manufacturers Association of America, Specification #70 for overhead cranes. CMAA requires the vertical deflection of the runway not to exceed an allowable span ratio of L/600 and a lateral span ratio of L/400. Deflections shall be determined without impact.

The runway beam is evaluated laterally using a 10% value of the wheel load. According to the crane drawing the maximum vertical wheel load is 17.3 kips. Ten percent of the 17.3 kips is 1.73 kips.

According to structural design notes applicable to the building the steel material meets ASTM A36 with a yield strength of 36 ksi. Due to the manner in which the runway beam is laterally braced the combined vertical and lateral stress should not exceed 21.6 ksi.

## VI. CRANE CALCULATIONS

Refer to Appendix B for calculations that were developed in the investigation of the existing

support system.

## **VII. CRANE ACCESS STAIR**

The proposed crane access stair is shown on drawings listed in Table B on drawing DWG 1.

Due to the speciality purpose that the stair serves, the design loads used are:

1. Dead loads - Actual weight of members
2. Live Loads - 50 psf uniformly applied
3. Tread Live Loads - 50 psf or a concentrated load of 300 lbs

Existing stair systems that serve a similar purpose show the floor plate, tread thickness and hand rails to be the same as those used in the design of the new stair.

There are existing platforms that were previously designed for a uniform dead load of 50 psf and a live load of 100 psf. The platforms were not completed to include the deck on the platforms. The support beams are "bare" with no loads. In light of the design values used for these platforms the proposed new access stair was designed to be supported on one of the platforms. This concept minimizes the amount of ground level space that invades the existing operations. The head room beneath the first landing is around 11'.

## **VIII. APPENDIX A - 25 TON CRANE DRAWING**

This appendix includes the proposed crane data sheet that was used in the investigation of the existing support system.

## **IX. APPENDIX B - EXISTING CRANE SUPPORT SYSTEM CALCULATIONS**

This appendix includes the structural calculations that cover the investigation of the existing support system.

## **X. APPENDIX C - CALCULATIONS FOR NEW CRANE ACCESS STAIR**

This appendix includes the structural calculations that cover the design of the proposed crane access stair.

## **XI. APPENDIX D - DRAWINGS**

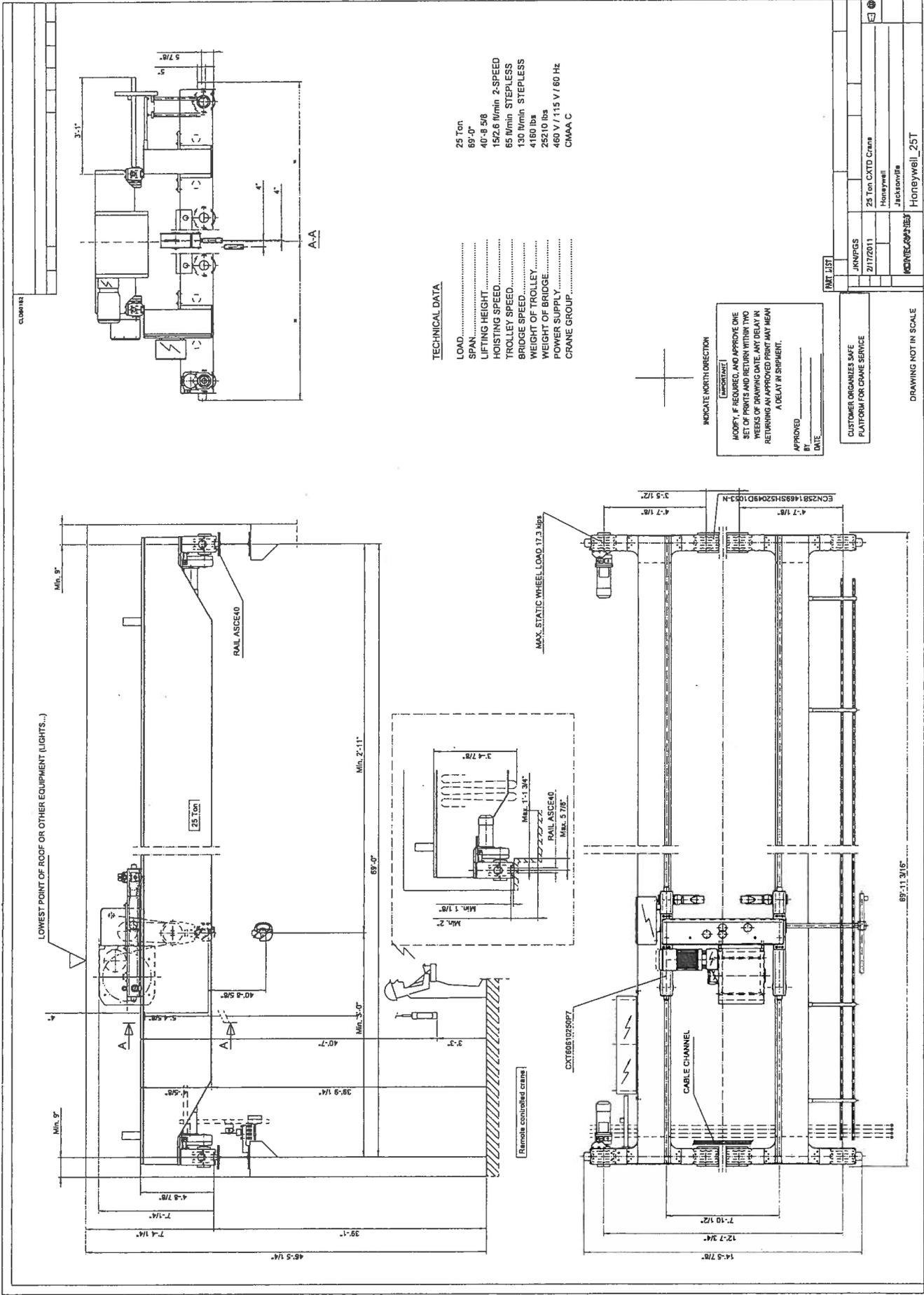
This appendix includes drawing DWG 1 which shows Table A and Table B which lists the specific reference drawings used and the new crane access stairs. The listed drawings from both tables are attached by reference with this report. Full size drawings are also provided for Table B.

# APPENDIX A

## 25 TON CRANE DRAWING

### NOTES:

1. REFER TO 11X17 DRAWING SEPARATELY ATTACHED WITH THS REPORT.
2. No. PAIRS OF WHEELS - 4
3. BOGGIE END TRUCK WHEEL SPACING -  $4'-7 \frac{1}{8}'' + 3'-5 \frac{1}{2}'' + 4'-7 \frac{1}{8}''$
4. CRANE WHEEL MAXIMUM LOAD - 17.3 KIPS
5. CRANE BRIDGE SPAN - 68'-0" (PER BUILDING DATA)



**TECHNICAL DATA**

LOAD..... 25 Ton  
 SPAN..... 69'-0"  
 LIFTING HEIGHT..... 40'-8 5/8"  
 HOISTING SPEED..... 152.6 ft/min 2-SPEED  
 TROLLEY SPEED..... 65 ft/min STEPLESS  
 BRIDGE SPEED..... 130 ft/min STEPLESS  
 WEIGHT OF TROLLEY..... 4160 lbs  
 WEIGHT OF BRIDGE..... 25210 lbs  
 POWER SUPPLY..... 480 V 115 V / 60 Hz  
 CRANE GROUP..... CMAA C

INDICATE NORTH DIRECTION

**REVISIONS**

COPY, IF REQUIRED, AND APPROVE ONE SET OF PRINTS AND RETURN WITHIN TWO WEEKS OF DATING DATE. ANY DELAY IN RETURNING AN APPROVED PRINT MAY MEAN A DELAY IN SHIPMENT.

APPROVED \_\_\_\_\_  
 BY \_\_\_\_\_  
 DATE \_\_\_\_\_

CUSTOMER ORIGINATES SAFE PLATFORM FOR CRANE SERVICE

**PART LIST**

JNVPFS	25 Ton CXTD Crane	Honeywell	Honeywell_25T
2/17/2011		Jacksonville	

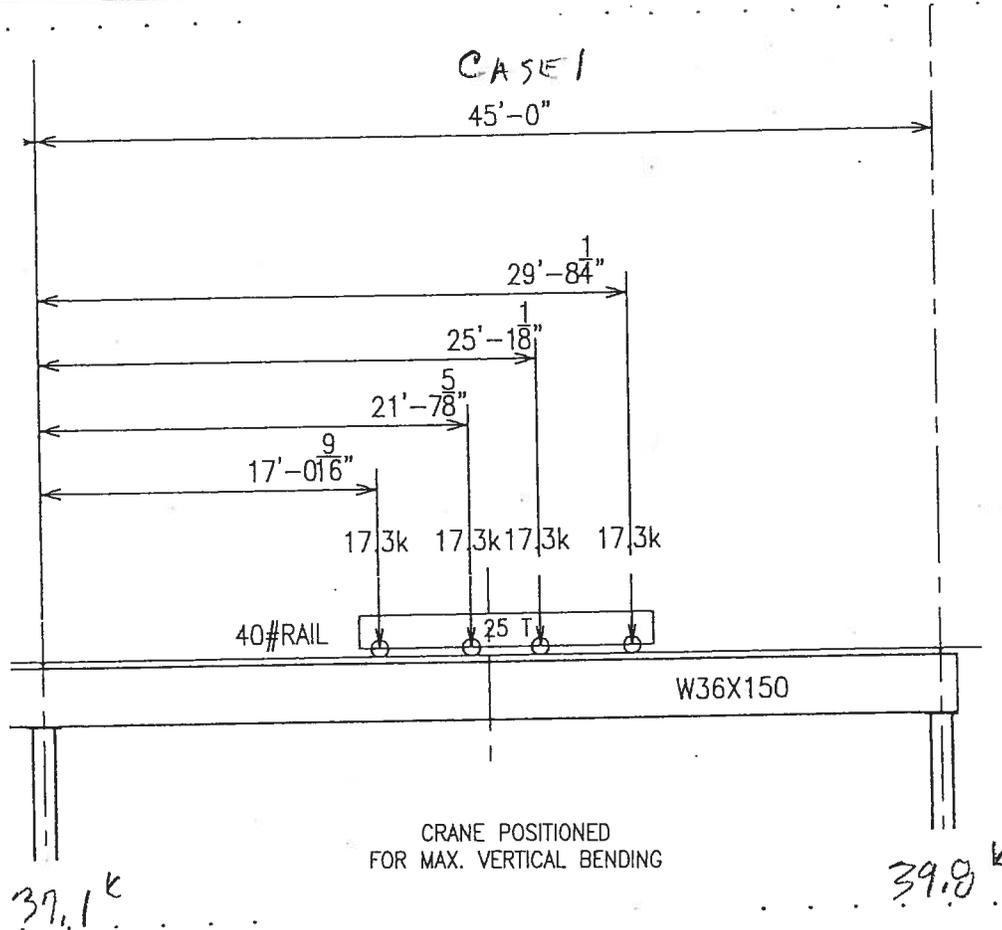
89-11-3105

DRAWING NOT IN SCALE

APPENDIX B

EXISTING CRANE SUPPORT  
SYSTEM CALCULATIONS

CRANE POSITIONED FOR MAX. RUNWAY LOADING



FOR MAX. LATERAL BENDING  
 USE 10% OF MAX. WHEEL LOAD

Moments:

Vertical:  $M_v = 683 \text{ KFF}$

Lateral:  $M_L = 64.0 \text{ KFF}$

Deflections:

$\Delta_v = 0.894''$        $\Delta_{All} = \frac{45(12)}{600} = 0.90''$

$\Delta_L = 0.21''$        $\Delta_{All} = \frac{45(12)}{400} = 1.35''$

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By GAH

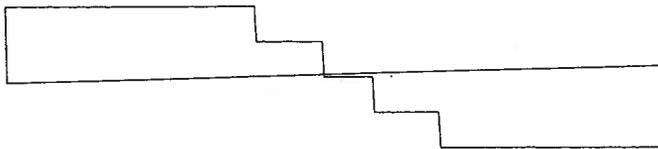
Date 3/21/11

Revised     

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 1: 45' RUNWAY SPAN  
MAX. VERTICAL BENDING

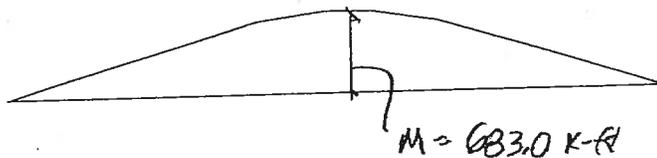
CASE 1: 45'  
M<sub>v</sub>

SHEAR DIAGRAM



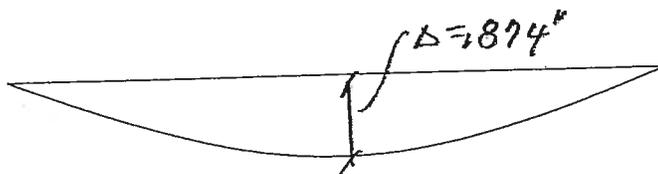
Max. Shear = -3.98E+04 lbs

MOMENT DIAGRAM



Max. Moment = 6.83E+05 ft-lbs

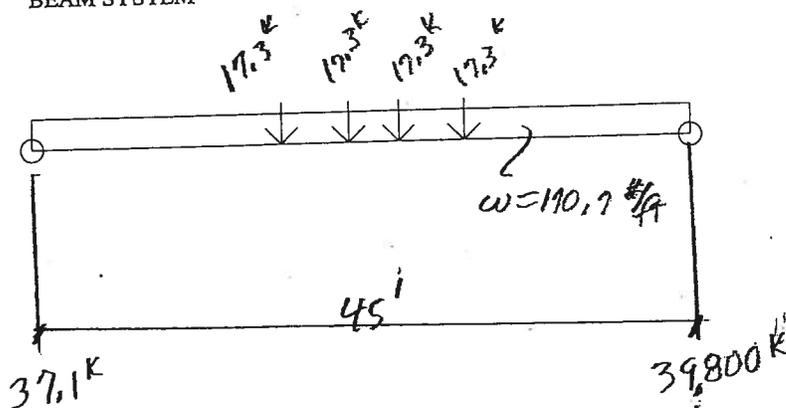
DEFLECTED SHAPE



Max. Def. = 0.874 in

$$D_{all} = \frac{45(2)}{600} = 0.150'' \text{ OKAY}$$

BEAM SYSTEM



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FOR HONEYWELL - BLOUNT

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Revised     

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 1: 45' RUNWAY SPAN  
MAX. VERTICAL BENDING

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 1: 45' RUNWAY SPAN  
MAX. VERTICAL BENDING

### Archon Beam Design Program

ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

### INPUT DATA

Beam Type = W36X150  
Beam Classification = W

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

Total Length = 45.00(ft)  
Unbraced Length = 17.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 9040(in<sup>4</sup>)  
Section Modulus = 504.0(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

### CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

### LOADS

- ( 1 ) Level Unif. Load = 150.7(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 45.00(ft).
- ( 2 ) Point Load = 1.73E+04(lbs)  
Located 17.05(ft) from the left side.
- ( 3 ) Point Load = 1.73E+04(lbs)  
Located 21.64(ft) from the left side.
- ( 4 ) Point Load = 1.73E+04(lbs)  
Located 25.10(ft) from the left side.
- ( 5 ) Point Load = 1.73E+04(lbs)  
Located 29.69(ft) from the left side.
- ( 6 ) Level Unif. Load = 20.00(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 45.00(ft).

### OUTPUT

Max. Moment = 6.83E+05(ft-lbs)  
Max. Shear = -3.98E+04(lbs)  
Max Deflection = 0.874(in)  
Reaction R1 = 3.71E+04(lbs)  
Reaction R2 = 3.98E+04(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 16.27 ksi  
ALLOWABLE BENDING STRESS = 20.06 ksi, PER (F1-6)

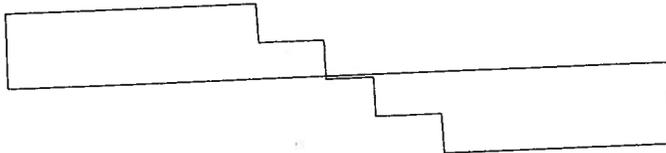
SHEAR STRESS = 1.775 ksi

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
 25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
 CASE 1: 45' RUNWAY SPAN  
 MAX. LATERAL BENDING W/O BRACING TRUSS

CASE 1: 45'  
 $M_{LAT}$

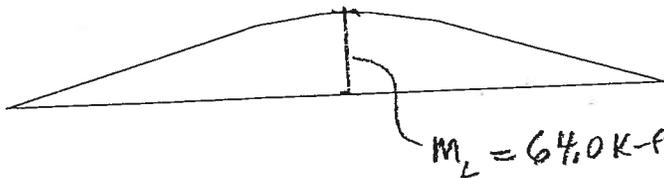
SHEAR DIAGRAM

NOTE 1



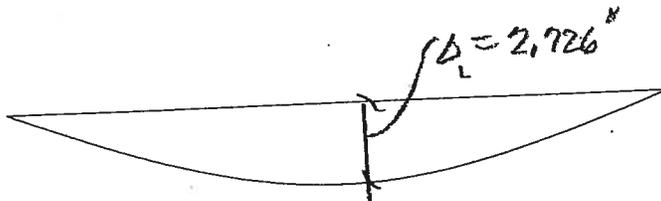
Max. Shear = -3594 lbs

MOMENT DIAGRAM



Max. Moment = 6.40E+04 ft-lbs

DEFLECTED SHAPE

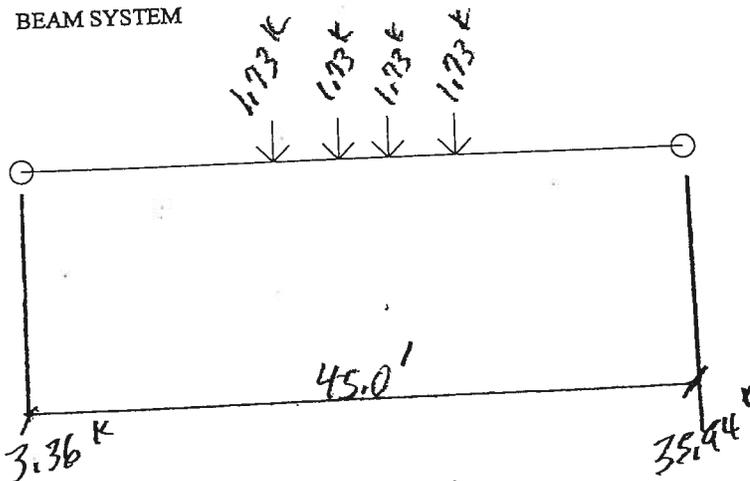


Max. Def. = 2.726 in

$$\Delta_{all} = \frac{45(12)}{400} = 1.35''$$

Add LAT. TRUSS

BEAM SYSTEM



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KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 1: 45' RUNWAY SPAN  
MAX. LATERAL BENDING W/O BRACING TRUSS

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 1: 45' RUNWAY SPAN  
MAX. LATERAL BENDING W/O BRACING TRUSS

*Archon Beam Design Program*

INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 45.00(ft)  
Unbraced Length = 17.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 270.0(in<sup>4</sup>)  
Section Modulus = 45.10(in<sup>3</sup>)  
Weak Axis Bending!  
Both ends of the beam are pinned.

LOADS

(1) Point Load = 1730(lbs)  
Located 17.05(ft) from the left side.

(2) Point Load = 1730(lbs)  
Located 21.64(ft) from the left side.

(3) Point Load = 1730(lbs)  
Located 25.10(ft) from the left side.

(4) Point Load = 1730(lbs)  
Located 29.69(ft) from the left side.

OUTPUT

Max. Moment = 6.40E+04(ft-lbs)  
Max. Shear = -3594(lbs)  
Max Deflection = 2.726(in)  
Reaction R1 = 3326(lbs)  
Reaction R2 = 3594(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 17.04 ksi  
ALLOWABLE BENDING STRESS = 27.00 ksi, PER (F2-1)

SHEAR STRESS = 0.239 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

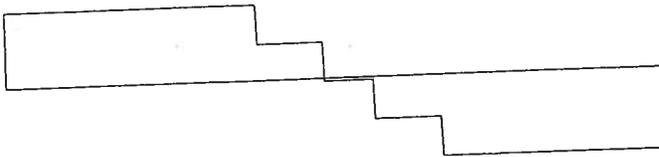
COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
 25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
 CASE 1: 45' RUNWAY SPAN  
 MAX. LATERAL BENDING W/ BRACING TRUSS

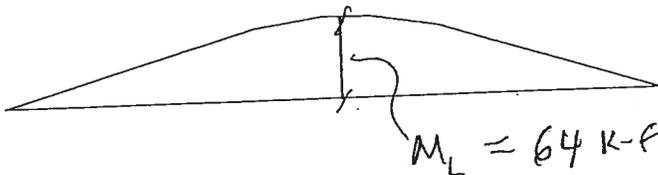
SHEAR DIAGRAM



NOTE!

Max. Shear = -3593 lbs

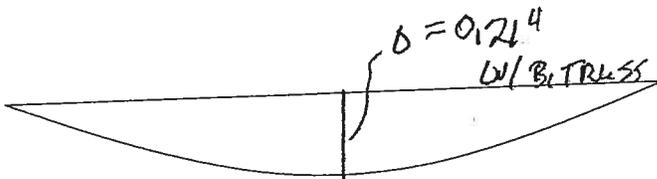
MOMENT DIAGRAM



$M_L = 64 \text{ K-F}$

Max. Moment = 6.40E+04 ft-lbs

DEFLECTED SHAPE

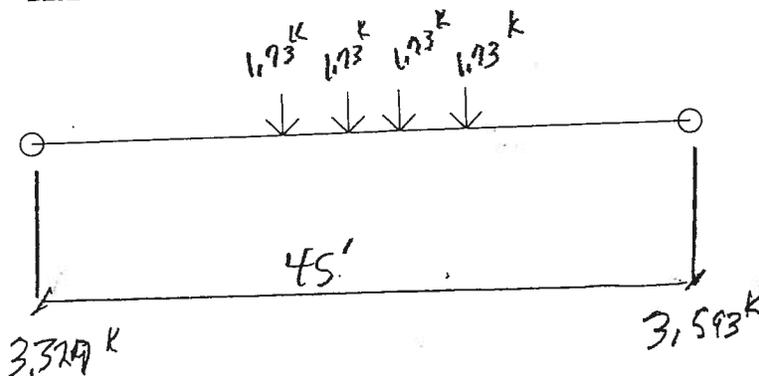


$\delta = 0.1214$   
 W/ BR. TRUSS

Max. Def. = 0.209 in 0 Kar

$$0_{ALL} = \frac{45(12)}{400} = 1.35''$$

BEAM SYSTEM



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CASE 1: 45' RUNWAY SPAN  
MAX. LATERAL BENDING W/ BRACING TRUSS

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 1: 45' RUNWAY SPAN  
MAX. LATERAL BENDING W/ BRACING TRUSS

*Archon Beam Design Program*

INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 45.00(ft)  
Unbraced Length = 17.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 3529(in<sup>4</sup>)  
Section Modulus = 45.10(in<sup>3</sup>)  
Weak Axis Bending!  
Both ends of the beam are pinned.

LOADS

( 1 ) Point Load = 1730(lbs)  
Located 17.05(ft) from the left side.

( 2 ) Point Load = 1730(lbs)  
Located 21.62(ft) from the left side.

( 3 ) Point Load = 1730(lbs)  
Located 25.10(ft) from the left side.

( 4 ) Point Load = 1730(lbs)  
Located 29.69(ft) from the left side.

OUTPUT

Max. Moment = 6.40E+04(ft-lbs)  
Max. Shear = -3593(lbs)  
Max Deflection = 0.209(in)  
Reaction R1 = 3327(lbs)  
Reaction R2 = 3593(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 17.03 ksi  
ALLOWABLE BENDING STRESS = 27.00 ksi, PER (F2-1)

SHEAR STRESS = 0.239 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

• CASE 45 - (45'-0" SPAN) (LINE J)

• Refer to COMPUTER RUNS FOR SHEARS, MOMENTS, ETC.

• CRANE POSITIONED FOR MAX. LOADING & DEFLECTION

VERTICAL:  $M_{V.M.} = 683 \text{ K-Ft}$

$A_{V.M.} = 44.06 \text{ in}^2$

LATERAL:  $M_L = 64 \text{ K-Ft}$

$A_L = 50.28 \text{ in}^2$

• W36X150 W/LATEAL TRUSS BRACING

Case 1:  $I_x = 9,040 \text{ in}^4$  (w/o C12) |  $I_y = 2900 \text{ in}^4$

$S_x = 503.621 \text{ in}^3$  (w/o C12) |  $S_y = 45.0 \text{ in}^3$

$I_x = 9929.06 \text{ in}^4$  (w/C12) |  $I_y = 3528.59 \text{ in}^4$

Case 2:  $S_x = 601.49 \text{ in}^3$  (w/C12) |  $S_y = 159.59 \text{ in}^3$

$S_x = 512.02 \text{ in}^3$  (w/C12) |  $S_y = 392.96 \text{ in}^3$

BENDING STRESSES:

Case 1:  $f_x = \frac{683(12)}{503.621} = 16.3 \text{ ksi}$  |  $f_y = \frac{64(12)}{45} = 17.1 \text{ ksi}$

Case 2:  $f_x = \frac{683(12)}{601.49} = 13.6 \text{ ksi}$  |  $f_y = \frac{64(12)}{159.59} = 4.9 \text{ ksi}$

$f_x = \frac{683(12)}{512.02} = 16.0 \text{ ksi}$  |  $f_y = \frac{64(12)}{392.96} = 2.0 \text{ ksi}$

BENDING STRESSES (CONT'D) (LINE J)• Combined Stresses:

$$(1) F_c = 16.3 + 17.1 = 33.4 \text{ ksi (w/o C12)}$$

(FOR REFERENCE ONLY)

$$(2) F_c = 15.0 + 4.9 = 19.9 \text{ ksi}$$

$$(3) F_c = 16.0 + 2.0 = 18.0 \text{ ksi}$$

$$F_{b_{all}} = 0.60 F_y = 0.6(36) = 21.6 \text{ ksi}$$

- CONCLUSION: W36X150 + C12X20.9 BRACE IS acceptable!

Check Deflection

- PER CMAA; Vertical Deflection ALLOWABLE

$$\Delta_v = L/600 = \frac{45(12)}{600} = 0.90''$$

- Actual Vertical deflection = 0.767'' (w/o C12)

$$\begin{aligned} \text{• Actual Vertical deflection} &= \frac{9040(.767)}{9929.06} \\ &= 0.698'' \end{aligned}$$

- CONCLUSION: W36X150 Vert. Deflection IS Acceptable!

• SPOT CHECK LATERAL TRUSS BRACING SYSTEM

• Max. Lateral "M" = 64.0 K-ft

Separation Distance Between W36 & C12:

$$d = 24.677''$$

$$F = M/d = \frac{64(12)}{24.677} = 31.1 \text{ K (TENSION)}$$

• C12X20.1:  $A = 6.08 \text{ in}^2$

• TENSION STRESS:

$$f_A = \frac{31.1}{6.08} = 5.12 \text{ ksi} < 0.6 \times 36 = 21.6 \text{ ksi}$$

• WF36 COM. STRESS:

$$f_A = \frac{31.1}{44.02} = 0.71 \text{ ksi (WORST CASE) OK}$$

• BRACING MEMBER: WF4X8.5  $L_u = 495(12) = 59.4''$

$I_x = 3.66 \text{ in}^4$      $I_y = 1.28 \text{ in}^4$      $A = 2.5 \text{ in}^2$

$r_x = 1.13 \text{ in}$      $r_y = 1.16 \text{ in}$

$P_{max} = \frac{59.4}{1.13} \approx 53$      $F_{all} = 18.08 \text{ ksi}$

$P_{all} = 2.5(18.08) = 45.2 \text{ K}$

# HARTLEY & ASSOCIATES, INC.

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Subject: KONE CRANES

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## • Deflection Check (cont'd)

• PER CMAA, Lateral Deflection ALLOWABLE

$$D_L = L/400 = \frac{45(12)}{400} = 1.35''$$

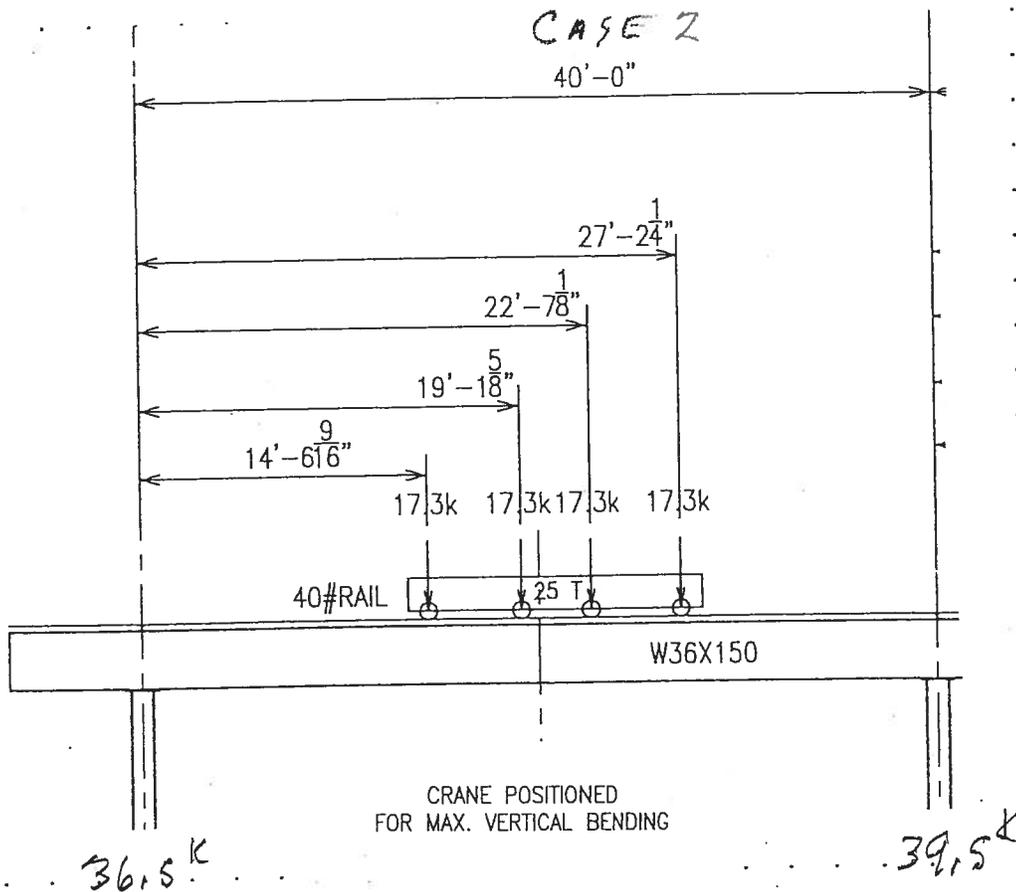
• ACTUAL LATERAL DEFLECTION

(W/C12 BRACING SYSTEM)  $\approx 0.195''$

• CONCLUSION: W 36x150 + C12x20.9 BRACING  
System is OKAY

Subject: KONECRANES  
FOR HONEYWELL - Blount Island

CRANE POSITIONED FOR MAX. RUNWAY BENDING



FOR MAX. LATERAL BENDING  
 USE 10% OF MAX. WHEEL LOAD

• Moments:

Vertical:  $M_v = 588k-ft$

LATERAL:  $M_l = 55.7k-ft$

Deflection

$\Delta_v = 0.60"$

$\Delta_l = 0.184"$

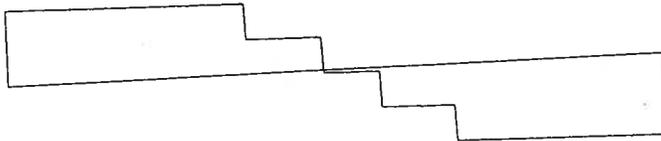
$\Delta_{ALL} = \frac{40(12)}{600} = 0.80"$

$\Delta_{FL} = \frac{40(12)}{400} = 1.2"$

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
 25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
 CASE 2: 40' RUNWAY SPAN  
 MAX VERTICAL BENDING

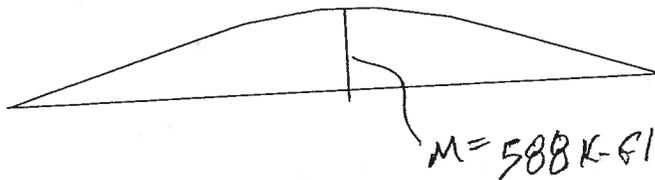
CASE 2: 40'  
 M<sub>v</sub>

SHEAR DIAGRAM



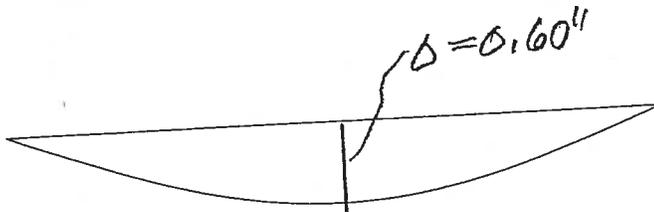
Max. Shear = -3.95E+04 lbs

MOMENT DIAGRAM



Max. Moment = 5.88E+05 ft-lbs

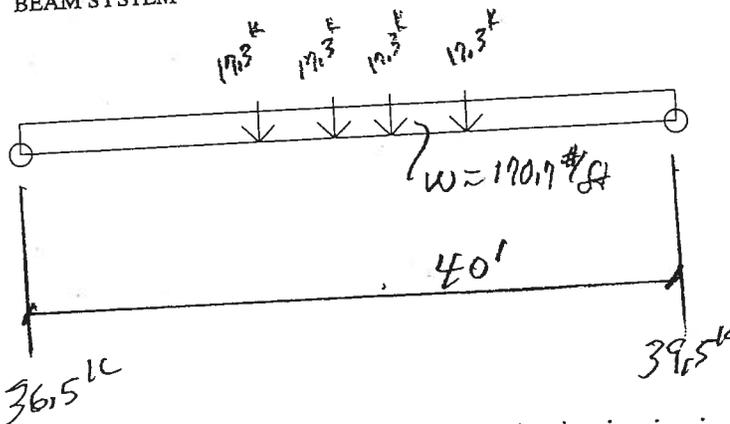
DEFLECTED SHAPE



Max. Def. = 0.600 in

$$\Delta_{all} = \frac{40(12)}{600} = 0.800''$$

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

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KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 2: 40' RUNWAY SPAN  
MAX VERTICAL BENDING

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 2: 40' RUNWAY SPAN  
MAX VERTICAL BENDING

## Archon Beam Design Program

### INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 14.55(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 9040(in<sup>4</sup>)  
Section Modulus = 504.0(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

### LOADS

- (1) Point Load = 1.73E+04(lbs)  
Located 14.55(ft) from the left side.
- (2) Point Load = 1.73E+04(lbs)  
Located 19.14(ft) from the left side.
- (3) Point Load = 1.73E+04(lbs)  
Located 22.59(ft) from the left side.
- (4) Point Load = 1.73E+04(lbs)  
Located 27.19(ft) from the left side.
- (5) Level Unif. Load = 150.7(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).
- (6) Level Unif. Load = 20.00(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

### OUTPUT

Max. Moment = 5.88E+05(ft-lbs)  
Max. Shear = -3.95E+04(lbs)  
Max Deflection = 0.600(in)  
Reaction R1 = 3.65E+04(lbs)  
Reaction R2 = 3.95E+04(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 14.00 ksi  
ALLOWABLE BENDING STRESS = 21.58 ksi, PER (F1-8)

SHEAR STRESS = 1.763 ksi

ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

### CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

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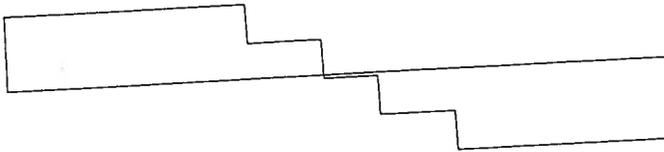
KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 2: 40' RUNWAY SPAN  
MAX LATERAL BENDING W/O BRACING TRUSS

CASE 2: 40'

(1)  $M_L$

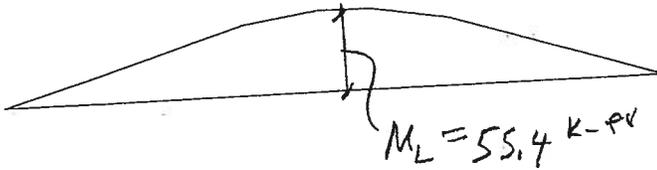
SHEAR DIAGRAM

Note



Max. Shear = -3610 lbs

MOMENT DIAGRAM



Max. Moment = 5.54E+04 ft-lbs

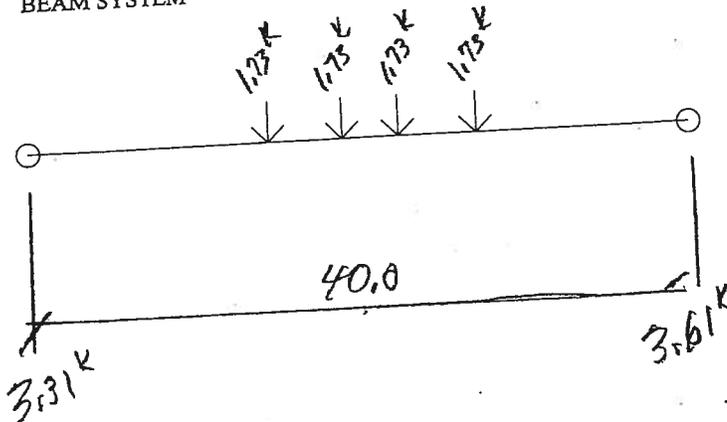
DEFLECTED SHAPE



Max. Def. = 1.884 in

$$\Delta_{ALL} = \frac{40(12)}{400} = 1.20''$$

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

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KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 2: 40' RUNWAY SPAN  
MAX LATERAL BENDING W/O BRACING TRUSS

ECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
ON CRANE - POSITIONED FOR MAX. LOADINGS  
E 2: 40' RUNWAY SPAN  
LATERAL BENDING W/O BRACING TRUSS

## Archon Beam Design Program

### INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 40.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 270.0(in<sup>4</sup>)  
Section Modulus = 45.10(in<sup>3</sup>)  
Weak Axis Bending!  
Both ends of the beam are pinned.

### LOADS

(1) Point Load = 1730(lbs)  
Located 14.55(ft) from the left side.

(2) Point Load = 1730(lbs)  
Located 19.14(ft) from the left side.

(3) Point Load = 1730(lbs)  
Located 22.59(ft) from the left side.

(4) Point Load = 1730(lbs)  
Located 27.19(ft) from the left side.

### OUTPUT

Max. Moment = 5.54E+04(ft-lbs)  
Max. Shear = -3610(lbs)  
Max Deflection = 1.884(in)  
Reaction R1 = 3310(lbs)  
Reaction R2 = 3610(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 14.74 ksi  
ALLOWABLE BENDING STRESS = 27.00 ksi, PER (F2-1)

SHEAR STRESS = 0.241 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

number axial stress passes !  
number bending stress passes !  
number shear stress passes !  
number combined stress passes !  
ber is treated as compact.

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOUNT

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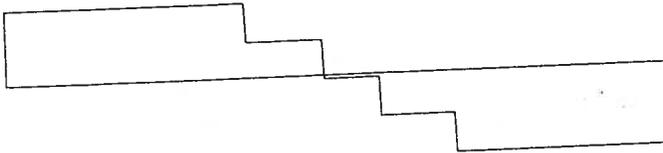
KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 2: 40' RUNWAY SPAN  
MAX LATERAL BENDING W/ BRACING TRUSS

CASE 2: 40'

(2)  $M_L$

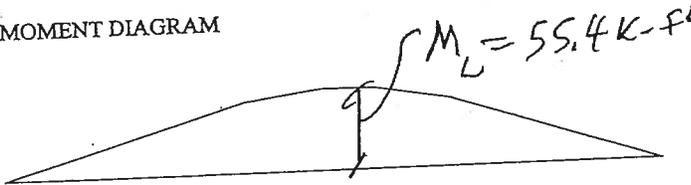
SHEAR DIAGRAM

NOTE



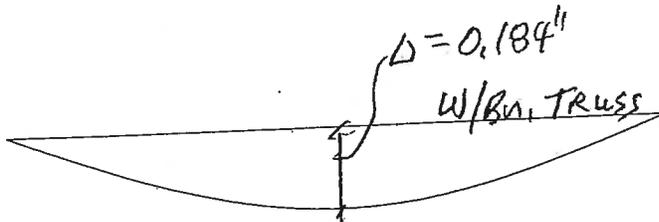
Max. Shear = -3610 lbs

MOMENT DIAGRAM



Max. Moment = 5.54E+04 ft-lbs

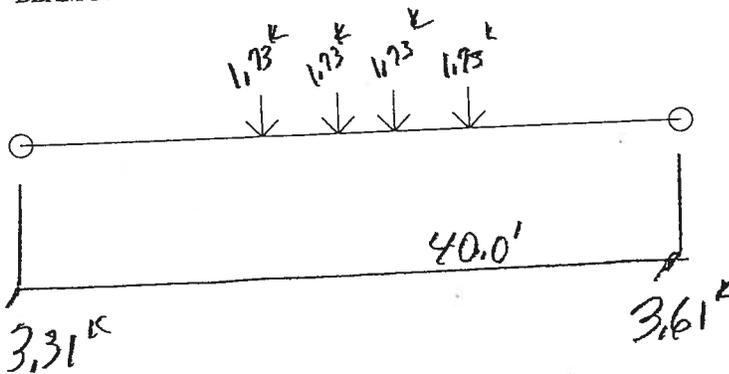
DEFLECTED SHAPE



Max. Def. = 0.184 in

$$D_{All} = \frac{40(12)}{400} = 1.2''$$

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

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KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 2: 40' RUNWAY SPAN  
MAX LATERAL BENDING W/ BRACING TRUSS

KONECRANES - FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE - POSITIONED FOR MAX. LOADINGS  
CASE 2: 40' RUNWAY SPAN  
MAX LATERAL BENDING W/ BRACING TRUSS

## Archon Beam Design Program

### INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 40.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 2762(in<sup>4</sup>)  
Section Modulus = 45.10(in<sup>3</sup>)  
Weak Axis Bending!  
Both ends of the beam are pinned.

### LOADS

(1) Point Load = 1730(lbs)  
Located 14.55(ft) from the left side.

(2) Point Load = 1730(lbs)  
Located 19.14(ft) from the left side.

(3) Point Load = 1730(lbs)  
Located 22.59(ft) from the left side.

(4) Point Load = 1730(lbs)  
Located 27.19(ft) from the left side.

### OUTPUT

Max. Moment = 5.54E+04(ft-lbs)  
Max. Shear = -3610(lbs)  
Max Deflection = 0.184(in)  
Reaction R1 = 3310(lbs)  
Reaction R2 = 3610(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 14.74 ksi  
ALLOWABLE BENDING STRESS = 27.00 ksi, PER (F2-1)

SHEAR STRESS = 0.241 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

• CASE 40 - (40' SPAN)

• Ref. TO COMPUTER RUNS FOR SHEARS, MOMENTS, etc.

• CRANE POSITIONED FOR MAX. LOADING & DEFLECTION

Vertical:  $M_V = 588 \text{ K-ft}$

$A_W = 44.2 \text{ in}^2$

Lateral:  $M_L = 55.4 \text{ K-ft}$

$A_L = 48.68 \text{ in}^2$

• SECTION 11 (LATERAL TRUSS BEAMS)

Case 1:  $I_x = 9040 \text{ in}^4 \text{ (w/o C10)}$

$I_y = 270 \text{ in}^4$

$S_x = 503.62 \text{ in}^3 \text{ (w/o C10)}$

$S_y = 45.0 \text{ in}^3$

Case 2:  $I_x = 9786.83 \text{ in}^4 \text{ (w/C10)}$

$I_y = 2762.18 \text{ in}^4$

TOP  $S_x = 583.92 \text{ in}^3 \text{ (w/C10)}$

$S_y = 119.58 \text{ in}^3$

Bot.  $S_x = 511.34 \text{ in}^3 \text{ (w/C10)}$

$S_y = 333.72 \text{ in}^3$

BENDING STRESSES

Case 1:  $f_x = \frac{588(12)}{503.62} = 14 \text{ ksi}$

$f_y = \frac{55.4(12)}{45} = 14.67 \text{ ksi}$

Case 2:  $f_x = \frac{588(12)}{583.92} = 12.1 \text{ ksi}$

$f_{yL} = \frac{55.4(12)}{119.58} = 5.6 \text{ ksi}$

$f_{xR} = \frac{588(12)}{511.34} = 13.8 \text{ ksi}$

$f_{yR} = \frac{55.4(12)}{333.72} = 2.0 \text{ ksi}$

BENDING STRESSES (cont)

• Combined Stresses

(1)  $f_c = 14.0 + 14.67 = 28.67 \text{ ksi}$  (w/6 C10)

(FOR REFERENCE ONLY)

(2)  $f_t = 17.1 + 5.6 = 22.7 \text{ ksi}$

(3)  $f_c = 13.3 + 2.0 = 15.3 \text{ ksi}$

$f_{b,all} = 0.6 F_y = 0.6(36) = 21.6 \text{ ksi}$

• CONCLUSION: W36X150 + C10X15.3 BRACED  
is acceptable

PER C.M.A.A.; VERTICAL DEFLECTION ALLOWANCE

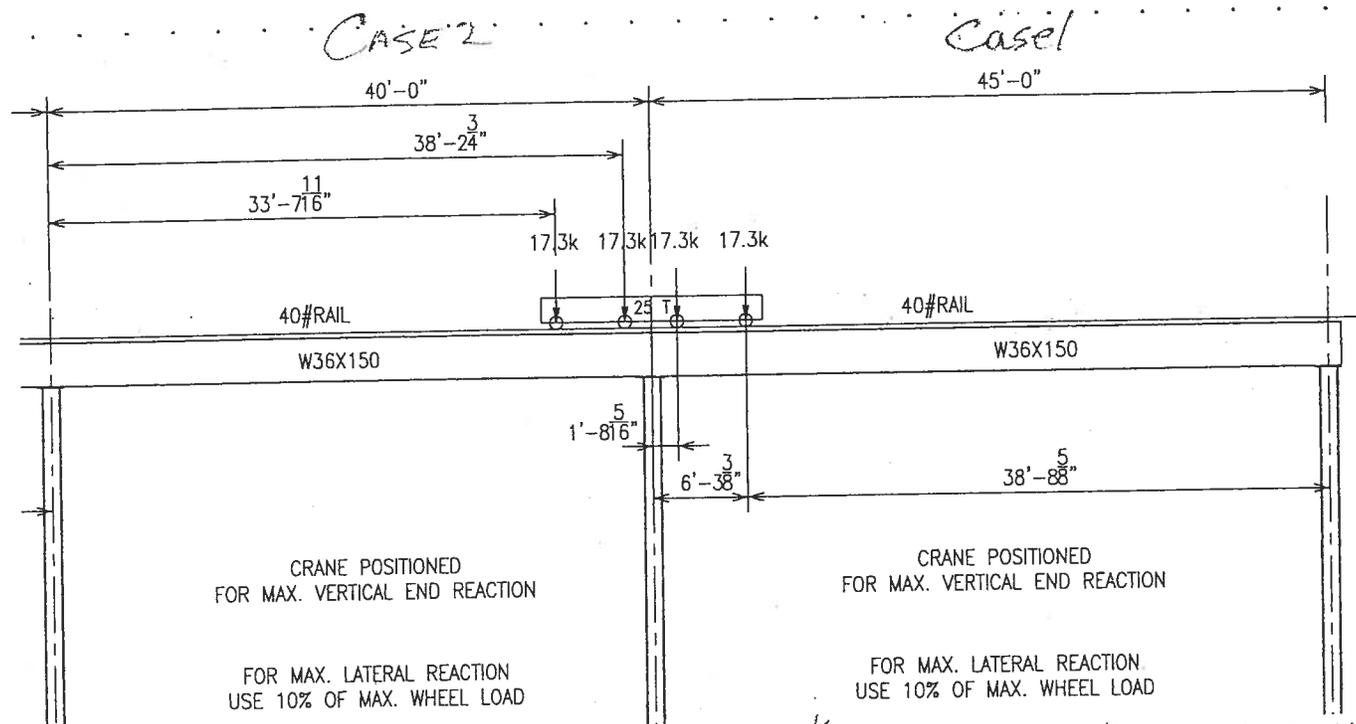
Vertical:  $\Delta_v = L/600 = \frac{40(12)}{600} = 0.80''$

act.  $\Delta_v = 0.60''$  OKAY

LATERAL:  $\Delta_L = L/400 = \frac{40(12)}{400} = 1.20''$

act.  $\Delta_L = 0.139''$  OKAY

CRANE POSITIONED FOR MAX. END REACTION.



6.947<sup>k</sup>

CASE 1:  $R_V = 35.4^k$  |  $R_L = 3.154^k$  |  $R_V = 6.909^k$   
 CASE 2:  $R_V = 34.5^k$  |  $R_L = 3.109^k$   
 $\Sigma R_V = 69.9^k$  |  $R_L = 6.264^k$

# HARTLEY & ASSOCIATES, INC.

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Subject: KONECRANES  
FOR HONEYWELL - BLOUNT

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KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 45' SIDE OF SUPPORT COLUMN  
MAX. VERTICAL END REACTION

CASE 1: 45'  
M<sub>END</sub> - 45' Bay

SHEAR DIAGRAM



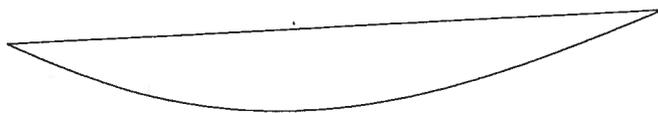
Max. Shear = 3.54E+04 lbs

MOMENT DIAGRAM



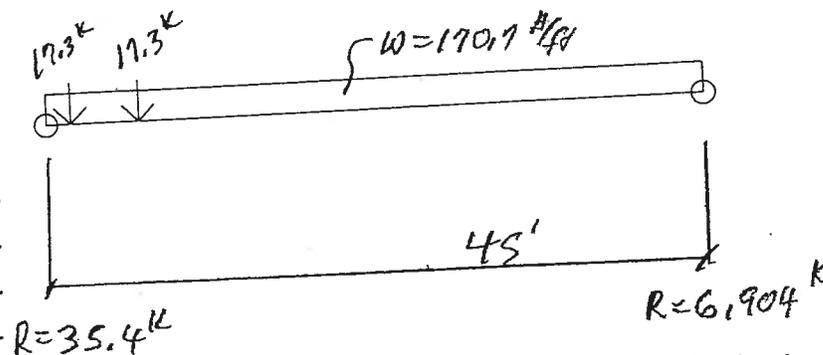
Max. Moment = 1.39E+05 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.174 in

BEAM SYSTEM



Subject: KONECRANES  
FOR HONEYWELL - BLOUNT

KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 45' SIDE OF SUPPORT COLUMN  
MAX. VERTICAL END REACTION

*Archon Beam Design Program*

INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 45.00(ft)  
Unbraced Length = 45.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 9040(in<sup>4</sup>)  
Section Modulus = 504.0(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

(1) Level Unif. Load = 150.7(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 45.00(ft).

(2) Level Unif. Load = 20.00(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 45.00(ft).

(3) Point Load = 1.73E+04(lbs)  
Located 1.690(ft) from the left side.

(4) Point Load = 1.73E+04(lbs)  
Located 6.280(ft) from the left side.

OUTPUT

Max. Moment = 1.39E+05(ft-lbs)  
Max. Shear = 3.54E+04(lbs)  
Max Deflection = 0.174(in)  
Reaction R1 = 3.54E+04(lbs)  
Reaction R2 = 6904(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER  
ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 3.319 ksi  
ALLOWABLE BENDING STRESS = 6.978 ksi, PER (F1-8)

SHEAR STRESS = 1.579 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 45' SIDE OF SUPPORT COLUMN  
MAX. VERTICAL END REACTION

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

Subject: KONECRANES  
FOR HONEYWELL - BLOUNT.

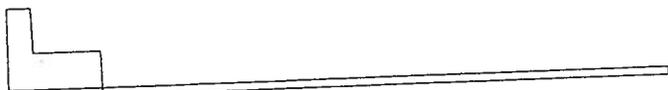
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KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 45' SIDE OF SUPPORT COLUMN  
MAX. LATERAL END REACTION

CASE 1: 45'

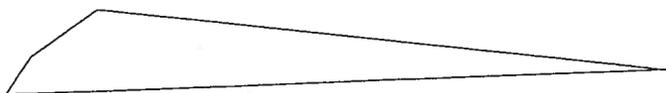
M<sub>max</sub> END - 45' BAY  
Lat

SHEAR DIAGRAM



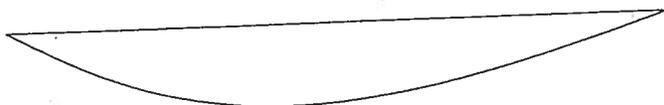
Max. Shear = 3154 lbs

MOMENT DIAGRAM



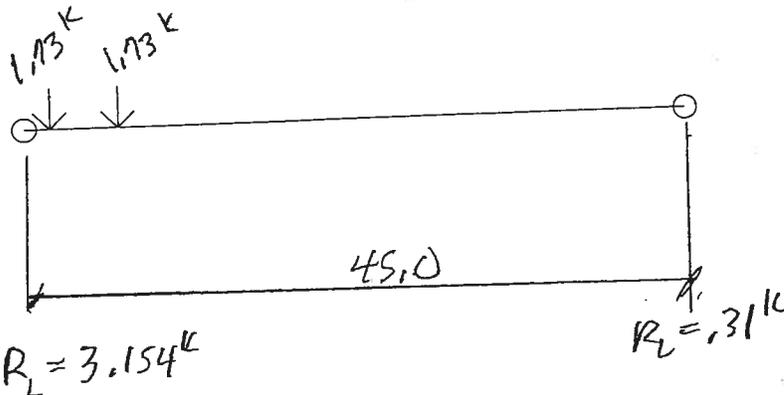
Max. Moment = 1.19E+04 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.386 in

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOUNT

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KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 45' SIDE OF SUPPORT COLUMN  
MAX. LATERAL END REACTION

## Archon Beam Design Program

### INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 45.00(ft)  
Unbraced Length = 45.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 270.0(in<sup>4</sup>)  
Section Modulus = 45.10(in<sup>3</sup>)  
Weak Axis Bending!  
Both ends of the beam are pinned.

### LOADS

( 1 ) Point Load = 1730(lbs)  
Located 1.690(ft) from the left side.

( 2 ) Point Load = 1730(lbs)  
Located 6.280(ft) from the left side.

### OUTPUT

Max. Moment = 1.19E+04(ft-lbs)  
Max. Shear = 3154(lbs)  
Max Deflection = 0.386(in)  
Reaction R1 = 3154(lbs)  
Reaction R2 = 306.4(lbs)

### CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 3.155 ksi  
ALLOWABLE BENDING STRESS = 27.00 ksi, PER (F2-1)

SHEAR STRESS = 0.210 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

### CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 40' SIDE OF SUPPORT COLUMN  
MAX. VERTICAL END REACTION

Case 2: 40' Bays  
M<sub>max</sub> " "

SHEAR DIAGRAM



Max. Shear = -3.45E+04 lbs

MOMENT DIAGRAM



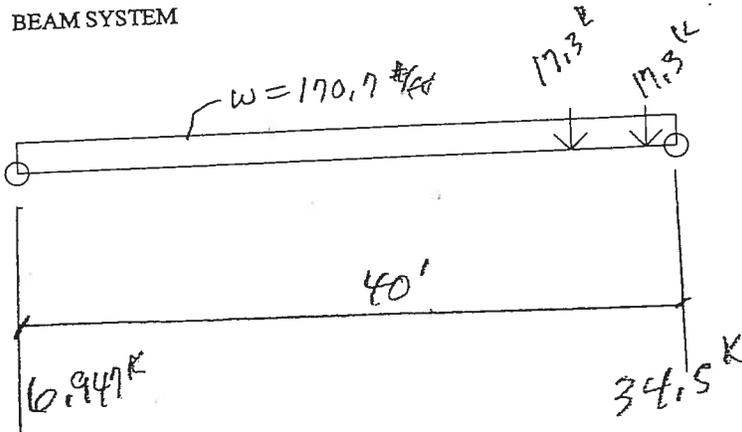
Max. Moment = 1.37E+05 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.130 in

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOUNT

Project No. 2011-03  
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By GH  
Date 3/21/11  
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KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 40' SIDE OF SUPPORT COLUMN  
MAX. VERTICAL END REACTION

KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'/45' BAYS - 40' SIDE OF SUPPORT COLUMN  
MAX. VERTICAL END REACTION

### Archon Beam Design Program

#### INPUT DATA

Beam Type = W36X150  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 33.72(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 9040(in<sup>4</sup>)  
Section Modulus = 504.0(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

#### LOADS

(1) Level Unif. Load = 150.7(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

(2) Level Unif. Load = 20.00(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

(3) Point Load = 1.73E+04(lbs)  
Located 33.60(ft) from the left side.

(4) Point Load = 1.73E+04(lbs)  
Located 38.23(ft) from the left side.

#### OUTPUT

Max. Moment = 1.37E+05(ft-lbs)  
Max. Shear = -3.45E+04(lbs)  
Max Deflection = 0.130(in)  
Reaction R1 = 6947(lbs)  
Reaction R2 = 3.45E+04(lbs)

#### CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 3.264 ksi  
ALLOWABLE BENDING STRESS = 9.312 ksi, PER (F1-8)

SHEAR STRESS = 1.539 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

#### CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS  
CASE 1: 40'45" BAYS - 40' SIDE OF SUPPORT COLUMN  
MAX. LATERAL END REACTION

Case 2: 40' Bay  
 $M_{Left}$

SHEAR DIAGRAM



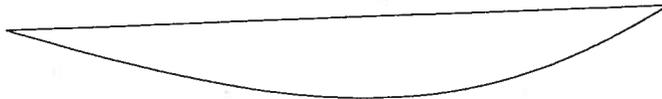
Max. Shear = -3107 lbs

MOMENT DIAGRAM



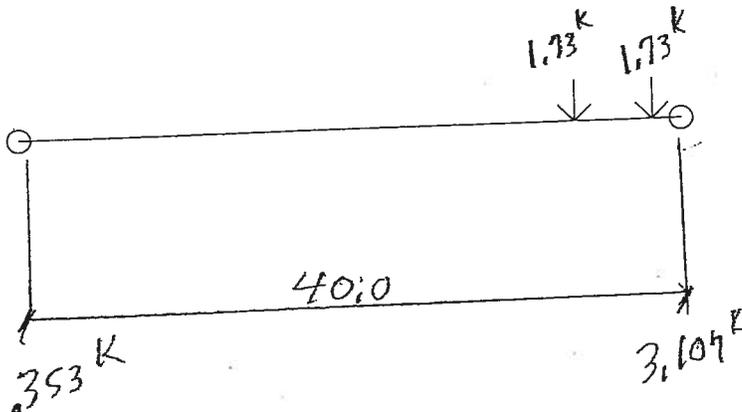
Max. Moment = 1.19E+04 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.0303 in

BEAM SYSTEM



KONECRANES FOR HONEYWELL @ BLOUNT ISLAND  
25 TON CRANE POSITIONED FOR MAX. END REACTIONS.  
CASE 1: 40'/45' BAYS - 40' SIDE OF SUPPORT COLUMN  
MAX. LATERAL END REACTION

*Archon Beam Design Program*

INPUT DATA

Beam Type = W36X150  
Beam Classification = W  
  
Total Length = 40.00(ft)  
Unbraced Length = 40.00(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 2762(in<sup>4</sup>)  
Section Modulus = 45.10(in<sup>3</sup>)  
Weak Axis Bending!  
Both ends of the beam are pinned.

LOADS

(1) Point Load = 1730(lbs)  
Located 33.60(ft) from the left side.  
  
(2) Point Load = 1730(lbs)  
Located 38.23(ft) from the left side.

OUTPUT

Max. Moment = 1.19E+04(ft-lbs)  
Max. Shear = -3107(lbs)  
Max Deflection = 0.0303(in)  
Reaction R1 = 353.4(lbs)  
Reaction R2 = 3107(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER  
  
ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER  
  
BENDING STRESS = 3.159 ksi  
ALLOWABLE BENDING STRESS = 27.00 ksi, PER (F2-1)  
  
SHEAR STRESS = 0.207 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 2011-03

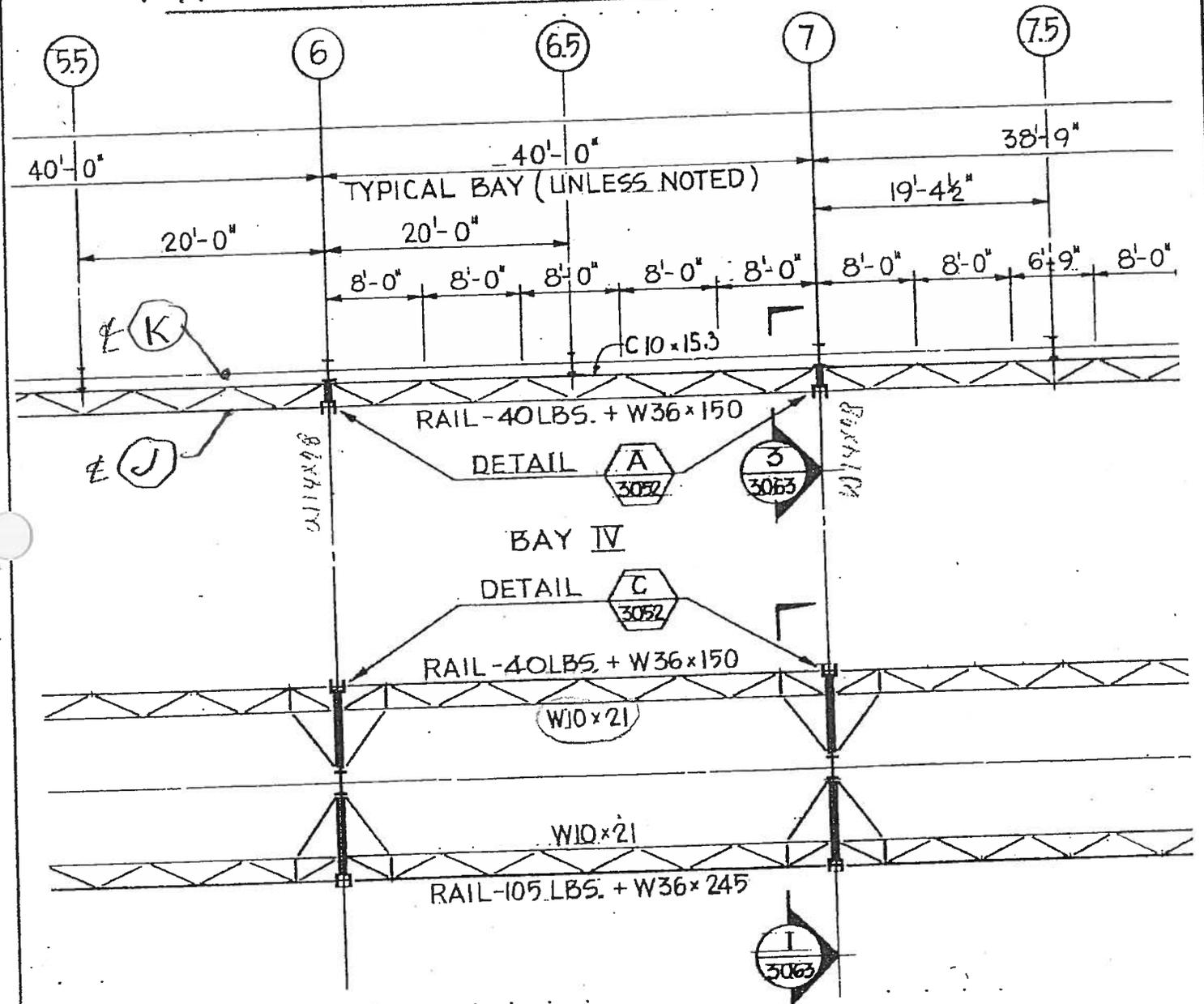
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By GPH

Date 3/10/11

Revised     

## TYP. LATERAL BRACING TRUSS - 40' SPAN OR SHORTER



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOWNT

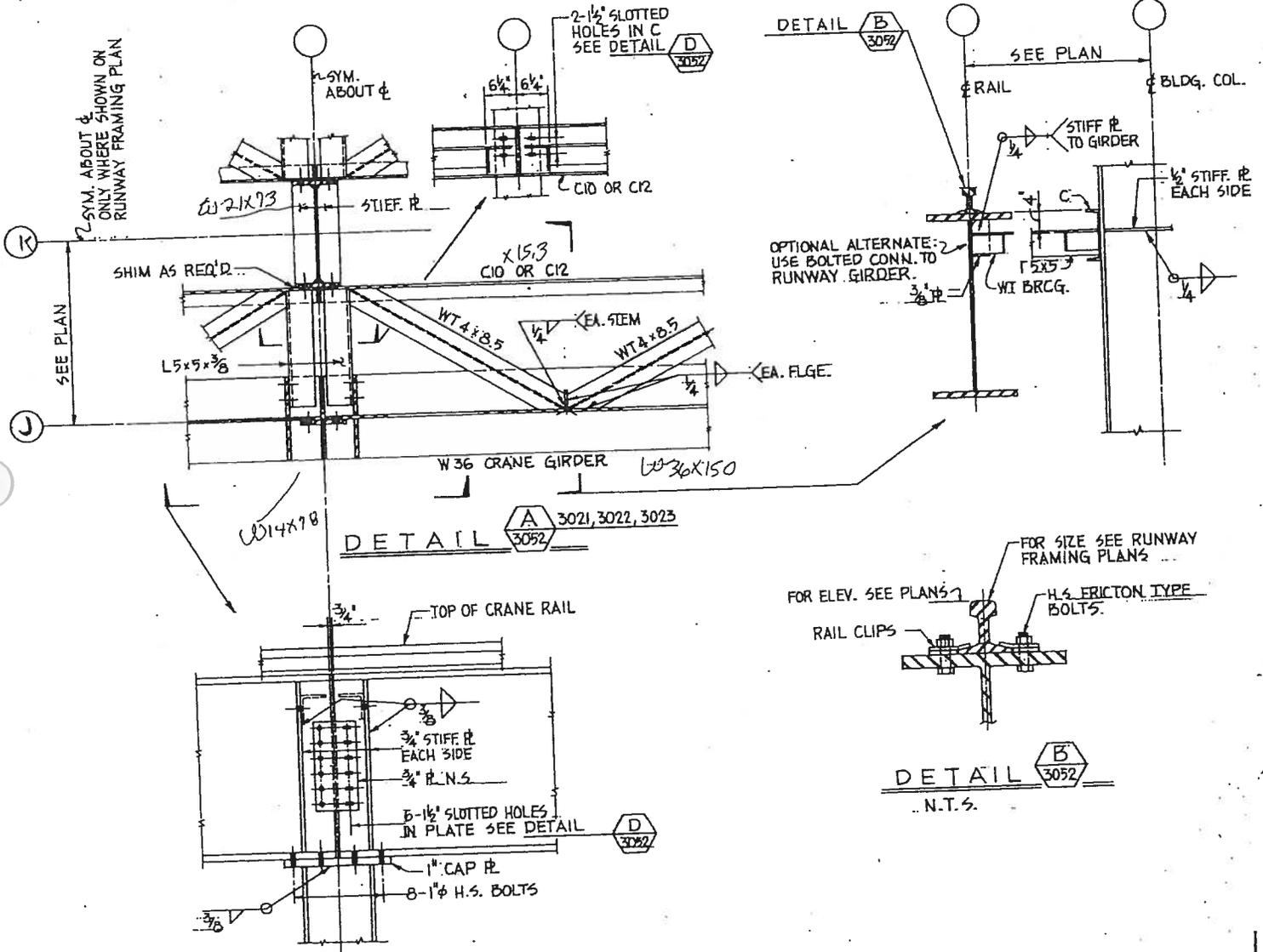
Project No. 2011-03

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By GAK

Date 3/21/11

Revised \_\_\_\_\_



• CHECK LATERAL TRUSS CONNECTION TO COLUMN - LINE J

MEMBER: L 5X5X $\frac{3}{8}$  :  $A = 3.61 \text{ in.}^2$   
 $A_x = A_y = 1.56 \text{ in.}^2$

•  $r_u = 2.4''$

•  $(r_u/A) = \frac{2.4}{1.56} = 1.54$        $F_{acc} = 20.86 \text{ ksi}$

•  $P_{COM} = 3.61(20.86) = \underline{75.3 \text{ KIP}}$

$P_{act} = \frac{69.9}{2} = \underline{34.95 \text{ KIP}} \quad \text{OKAY}$

• CHECK TENSION ALLOWANCE

$P_{TEN} = 0.6(36)(3.61) = \underline{78 \text{ KIPS}}$

• CHECK BOLTS: No. 2       $d = \frac{7}{8}'' \phi$

• Allow. Tension/Bolt =  $26.5 \text{ K}$

$P_{TOT} = 2(26.5) = \underline{53.0 \text{ KIP}}$

• Allow. Shear/Bolt =  $12.6 \text{ K}$

$P_{TOT} = 4(12.6) = \underline{50.4 \text{ KIP}}$

NOTE: REACTION ACTUALLY TRANSFERRED via Diagonal  
WT 4X8.5

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

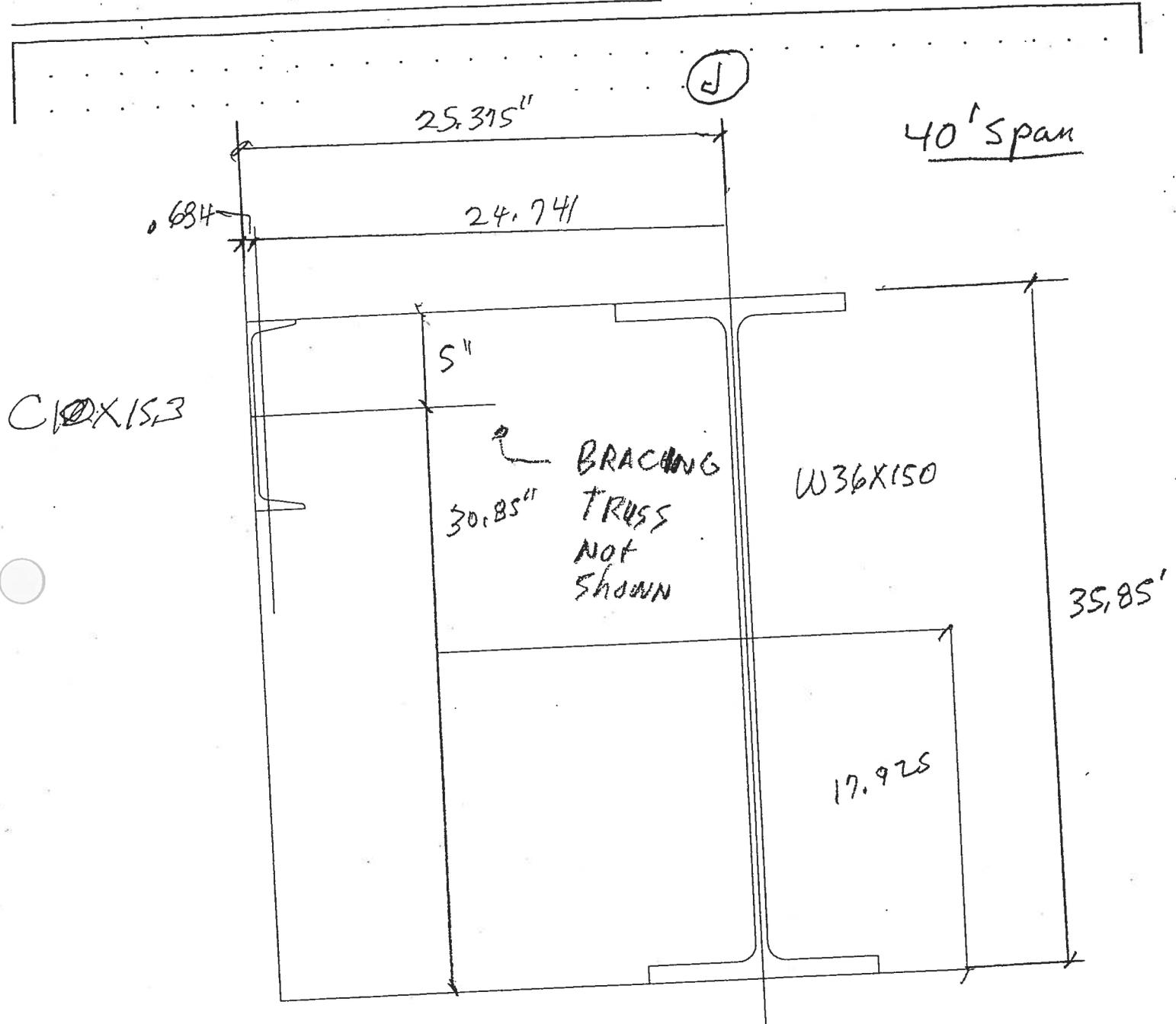
Project No. 2011-03

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By GAH

Date 3/21/11

Revised     



COMPOSITE UNIT W/CRANE BEAM + BRACING TRUSS

TYP. FOR 40' SPANS OR SHORTER!

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOWOUT

Project No. 2011-03

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By GAH

Date 3/11/21

Revised     

## COMPOSITE UNIT W/CRANE BEAM + BRACING TRUSS

Title Block Line 6

Printed: 3 MAR 2011, 9:31AM

### General Section Properties

GENERALC, INC. 1983-2010, Ver. 6.1.51, N44085

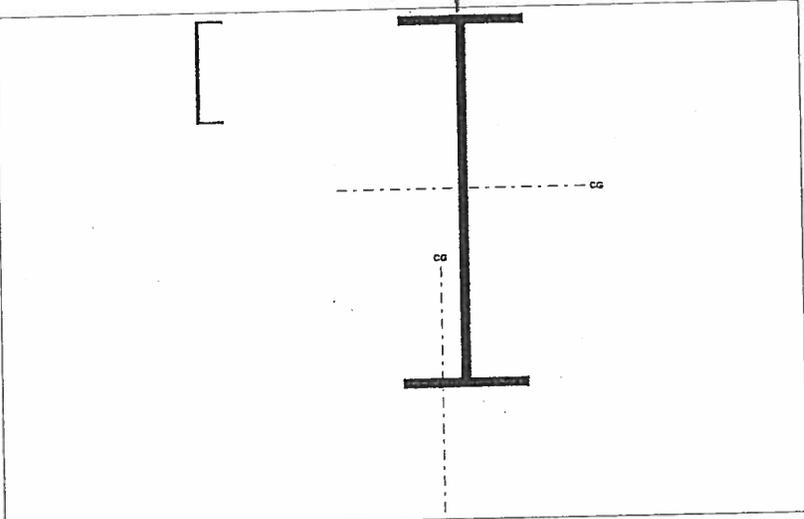
License Owner: HARTLEY & ASSOCIATES, INC.

Lic. #: KW-06001371

Description: KONECRANES - HONEYWELL - PROPERTIES OF 40' SPAN CRANE RUNWAY

### Final Section Properties

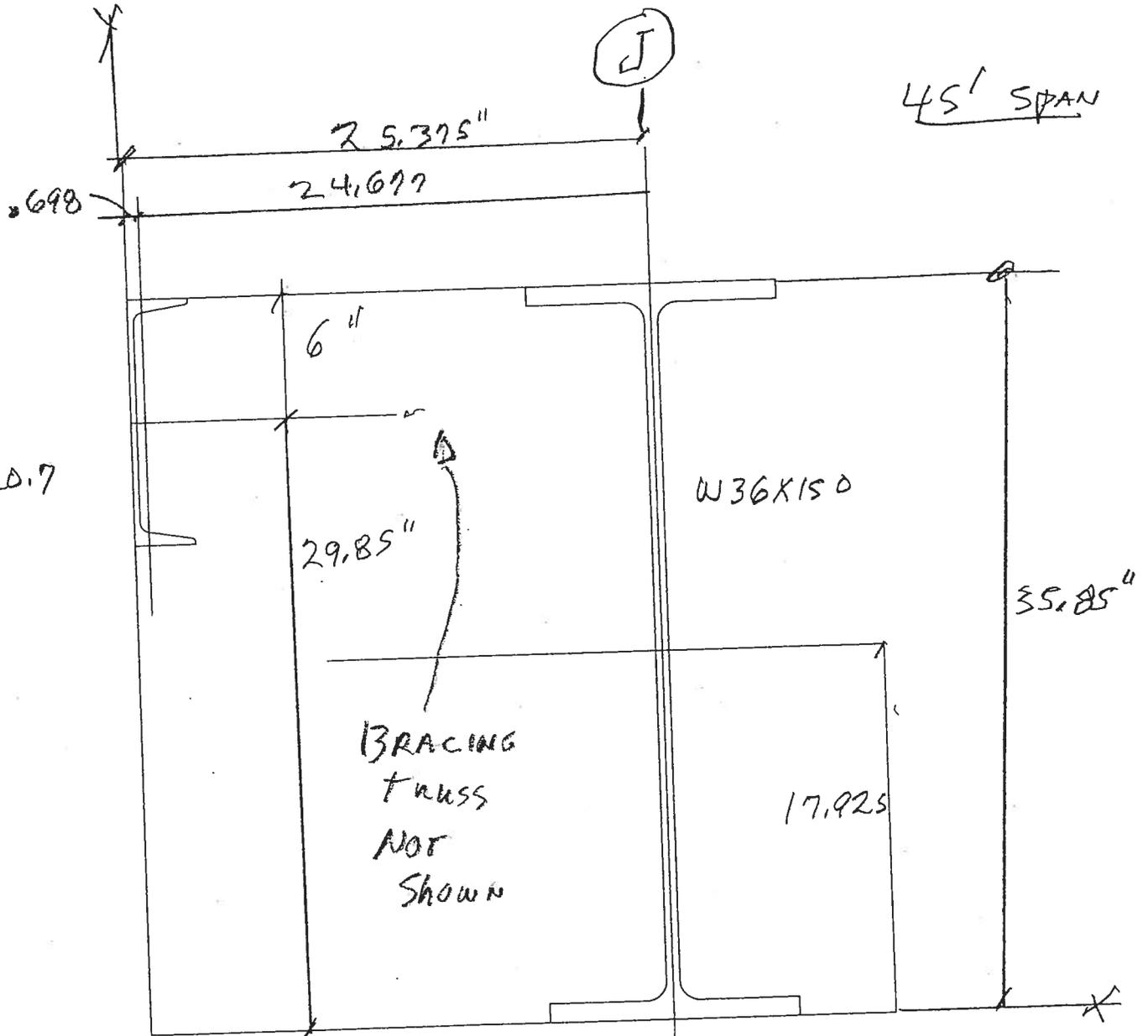
Total Area	:	48.680 in <sup>2</sup>
Calculated final C.G. distance from Datum :		
X cg Dist.	:	-2.277 in
Y cg Dist.	:	19.114 in
Edge Distances from CG. :		
+X	:	8.277 in
-X	:	-23.098 in
+Y	:	16.761 in
-Y	:	-19.139 in
Ixx =	:	9,786.83 in <sup>4</sup>
Iyy =	:	2,762.18 in <sup>4</sup>
Sxx : -X	:	511.34 in <sup>3</sup>
Sxx : +X	:	583.92 in <sup>3</sup>
Syy : -Y	:	119.58 in <sup>3</sup>
Syy : +Y	:	333.72 in <sup>3</sup>
r <sub>xx</sub>	:	14.179 in
r <sub>yy</sub>	:	7.533 in



### Steel Shapes

<b>C10X15.3 : 1</b>	Area = 4.480 in <sup>2</sup>	Height = 10.000 in	Width = 2.600 in	Ixx = 67.300 in <sup>4</sup>	Iyy = 2.270 in <sup>4</sup>	Sxx = 13.460 in <sup>3</sup>	Syy = 3.580 in <sup>3</sup>	Rotation = 0 deg CCW	Xcg = -24.741 in	Ycg = 30.850 in
<b>W36X150 : 2</b>	Area = 44.200 in <sup>2</sup>	Height = 35.900 in	Width = 12.000 in	Ixx = 9,040.000 in <sup>4</sup>	Iyy = 270.000 in <sup>4</sup>	Sxx = 503.621 in <sup>3</sup>	Syy = 45.000 in <sup>3</sup>	Rotation = 0 deg CCW	Xcg = 0.000 in	Ycg = 17.925 in

• 40' SPAN OR SHORTER



COMPOSITE UNIT W/CRANE BEAM + BRACING TRUSS  
45' SPAN

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 2011-05  
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 By DAH  
 Date 3/21/11  
 Revised     

COMPOSITE UNIT W/CRANE BEAM + BRACING TRUSS.

Title Block Line 6

**General Section Properties**

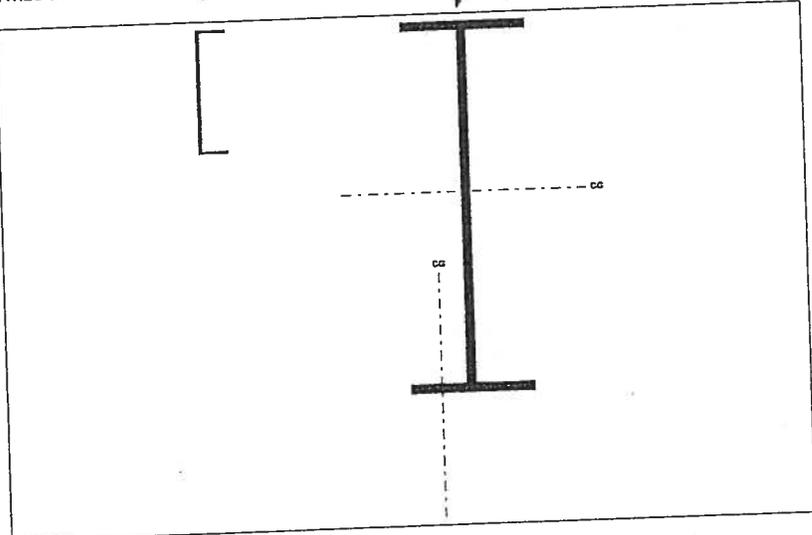
Printed: 3 MAR 2011, 9:28AM  
 GENERALC, INC. 1983-2010, Ver: 6.1.51, N:44085  
 License Owner: HARTLEY & ASSOCIATES, INC.

Lic. #: KW-06001371

Description: KONECRANES - HONEYWELL - PROPERTIES OF 45' SPAN CRANE RUNWAY

**Final Section Properties**

Total Area	:	50.280 in <sup>2</sup>
Calculated final C.G. distance from Datum :		
X cg Dist.	:	-2.984 in
Y cg Dist.	:	19.367 in
Edge Distances from CG. :		
+X	:	8.984 in
-X	:	-22.391 in
+Y	:	16.508 in
-Y	:	-19.392 in
lxx =	:	9,929.06 in <sup>4</sup>
lyy =	:	3,528.59 in <sup>4</sup>
Sxx: -X	:	512.02 in <sup>3</sup>
Sxx: +X	:	601.47 in <sup>3</sup>
Syy: -Y	:	157.59 in <sup>3</sup>
Syy: +Y	:	392.76 in <sup>3</sup>
rxx	:	14.053 in
ryy	:	8.377 in



**Steel Shapes**

<b>C12X20.7 : 1</b>	Area = 6.080 in <sup>2</sup>	Height = 12.000 in	Width = 2.940 in	lxx = 129.000 in <sup>4</sup>	lyy = 3.860 in <sup>4</sup>	Sxx = 21.500 in <sup>3</sup>	Syy = 5.530 in <sup>3</sup>	Rotation = 0 dec CCW	Xcg = -24.677 in	Ycg = 29.850 in
<b>W36X150 : 2</b>	Area = 44.200 in <sup>2</sup>	Height = 35.900 in	Width = 12.000 in	lxx = 9,040.000 in <sup>4</sup>	lyy = 270.000 in <sup>4</sup>	Sxx = 503.621 in <sup>3</sup>	Syy = 45.000 in <sup>3</sup>	Rotation = 0 dec CCW	Xcg = 0.000 in	Ycg = 17.925 in

45' SPAN.



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOWNT

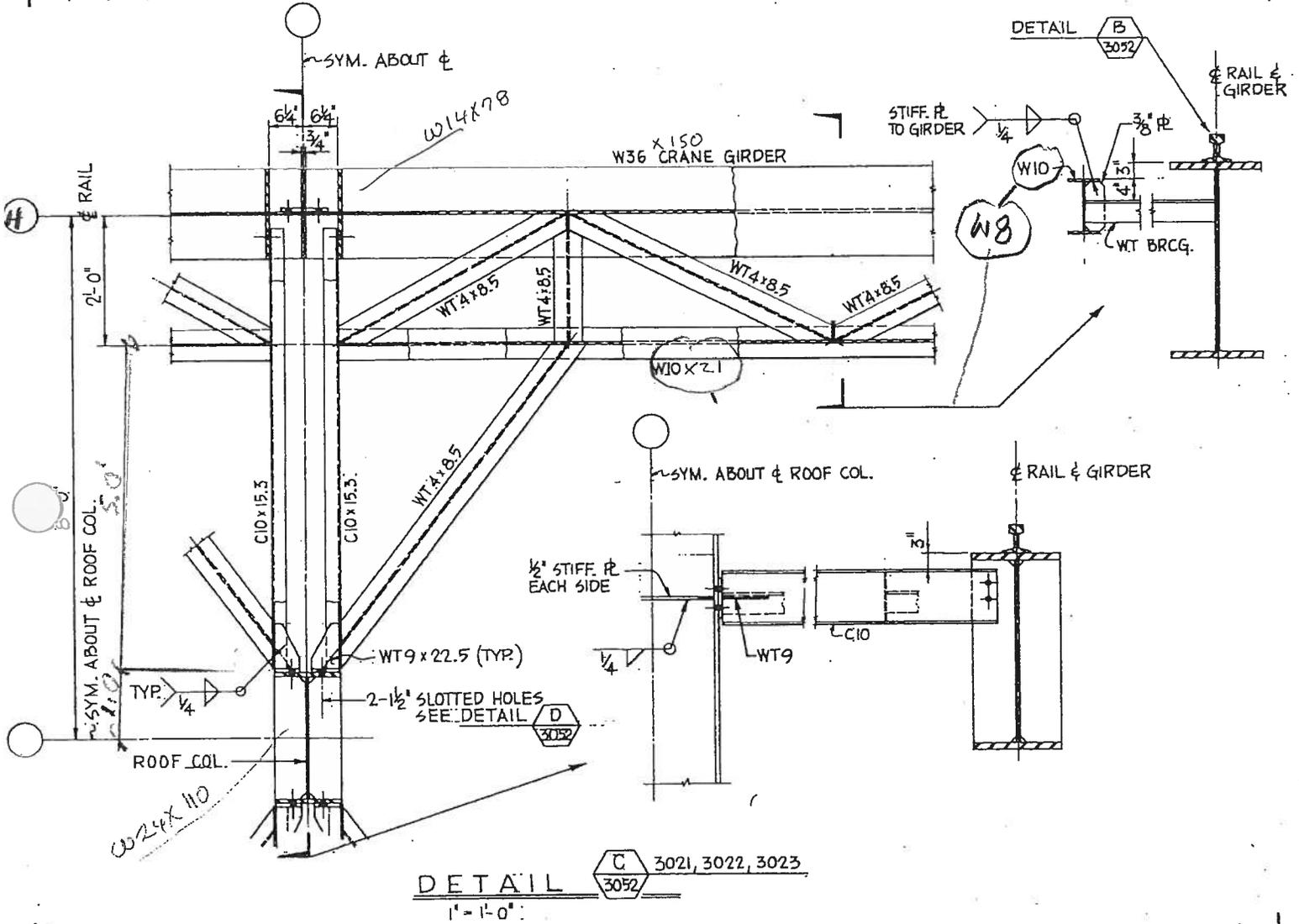
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By GAH

Date 3/21/11

Revised     



CASE 45 - (45'-0" SPAN) - (LINE #)

• REFER TO COMPUTER RUNS FOR MOMENTS, SHEARS, & DEFLECTION

• CRANE POSITIONED FOR MAX. LOADING & DEFLECTION

• VERTICAL:  $M_v = 683 \text{ K-Ft}$

• LATERAL:  $M_L = 64 \text{ K-Ft}$

• W. 36X150 w/ LATERAL TRUSS BRACING

Case 1:  $I_x = 9040 \text{ in}^4$  (w/o w10) |  $I_y = 270.0 \text{ in}^4$

1.  $S_x = 503.621 \text{ in}^3$  (w/o w10) |  $S_y = 45.0 \text{ in}^3$

Case 2:  $I_x = 9709.3 \text{ in}^4$  (w/w10) |  $I_y = 3541.02 \text{ in}^4$

2.  $S_x = 581.87 \text{ in}^3$  (w/w10) |  $S_y = 390.29 \text{ in}^3$

•  $S_x = 505.33 \text{ in}^3$  (BOT) | R.  $S_y = 148.77 \text{ in}^3$

• BENDING STRESSES:

Case 1:  $f_x = \frac{683(12)}{503.621} = 16.3 \text{ ksi}$  |  $f_y = \frac{64(12)}{45} = 17.1 \text{ ksi}$

Case 2:  $f_x = \frac{683(12)}{581.87} = 14.0 \text{ ksi}$  |  $f_y = \frac{64(12)}{390.29} = 1.96 \text{ ksi}$

$f_x = \frac{683(12)}{505.33} = 16.2 \text{ ksi}$  |  $f_y = \frac{64(12)}{148.77} = 5.2 \text{ ksi}$

◦ BENDING STRESSES (CONT'D) (LINE H)

◦ COMBINED STRESSES

$$(1) F_c = 16.3 + 17.1 = 33.4 \text{ ksi (w/o w/o)}$$

(FOR REFERENCE ONLY)

$$(2) F_c = 14.1 + 1.96 = 16.06 \text{ ksi (w/o w/o)}$$

$$(3) F_c = 16.22 + 5.2 = 21.42 \text{ ksi (w/o w/o)}$$

$$F_{b_{all}} = 0.6 F_y = 0.6(36) = 21.6 \text{ ksi}$$

◦ CONCLUSION: W36X150 + W8 CROSS BRACE  
IS ACCEPTABLE

◦ CHECK DEFLECTIONS

◦ PER CMAA; Vertical Deflection Allowable

$$\Delta_v = \frac{L}{600} = \frac{45(12)}{600} = 0.90'$$

◦ Actual Vertical Deflection = 0.767"

(w/o w/o)

$$\begin{aligned} \text{Actual Vertical Deflection} &= \frac{4040}{9747.08} (0.767) \\ &= 0.711" \end{aligned}$$

◦ CONCLUSION: W36X150 VERTICAL DEFLECTION  
IS ACCEPTABLE!

• SPOT CHECK LATERAL TRUSS BRACING SYSTEM

• Max. Lateral "M" = 6.4 K-ft

• Separation Distance BETWEEN W36 & W8

$d = 24"$

$\therefore F = \frac{M}{d} = \frac{6.4(12)}{24} = 3.2 \text{ K (TENSION)}$

• Check W10x21  $A = 6.19 \text{ in}^2$

• TENSION STRESS:

$f_a = 3.2 / 6.19 = 5.17 \text{ ksi} < 0.6 \times 36 = 21.6 \text{ ksi}$

• WF36 COMP. STRESS

$f_a = \frac{3.2}{44.02} = 0.07 \text{ ksi (Worst Case)}$

• Check W10x21 FOR COMPRESSION Allowable

$A = 6.19 \text{ in}^2 \quad r_x = 4.14 \text{ in} \quad r_y = 1.25$

$l_y = 8' = 96" \quad (l/r_y) = \frac{96}{1.25} = 76.8$

•  $F_{all} = 15.75 \text{ ksi} \quad P_c = 15.75 (6.19) = 97.2 \text{ K}$

•  $l_x = 45(12) = 540 \quad (l/r_x) = \frac{540}{4.14} = 130.4$

•  $F_{all} = 8.75 \text{ ksi} \quad P_c = 8.75 (6.19) = 54.2 \text{ Kips}$

• NOTE: WB is IN TENSION!

$\therefore P_T = 6.19 (6 \times 36) = 133.7 \text{ K Allowable!}$

CHECK LATERAL TRUSS CONNECTION TO  
COLUMN - LINE "H"

• C 10X15.3  $A = 4.49 \text{ in}^2$   $r_x = 3.89 \text{ in}$   $r_y = 0.913$

•  $L_u = 5' = 60 \text{ in}$   $(\frac{L_u}{r_x}) = \frac{60}{3.89} = 15.5$   $F_{all} = 20.86 \text{ ksi}$

$P_x = 4.49 (20.86) = 93.66 \text{ k}$

$(\frac{L_u}{r_y}) = \frac{60}{0.913} = 65.7$   $F_{all} = 14.88 \text{ ksi}$

$P_y = 4.49 (14.88) = 66.8 \text{ k}$

$\therefore P_{max} = \frac{66.8}{2} = 33.4 \text{ k} < 66.8 \text{ k} > \text{O.K.}$

• CHECK DIAGONAL BRACING STRUT TO COL

• MEMBER: WT 4X8.5  $A = 2.5 \text{ in}^2$

$r_x = 1.13 \text{ in}$

•  $L_u = 77 \text{ in}$

$r_y = 1.16 \text{ in}$

$(\frac{L_u}{r_x}) = \frac{77}{1.13} = 68.1$   $F_{all} = 16.62 \text{ ksi}$

•  $P_{all} = (2.5)(16.62) = 41.6 \text{ kip}$

NOTE: THE END REACTION,  $R = 34.95 \text{ k}$ , IS RESISTED  
BY 2 - WT 4X8.5 MEMBERS

Check W36 SPLICE @ COL LINE

◦ Web P:  $\approx 18" \times 9"$  w/6 -  $7/8"$   $\phi$  HS BOLTS

◦ Allowable shear:  $V_a = 12.6 K$

◦ Total Allowable =  $6(12.6) = 75.6 K$

◦ Col Cap P: HAS 8 -  $1"$   $\phi$  BOLTS

◦ Allowable shear:  $V_a = 16.5 K$

◦ Total Allowable =  $8(16.5) = 132 K$

◦ COMBINED CAPACITY IN SHEAR:  $P_s = 207.6 K$

◦ LONGITUDINAL CRANE FORCE

$$V_L = 0.10 \times \text{WHEEL LOAD}$$

$$V_L = 0.10 (4)(17.3)$$

$$V_L = \underline{6.92 K}$$

Check WEB P:  $t = 3/4"$   $A_{gross} = .75(18) = 13.5 \text{ in}^2$



$7/8"$   $\phi$  ( $15/16"$  Hole)

$$15/16" \text{ Hole} = \left(\frac{15}{16}\right)(.75) = 0.703 \text{ in}^2$$

$$6 \text{ Holes} = 6(0.703) = 4.21 \text{ in}^2$$

$$\text{NET A} = 13.5 - 4.21 = 9.29 \text{ in}^2$$

Allow TENSION:  $P_T = 9.29(20 \text{ ksi})$

$$P_T = 185.8 K$$

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject KONECRANES

FOR HONEYWELL - BLOWOT

Project No. 2011-03

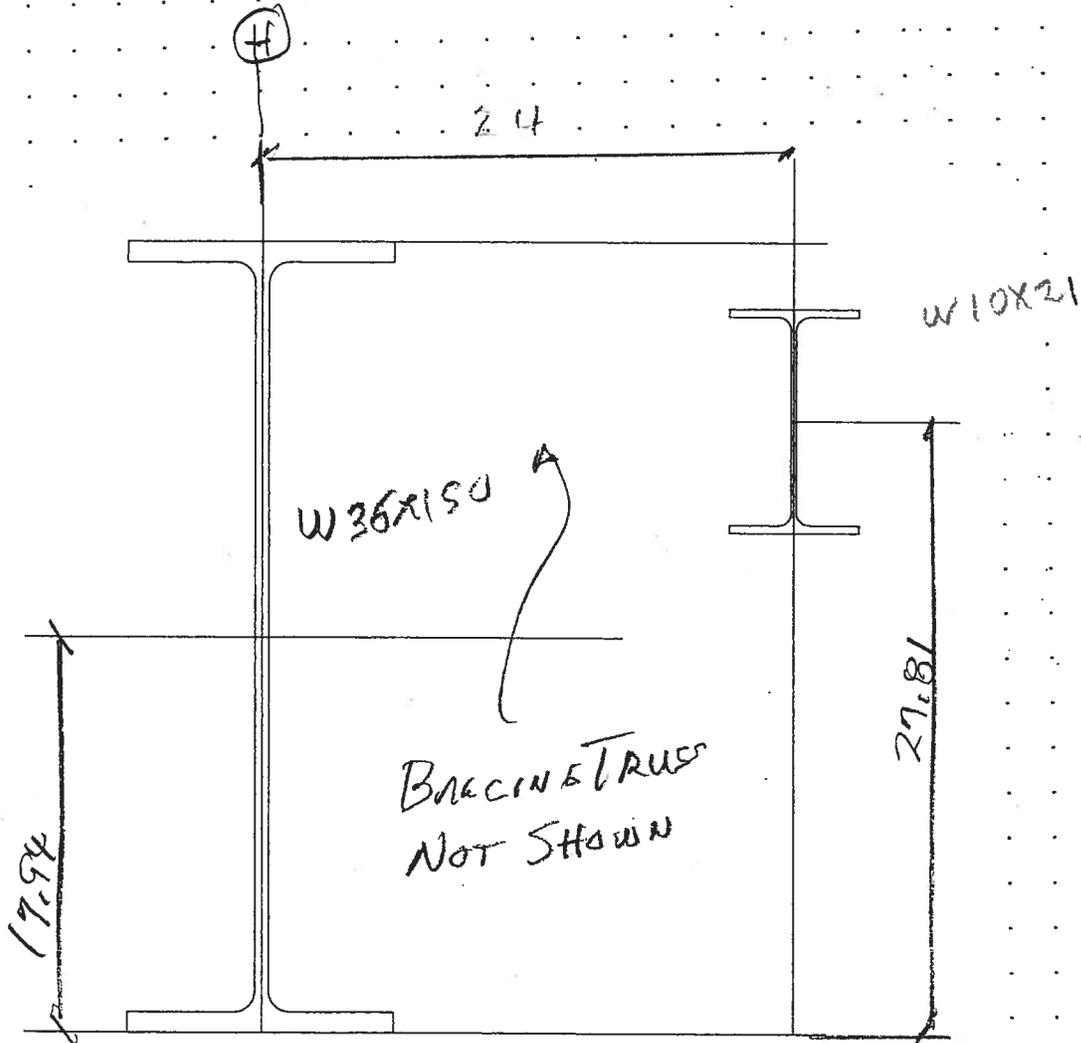
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By DAH

Date 3/21/11

Revised     

COMPOSITE USING BRACING TRUSS W10X21



COMPOSITE USING BRACING FORSS. W10X21

(H)

Title Block Line 6

Printed: 8 MAR 2011, 3:16PM

General Section Properties

ENERCALC, INC. 1983-2010, Ver: 6.1.51, N:44085

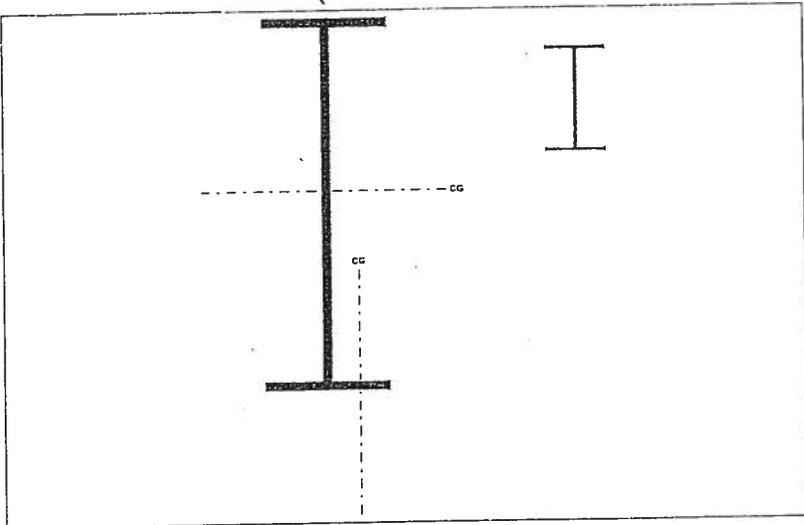
License Owner: HARTLEY & ASSOCIATES, INC.

Lic. #: KW-06001371

Description: COMPOSITE SECTION - HONEYWELL

Final Section Properties

Total Area	:	50.690 in <sup>2</sup>
Calculated final C.G. distance from Datum :		
X cg Dist.	:	3.073 in
Y cg Dist.	:	19.204 in
Edge Distances from CG. :		
+X	:	23.802 in
-X	:	-9.073 in
+Y	:	16.686 in
-Y	:	-19.214 in
I <sub>xx</sub> =	:	9,709.29 in <sup>4</sup>
I <sub>yy</sub> =	:	3,541.02 in <sup>4</sup>
S <sub>xx</sub> : -X	:	505.33 in <sup>3</sup>
S <sub>xx</sub> : +X	:	581.87 in <sup>3</sup>
S <sub>yy</sub> : -Y	:	390.29 in <sup>3</sup>
S <sub>yy</sub> : +Y	:	148.77 in <sup>3</sup>
r <sub>xx</sub>	:	13.840 in
r <sub>yy</sub>	:	8.358 in



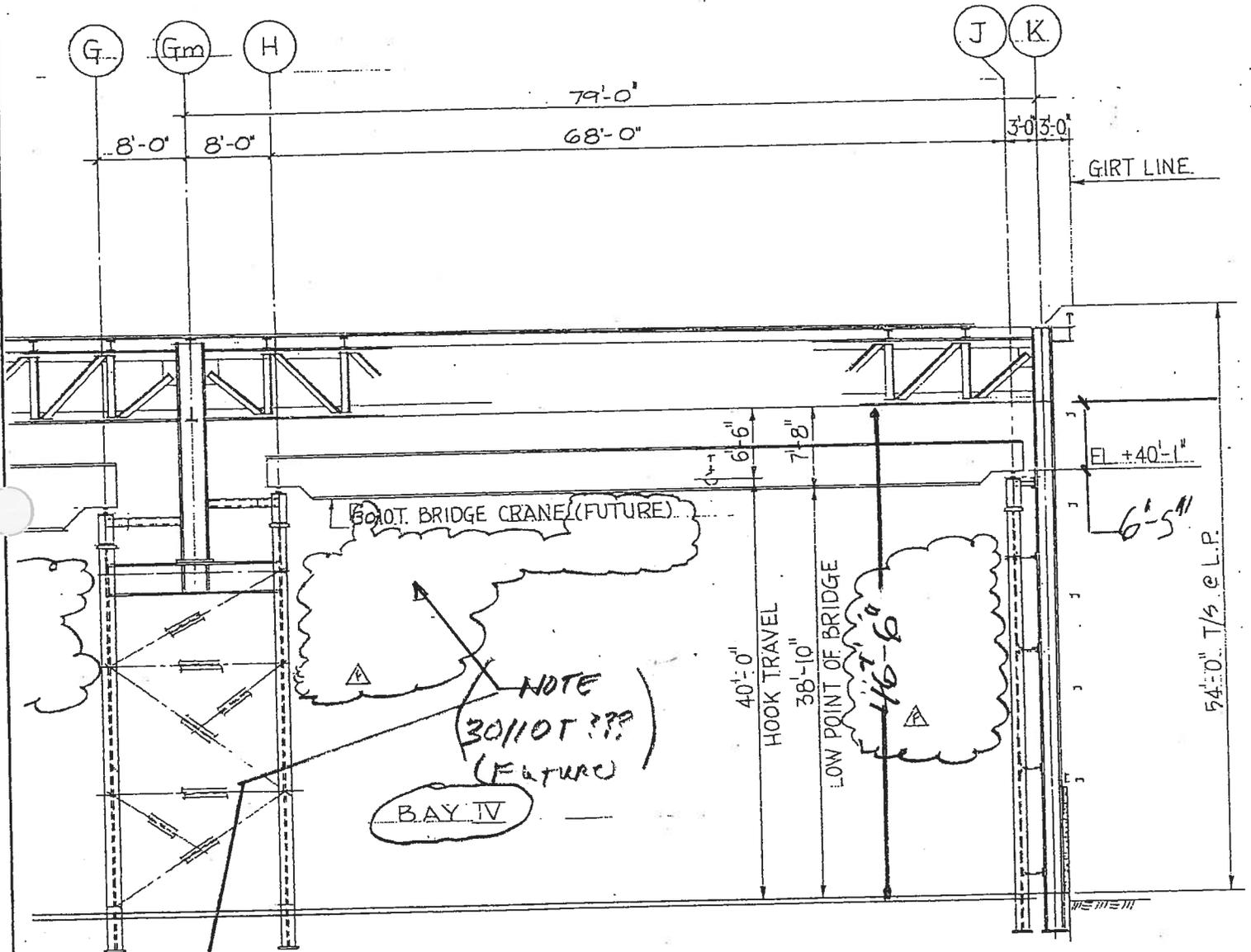
Steel Shapes

<b>W36X150 : 1</b>	Area = 44.200 in <sup>2</sup>	Height 35.900 in	Width 12.000 in	I <sub>xx</sub> = 9,040.000 in <sup>4</sup>	I <sub>yy</sub> = 270.000 in <sup>4</sup>	S <sub>xx</sub> = 503.621 in <sup>3</sup>	S <sub>yy</sub> = 45.000 in <sup>3</sup>	Rotation = 0 deg CCW	X <sub>cg</sub> = 0.000 in	Y <sub>cg</sub> = 17.940 in
<b>W10X22 : 2</b>	Area = 6.490 in <sup>2</sup>	Height 10.200 in	Width 5.750 in	I <sub>xx</sub> = 118.000 in <sup>4</sup>	I <sub>yy</sub> = 11.400 in <sup>4</sup>	S <sub>xx</sub> = 23.137 in <sup>3</sup>	S <sub>yy</sub> = 3.965 in <sup>3</sup>	Rotation = 0 deg CCW	X <sub>cg</sub> = 24.000 in	Y <sub>cg</sub> = 27.810 in

NOTE: W10X21 substituted W10X22 - CURRENT S/P

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

BAY IV CROSS-SECTION

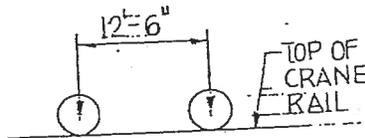


PARTIAL BUILDING SECTION (LOOKING NORTH)  
SCALE: 1/8" = 1'-0"

NOTE: NO TABULATED VALUES  
FOR THIS LOADING

**CRANE LOADS (EXISTING)**

CRANE CAPACITY	SPAN	WHEEL LOAD (EACH WHEEL)	VERT IMPACT (EACH WHEEL)	SIDE THRUST EACH RAIL *	LONGIT. FORCE EACH WHEEL	BUMPER FORCE PER. RAIL
40T. + 10T. AUX.	102'-0"	88 <sup>k</sup>	22	15 <sup>k</sup>	11 <sup>k</sup>	43 <sup>k</sup>
30T. + 10T. AUX.	102'-0"	69 <sup>k</sup>	18 <sup>k</sup>	12 <sup>k</sup>	9 <sup>k</sup>	35 <sup>k</sup>
30T. + 10T. AUX.	44'-0"	55 <sup>k</sup>	14 <sup>k</sup>	12 <sup>k</sup>	7 <sup>k</sup>	17 <sup>k</sup>
30T. + 5T. AUX.	102'-0"	65 <sup>k</sup>	15 <sup>k</sup>	11 <sup>k</sup>	8 <sup>k</sup>	32 <sup>k</sup>
20T. + 5T. AUX.	102'-0"	55 <sup>k</sup>	14 <sup>k</sup>	7 <sup>k</sup>	7 <sup>k</sup>	29 <sup>k</sup>
20T.	102'-0"	52 <sup>k</sup>	13 <sup>k</sup>	7 <sup>k</sup>	7 <sup>k</sup>	27 <sup>k</sup>
10T.	68'-0"	29 <sup>k</sup>	5 <sup>k</sup>	4 <sup>k</sup>	3 <sup>k</sup>	16 <sup>k</sup>
10T.	44'-0"	23 <sup>k</sup>	6 <sup>k</sup>	4 <sup>k</sup>	4 <sup>k</sup>	11 <sup>k</sup>



CRANE BRIDGE WHEELS

NOTES:

1. WHEEL LOADS DERIVED FROM "WHITING CRANE HANDBOOK" MAIN HOOK AND AUX. HOOK LIFTS DO NOT OCCUR AT SAME TIME

2. CRANE LOADS ARE BASED ON THE FOLLOWING:

- a) LONGITUDINAL FORCE - 12.5% OF MAX. WHEEL LOAD (EA. WHEEL)
- b) TOTAL SIDE THRUST EACH RAIL - 12.5% OF CAPACITY + TROLLEY WT.
- c) IMPACT - 25% OF MAX. WHEEL LOAD
- d) BUMPER FORCE PER RAIL =  $WV^2 / 4gs$

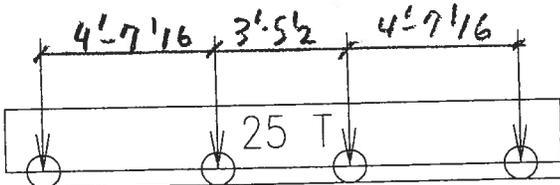
WHERE W = UNLOADED WT. OF CRANE

V = 50% OF MAX. CRANE VELOCITY (V=150 FPM)

S = 0.17 FT. (COMPRESSION TRAVEL OF ENERGY ABSORBING DEVICE)

g = 32.2 FT/SEC.<sup>2</sup>

17.3k 17.3k 17.3k 17.3k



NEW 2ST CRANE

STATIC LOAD = 17.3 KIPS

LAT. LOAD = 1.73 K

PER CMAA

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOWNT.

Project No. 2011-03

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By GH

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Revised     

## STRUCTURAL STEEL GENERAL NOTES

1. ALL STRUCTURAL STEEL WORK SHALL CONFORM TO THE CURRENT ISSUE OF THE AISC "SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS", AND SHALL COMPLY WITH ALL LOCAL LAWS AND ORDINANCES. WHERE CONFLICTING REQUIREMENTS OCCUR, THE MORE STRINGENT SHALL APPLY.

2. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM DESIGNATION A36 (FY=36KSI) UNLESS NOTED.

3. ALL WELDING SHALL CONFORM TO THE CURRENT SPECIFICATIONS OF THE AMERICAN WELDING SOCIETY, AND SHALL COMPLY WITH ALL LOCAL LAWS AND ORDINANCES. WELDING ELECTRODES SHALL BE E-70 SERIES.

4. BOLTS SHALL BE 7/8" Ø UNLESS NOTED  
a. HIGH STRENGTH BOLTS SHALL CONFORM TO ASTM DESIGNATION A325  
b. ALL OTHER BOLTS SHALL CONFORM TO ASTM DESIGNATION A307

5. CONNECTIONS:  
ALL BEAM CONNECTIONS SHALL BE STANDARD FRAMED OR SEATED, UNLESS NOTED.  
UNLESS GREATER REACTIONS ARE INDICATED ON THE PLANS, CONNECTIONS SHALL DEVELOP AT LEAST ONE-HALF OF THE TOTAL UNIFORM LOAD CAPACITY OF THE BEAM FOR THE GIVEN SPAN. IN NO CASE SHALL THE CONNECTION HAVE LESS THAN THE MINIMUM NUMBER OF BOLTS SHOWN IN TABLE I OF THE AISC MANUAL.

6. ALL FIELD CONNECTIONS SHALL BE BOLTED, UNLESS NOTED.  
BOLTED CONNECTIONS SHALL UTILIZE HIGH STRENGTH BOLTS UNLESS NOTED.

7. GIRT AND PURLIN CONNECTIONS MAY BE BOLTED WITH 3/4" Ø A307 BOLTS.

8. ALL GUSSET PLATES SHALL BE 3/8" THICK MINIMUM.

9. ALL TRUSSES SHALL BE OF SHOP WELDED CONSTRUCTION. FIELD SPLICES SHALL BE APPROVED BY THE ENGINEER AND SHALL BE BOLTED OR WELDED.

10. ALL TENSION CONNECTIONS SHALL DEVELOP THE FULL DESIGN LOAD INDICATED, BUT NOT LESS THAN 50% OF THE FULL CAPACITY OF THE MEMBER IN TENSION.

11. AXIALLY STRESSED MEMBERS MEETING AT A POINT SHALL HAVE THEIR GRAVITY AXES INTERSECTING AT A JOINT IF PRACTICABLE, IF NOT, PROVISIONS SHALL BE MADE FOR BENDING STRESSES DUE TO THE ECCENTRICITY.

12. TRUSS END CONNECTIONS SHALL HAVE THEIR WORKING POINT ON THE CENTERLINE OF THE COLUMNS.

13. TRUSSES SHALL BE CAMBERED FOR DEAD LOAD ONLY, USING COEFFICIENT FROM AISC "MANUAL OF STEEL CONSTRUCTION."

14. REMOVE PAINT AT EXIST STEEL WHERE NEW WELDED CONNECTIONS ARE REQUIRED.

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject KONE CRANES  
FOR HONEYWELL - BLOWNT

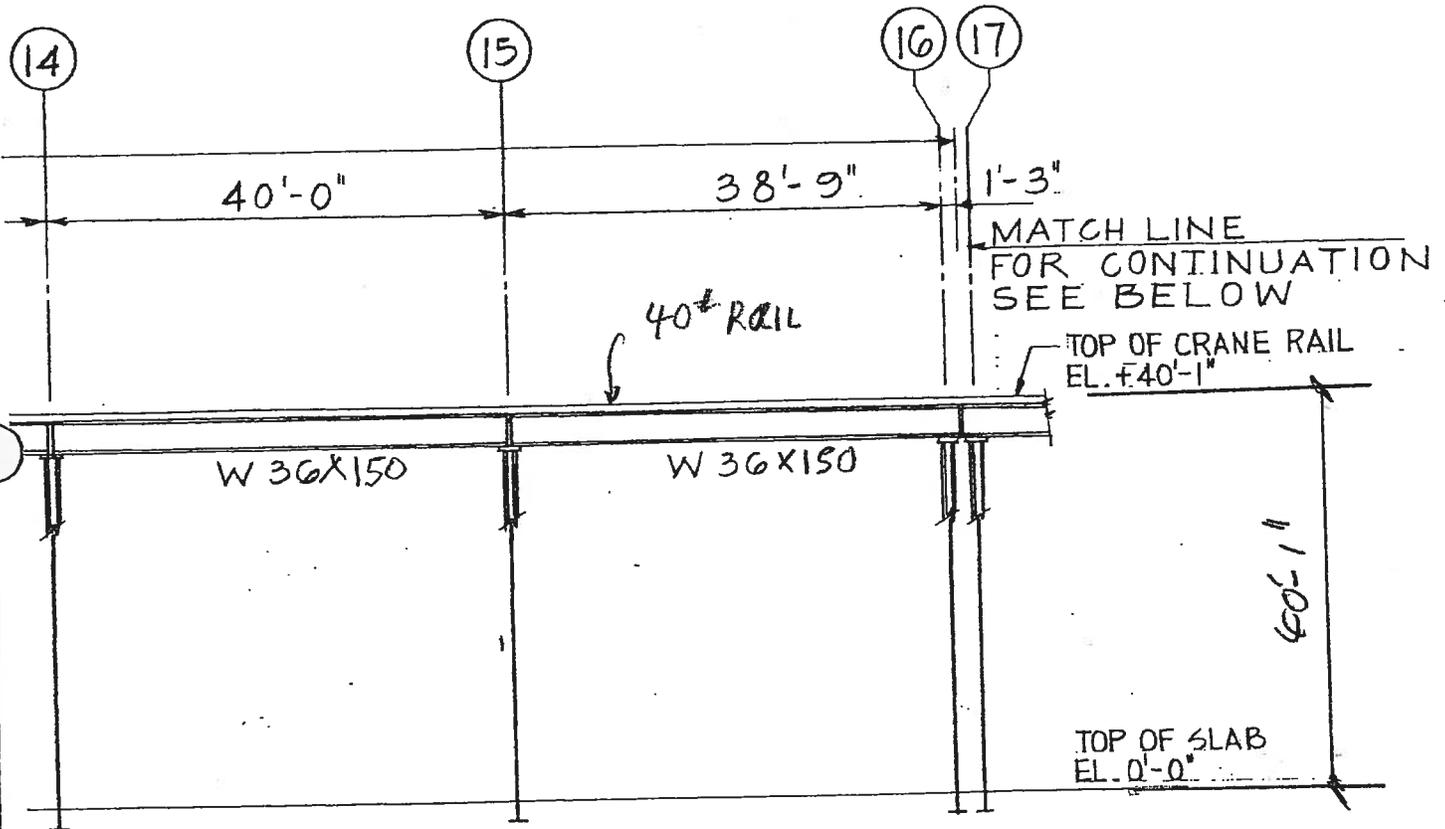
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By GAH

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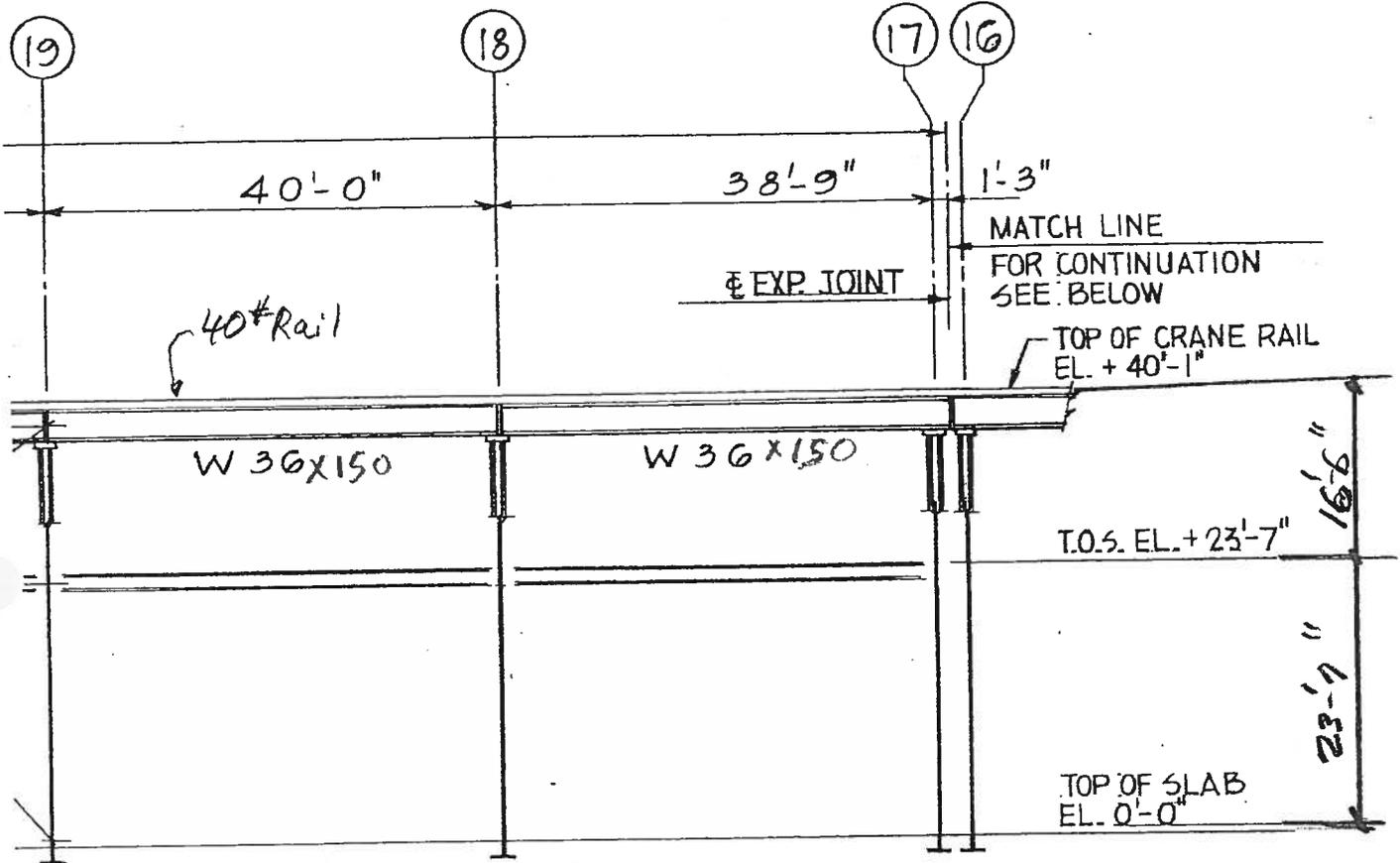
Revised     



PART RUNWAY ELEVATION - COL. LINE "J"

Subject: KONE CRANES  
FOR HONEYWELL - BLOWNT.

Project No. 2011-05  
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By DAH  
Date 3/21/11  
Revised     



PART RUNWAY ELEVATION - COL. LINE "H"

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONE CRANES

FOR HONEYWELL - BLOWNT ISLAND

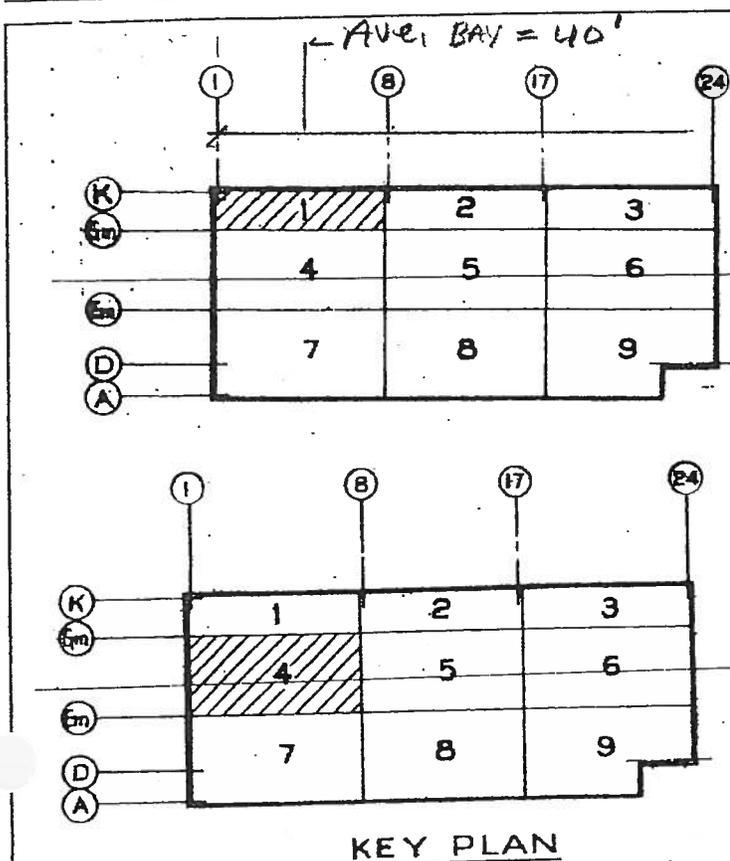
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Date 3/21/11

Revised     



FOR COLUMN LOADS:

Area OVER COL  
 $A = 40 (98.5)$   
 $A = 3940 \text{ SF}$   
 $\Sigma = 197.0$   
 $\Sigma/2 = 98.5'$

Approx. Col. Load

$R_{DL} = 30 (3940) = 118,200 \text{ \#}$

$R_{LL} = 20 (3940) = 78,800 \text{ \#}$

50% TO EA. CRANE COL.

$R_{DL} = .5 (118,200) = 59,100 \text{ \#}$

$R_{LL} = .5 (78,800) = 39,400 \text{ \#}$

$\Sigma R_{ROOF} = 98,500 \text{ \#}$

ROOF LOADS			
	METAL DECK	PURLIN	GIRDER OR TRUSS
5 PLY	6	6	6
1" INSULATION	2	2	2
METAL DECK	3	3	3
PURLIN	—	3	3
GIRDER	—	—	6
MECH.	—	10	10
$\Sigma$ DEAD LOAD	11	24	30
LIVE LOAD	20	20	20
TOTAL	31 P.S.F.	44 P.S.F.	50 P.S.F.

PURLIN - ADD'L. 1<sup>K</sup> LOAD CONCENTRATED @  $\phi$   
 GIRDER OR TRUSS - ADD'L. 2<sup>K</sup> CONCENTR. @  $\phi$  } REACTIONS NOT CARRIED OVER.



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Subject: KONE CRANES

FOR HONEYWELL - Blount Island

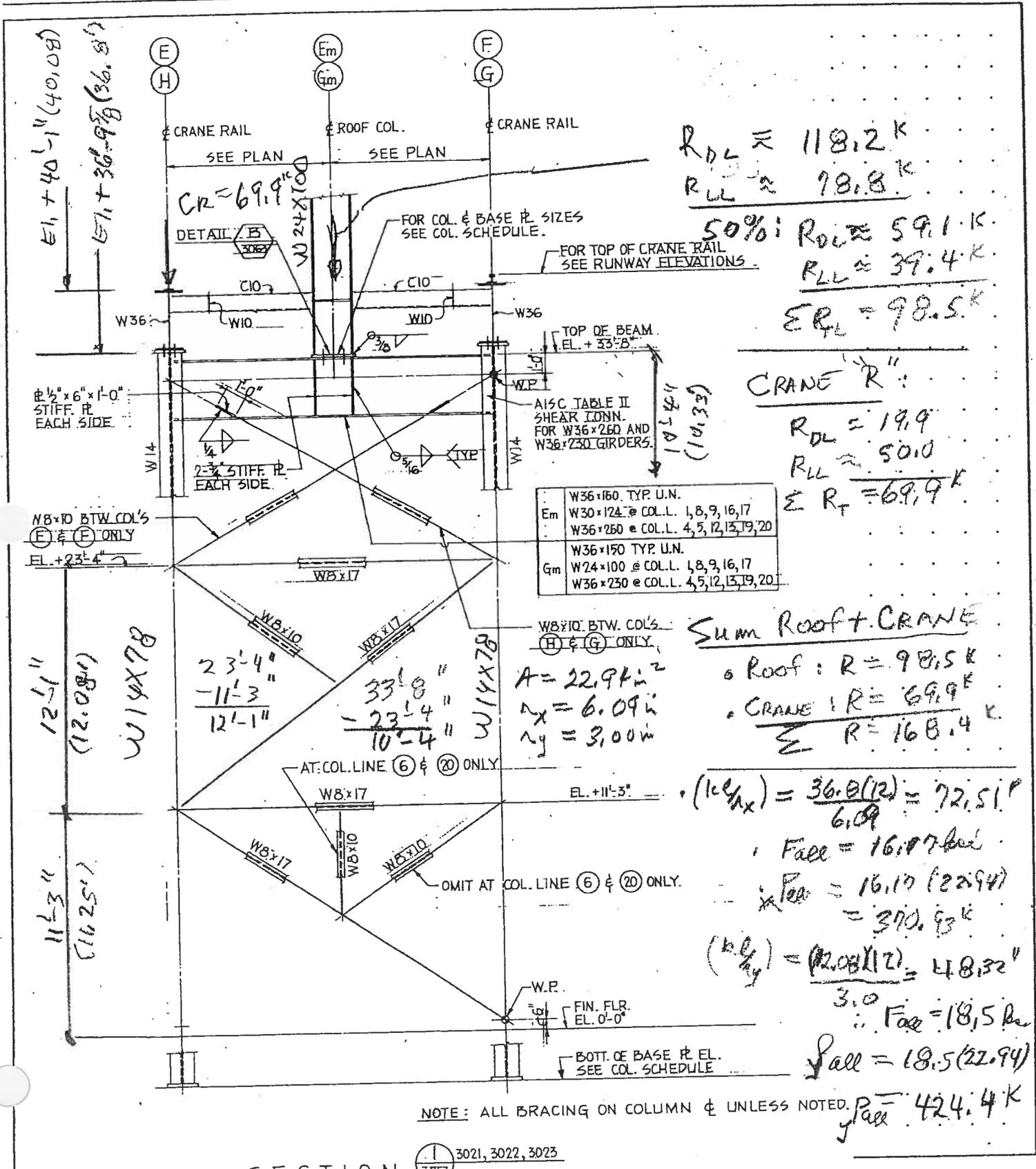
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Em	W36x160 TYP. U.N.
	W30x124 @ COL. L. 1, 8, 9, 16, 17
	W36x260 @ COL. L. 4, 5, 12, 13, 19, 20
Gm	W36x150 TYP. U.N.
	W24x100 @ COL. L. 1, 8, 9, 16, 17
	W36x230 @ COL. L. 4, 5, 12, 13, 19, 20

SECTION 3021, 3022, 3023  
3063

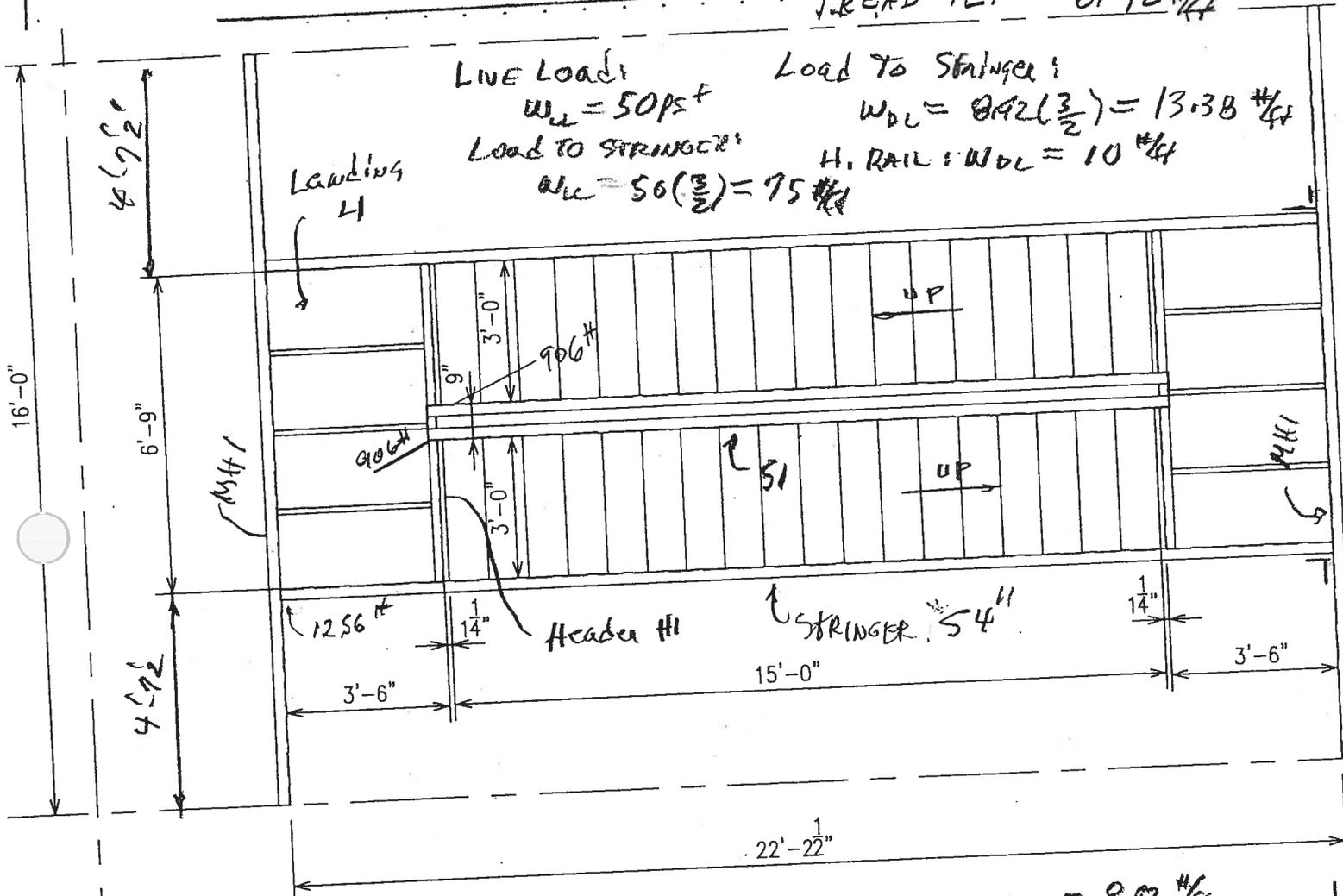
TYPICAL BRACING AT CRANE COL'S. E & F, G & H.

NOTE: ALL BRACING ON COLUMN & UNLESS NOTED.

APPENDIX C  
CALCULATIONS  
FOR  
NEW  
CRANE ACCESS STAIR

**CRANE ACCESS STAIR**

**DESIGN LOADS**



TREAD T.C. = 8.92 #/ft

LINE LOAD  
 $w_L = 50 \text{ psf}$   
 Load TO STRINGER:  
 $w_L = 50 \left(\frac{3}{2}\right) = 75 \text{ #/ft}$

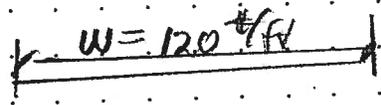
Load TO STRINGER:  
 $w_{DL} = 8.92 \left(\frac{3}{2}\right) = 13.38 \text{ #/ft}$   
 H. RAIL:  $w_{DL} = 10 \text{ #/ft}$

Use 3/16" FLOOR #;  $w_L = 8.71 \text{ #/sf}$  TREAD:  $w_{DL} = 8.92 \text{ #/ft}$

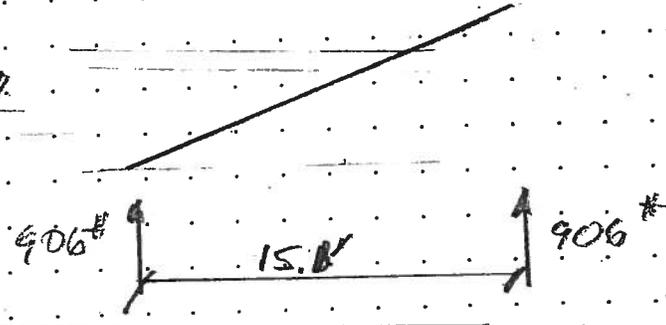
**DESIGN LOADS TO STRINGER**

Tread	$w_{DL} = 13.4 \text{ #/ft}$	USE:
H. Rail	$w_{DL} = 10.0 \text{ #/ft}$	
	$\Sigma w_{DL} = 23.4 \text{ #/ft}$	$w_{TL} = 120 \text{ #/ft}$
Stringer D.L.	$w_{DL} = 20.7$	
	$\Sigma w_{DL} = 44.1 \text{ #/ft}$	
LIVE LOAD	$w_L = 75.0 \text{ #/ft}$	
	$\Sigma w_{TL} = 119.1 \text{ #/ft}$	

Stringer "SL":



Check C12X20?



See Computer Prints

$\Delta_{max} = 0.0375 \text{ in}$        $D/L = 1/4832$

$f_{bending} = 1.909 \text{ ksi}$

Use C12X20.7 to support the rails direct

# HARTLEY & ASSOCIATES, INC.

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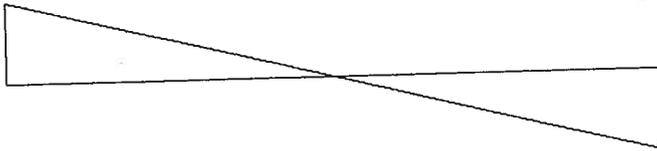
By GAH

Date 3/21/11

Revised     

## KONECRANES - HONEYWELL - CRANE ACCESS STAIR INTERIOR STRINGER - LOWER LEVER

SHEAR DIAGRAM



Max. Shear = -906.0 lbs

MOMENT DIAGRAM



Max. Moment = 3420 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.0375 in

BEAM SYSTEM



KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
INTERIOR STRINGER - LOWER LEVER

*Archon Beam Design Program*

INPUT DATA

Beam Type = C12X20.7  
Beam Classification = C

Total Length = 15.10(ft)  
Unbraced Length = 5.000(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 129.0(in<sup>4</sup>)  
Section Modulus = 21.50(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

( 1 ) Level Unif. Load = 120.0(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 15.10(ft).

OUTPUT

Max. Moment = 3420(ft-lbs)  
Max. Shear = -906.0(lbs)  
Max Deflection = 0.0375(in)  
Reaction R1 = 906.0(lbs)  
Reaction R2 = 906.0(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 1.909 ksi  
ALLOWABLE BENDING STRESS = 21.60 ksi, PER (.6Fy)

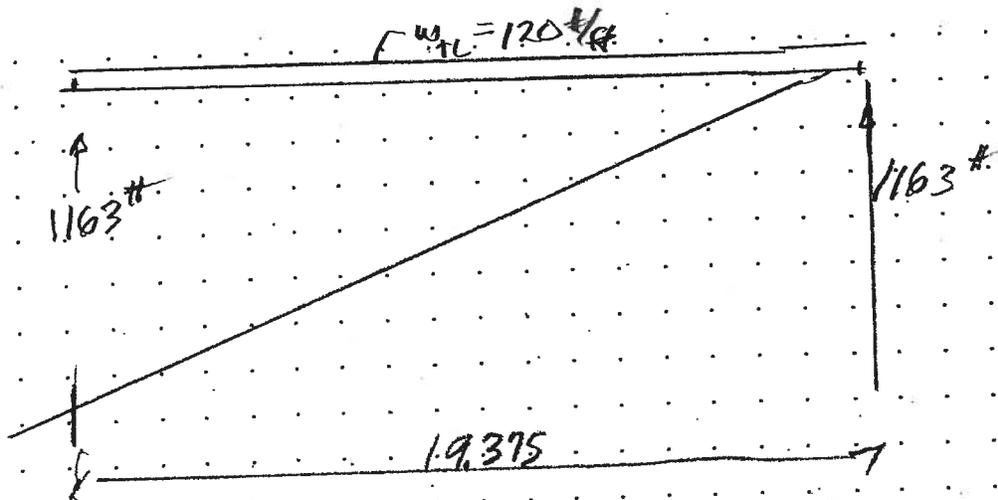
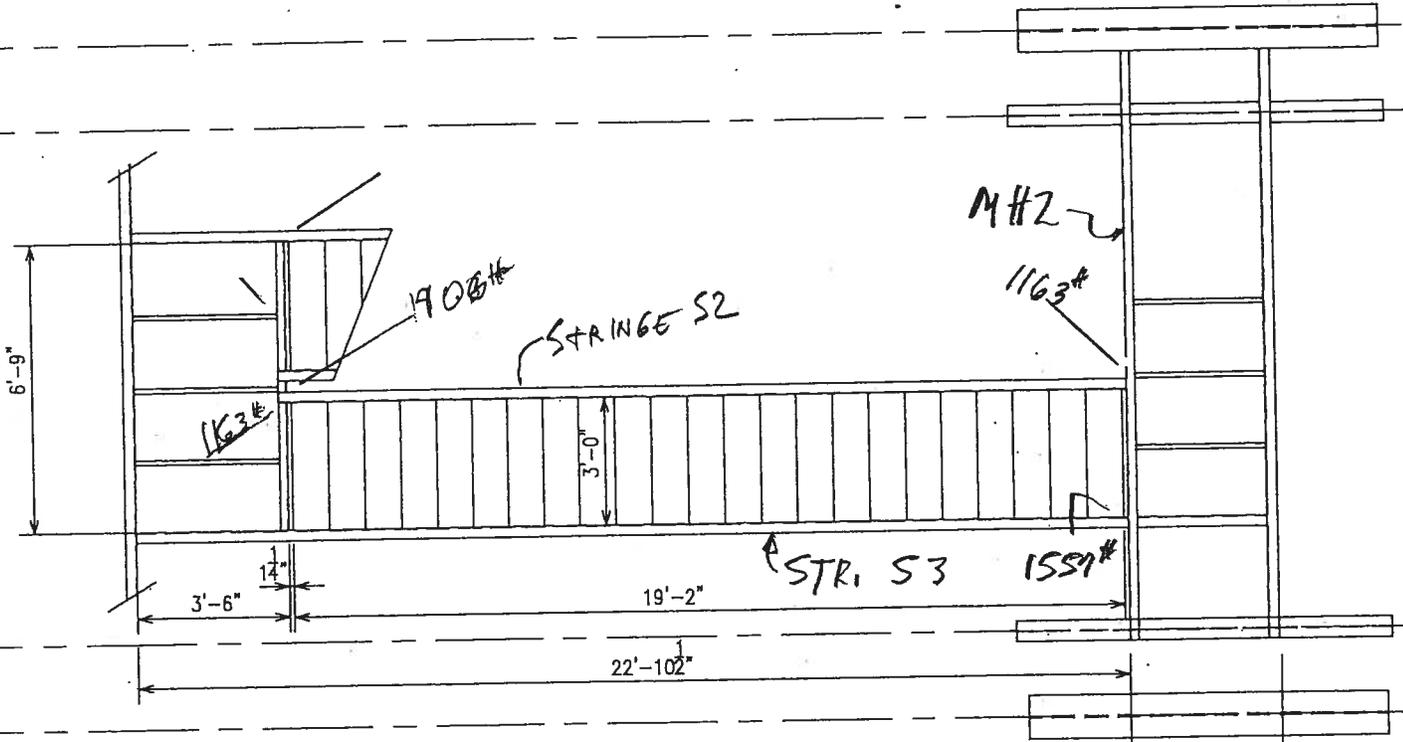
SHEAR STRESS = 0.268 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

Upper Stinger Check "S2"

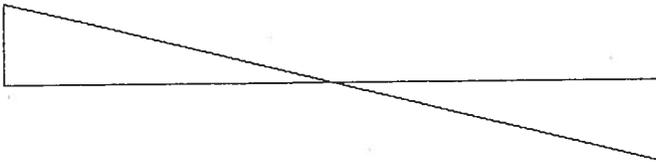


Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

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By DAH  
Date 3/21/11  
Revised \_\_\_\_\_

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
STRINGER "S2" - UPPER LEVEL  
UNIFORM LOADING - DL + LL

SHEAR DIAGRAM



Max. Shear = 1163 lbs

MOMENT DIAGRAM



Max. Moment = 5631 ft-lbs

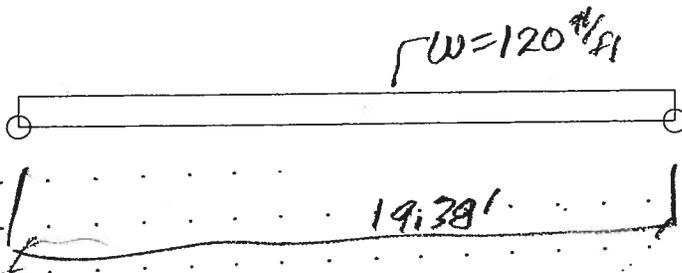
DEFLECTED SHAPE



Max. Def. = 0.102 in

$$d/L = 1/2280$$

BEAM SYSTEM



Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

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Date 3/21/11  
Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
STRINGER "S2" - UPPER LEVEL  
UNIFORM LOADING - DL + LL

*Archon Beam Design Program*

INPUT DATA

Beam Type = C12X20.7  
Beam Classification = C

Total Length = 19.38(ft)  
Unbraced Length = 5.000(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 129.0(in<sup>4</sup>)  
Section Modulus = 21.50(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

(1) Level Unif. Load = 120.0(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 19.38(ft).

OUTPUT

Max. Moment = 5631(ft-lbs)  
Max. Shear = 1163(lbs)  
Max Deflection = 0.102(in)  
Reaction R1 = 1163(lbs)  
Reaction R2 = 1163(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 3.143 ksi  
ALLOWABLE BENDING STRESS = 21.60 ksi, PER (.6Fy)

SHEAR STRESS = 0.344 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

Check Landing "L1" :

D/t. R =  $3/16"$  Supports @  $\approx 11.7' = 20.4"$

$3/16" R: S_x = \frac{bt^2}{6} = \frac{12(.1875)^2}{6} = 0.071 \text{ in}^3$

Design Load:

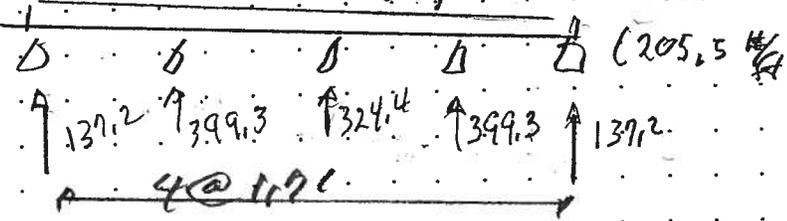
D.L.:  $W_{DL} = 8.71 \text{ psf}$

L.L.:  $W_{LL} = 50 \text{ psf}$  or  $W_p = 300 \#$

$\Sigma W_{TL} = 58.71 \text{ psf}$

Case 1

$\Sigma W_{TL} = 58.71 \text{ psf}$

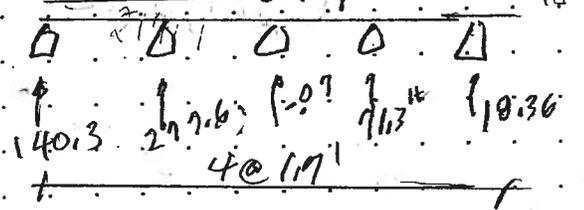


124.8    132.0

200 #

Case 2

$W = 8.71 \text{ psf}$  (30.5 #/ft)



# HARTLEY & ASSOCIATES, INC.

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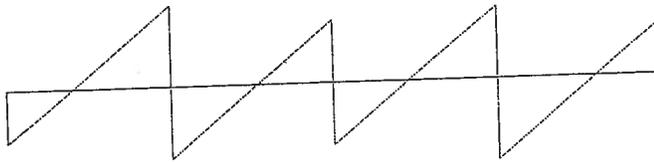
Date 3/21/11

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KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING L1  
CASE 1  
UNIFORM LOADING

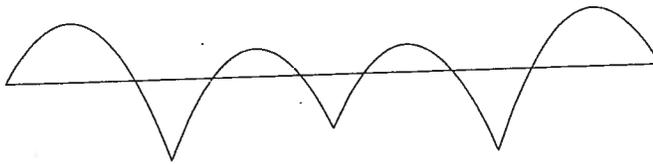
Max. Shear(lb) = -212.1

SHEAR DIAGRAM



MOMENT DIAGRAM

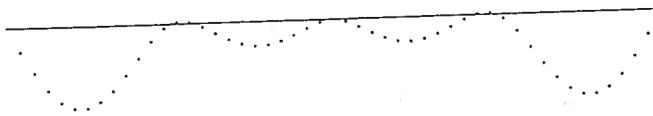
Max. MOMENT(ft-lb) = -63.63



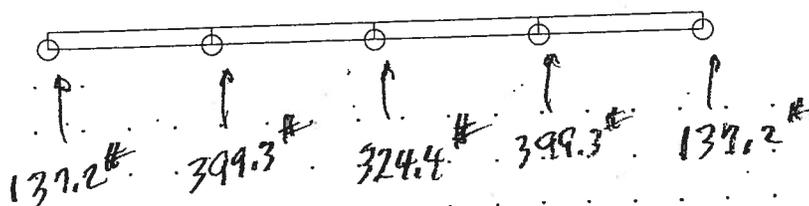
DEFLECTED SHAPE

Max. Def(in) = 0.0284

$$\delta/L = 1/918$$



BEAM SYSTEM



Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

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Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING L1  
CASE 1  
UNIFORM LOADING

OUTPUT OF MULTI-SPAN BEAM  
Archon Beam Analysis Program

INPUT VARIABLES

Start of first span is pinned  
End of last span is pinned

SPAN NO. 1 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 205.5  
Selfweight load(lbs/ft) = 0.00

No point loads in span no. 1

OUTPUT RESULTS

Left End Moment(ft-lbs) = 0  
Right End Moment(ft-lbs) = 63.63

SPAN NO. 2 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 205.5  
Selfweight load(lbs/ft) = 0.00

No point loads in span no. 2

OUTPUT RESULTS

Left End Moment(ft-lbs) = -63.63  
Right End Moment(ft-lbs) = 42.42

SPAN NO. 3 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 205.5  
Selfweight load(lbs/ft) = 0.00

No point loads in span no. 3

OUTPUT RESULTS

Left End Moment(ft-lbs) = -42.42  
Right End Moment(ft-lbs) = 63.63

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING L1  
CASE 1  
UNIFORM LOADING

SPAN NO. 4 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 205.5  
Selfweight load(lbs/ft) = 0.00

No point loads in span no. 4

OUTPUT RESULTS

Left End Moment(ft-lbs) = -63.63  
Right End Moment(ft-lbs) = 0

SUPPORT REACTIONS

Load on Support No. 1 is 137.2 lbs  
Load on Support No. 2 is 399.3 lbs  
Load on Support No. 3 is 324.4 lbs  
Load on Support No. 4 is 399.3 lbs  
Load on Support No. 5 is 137.2 lbs

Stress Output and Code Check

SPAN NO. 1 CUSTOM

Actual shear stress(ksi) = 0.0267  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 3.103  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)  
This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

SPAN NO. 2 CUSTOM

Actual shear stress(ksi) = 0.0232  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 3.103  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)  
This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

SPAN NO. 3 CUSTOM

Actual shear stress(ksi) = 0.0235  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 3.103  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWOT

Project No. 1011

Page C12 of 11

By DAH

Date 3/21/11

Revised \_\_\_\_\_

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING L1  
CASE 1  
UNIFORM LOADING

This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

SPAN NO. 4 CUSTOM

Actual shear stress(ksi) = 0.0264  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 3.103  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)  
This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWOT

Project No. 1111

Page C13 of 1

By DAH

Date 3/21/11

Revised \_\_\_\_\_

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING "L1"  
CASE 2  
UNIFORM DL + 300 LBS IN 1ST SPAN

SHEAR DIAGRAM

Max. Shear(lb) = -211.6



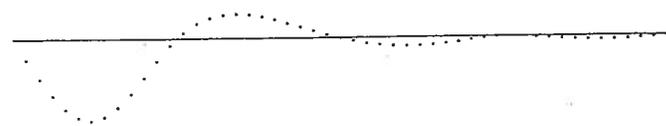
MOMENT DIAGRAM

Max. MOMENT(ft-lb) = 108.2

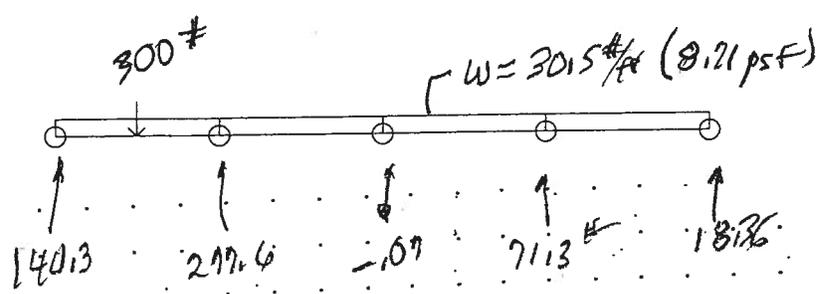


DEFLECTED SHAPE

Max. Def(in) = 0.0598



BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOWNT

Project No. 1111

Page C14 of 1

By DAK

Date 3/21/11

Revised \_\_\_\_\_

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING "L1"  
CASE 2  
UNIFORM DL + 300 LBS IN 1ST SPAN

OUTPUT OF MULTI-SPAN BEAM  
Archon Beam Analysis Program

### INPUT VARIABLES

Start of first span is pinned  
End of last span is pinned

#### SPAN NO. 1 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 30.50  
Selfweight load(lbs/ft) = 0.00

Point Load(lbf) # 1 is 300.0 located 0.85 ft from left end of span.

#### OUTPUT RESULTS

Left End Moment(ft-lbs) = 0  
Right End Moment(ft-lbs) = 60.67

#### SPAN NO. 2 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 30.50  
Selfweight load(lbs/ft) = 0.00

No point loads in span no. 2

#### OUTPUT RESULTS

Left End Moment(ft-lbs) = -60.67  
Right End Moment(ft-lbs) = -7.365

#### SPAN NO. 3 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 30.50  
Selfweight load(lbs/ft) = 0.00

No point loads in span no. 3

#### OUTPUT RESULTS

Left End Moment(ft-lbs) = 7.365  
Right End Moment(ft-lbs) = 12.86

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING "L1"  
CASE 2  
UNIFORM DL + 300 LBS IN 1ST SPAN

#### SPAN NO. 4 CUSTOM

Moment of Inertia (in<sup>4</sup>) = 0.0231  
Young's Modulus (psi) = 2.90E+07  
Span Length (ft) = 1.700  
Uniform Load (lbs/ft) = 30.50  
Selfweight load(lbs/ft) = 0.00

No point loads in span no. 4

#### OUTPUT RESULTS

Left End Moment(ft-lbs) = -12.86  
Right End Moment(ft-lbs) = 0

#### SUPPORT REACTIONS

Load on Support No. 1 is 140.2 lbs  
Load on Support No. 2 is 277.6 lbs  
Load on Support No. 3 is -0.0679 lbs  
Load on Support No. 4 is 71.31 lbs  
Load on Support No. 5 is 18.36 lbs

#### Stress Output and Code Check

#### SPAN NO. 1 CUSTOM

Actual shear stress(ksi) = 0.0268  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 5.275  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)  
This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

#### SPAN NO. 2 CUSTOM

Actual shear stress(ksi) = 8.29E-03  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 2.958  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)  
This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

#### SPAN NO. 3 CUSTOM

Actual shear stress(ksi) = 4.76E-03  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 0.627  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOWOUT

Project No. 1111

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By DAK

Date 3/21/11

Revised \_\_\_\_\_

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING "L1"  
CASE 2  
UNIFORM DL + 300 LBS IN 1ST SPAN

This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

SPAN NO. 4 CUSTOM

Actual shear stress(ksi) = 4.17E-03  
Allowable shear stress(ksi) = 14.40 PER (F4-1)

Actual bending stress(ksi) = 0.627  
Allowable bending stress(ksi) = 21.60 PER (.6Fy)  
This is a conservative est., AISC may allow a larger value!

Member passes due to shear!  
Member passes due to Bending!

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES

FOR HONEYWELL - BLOWNT

Project No. 1111

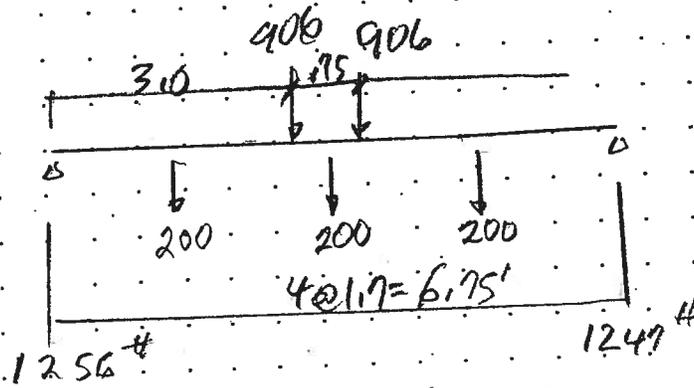
Page C16 of     

By DAH

Date 3/21/11

Revised     

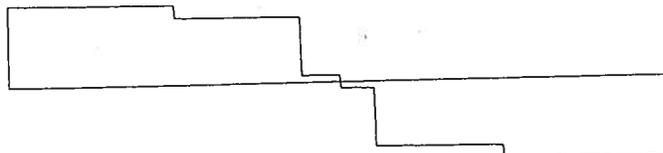
Check Header "H1"



$$\begin{array}{r} 1.7' \\ + 1.7' \\ \hline 3.4' \\ + 1.7' \\ \hline 5.1' \end{array}$$

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING "L1"  
HEADER BEAM "H1"  
STRINGER LOADS + PLATFORM HEADERS

SHEAR DIAGRAM



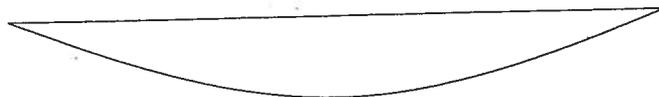
Max. Shear = 1256 lbs

MOMENT DIAGRAM



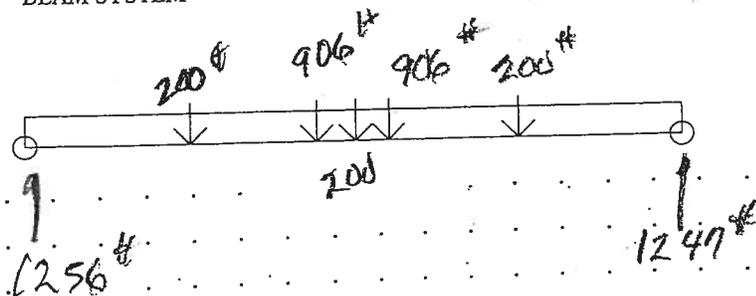
Max. Moment = 3492 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.0188 in

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 2011-4

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By D.H.

Date 3/21/11

Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING "L1"  
HEADER BEAM "H1"  
STRINGER LOADS + PLATFORM HEADERS

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LANDING "L1"  
HEADER BEAM "H1"  
STRINGER LOADS + PLATFORM HEADERS

### Archon Beam Design Program

#### INPUT DATA

Beam Type = C9X13.4  
Beam Classification = C

Total Length = 6.790(ft)  
Unbraced Length = 0.0100(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 47.90(in<sup>4</sup>)  
Section Modulus = 10.60(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

#### LOADS

- ( 1) Point Load = 906.0(lbs)  
Located 3.000(ft) from the left side.
- ( 2) Point Load = 906.0(lbs)  
Located 3.750(ft) from the left side.
- ( 3) Point Load = 200.0(lbs)  
Located 1.700(ft) from the left side.
- ( 4) Point Load = 200.0(lbs)  
Located 3.400(ft) from the left side.
- ( 5) Point Load = 200.0(lbs)  
Located 5.100(ft) from the left side.
- ( 6) Level Unif. Load = 13.43(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 6.790(ft).

#### OUTPUT

Max. Moment = 3492(ft-lbs)  
Max. Shear = 1256(lbs)  
Max Deflection = 0.0188(in)  
Reaction R1 = 1256(lbs)  
Reaction R2 = 1247(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 3.953 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 0.598 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

#### CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONE CRANES

FOR HONEYWELL - BLOWNT

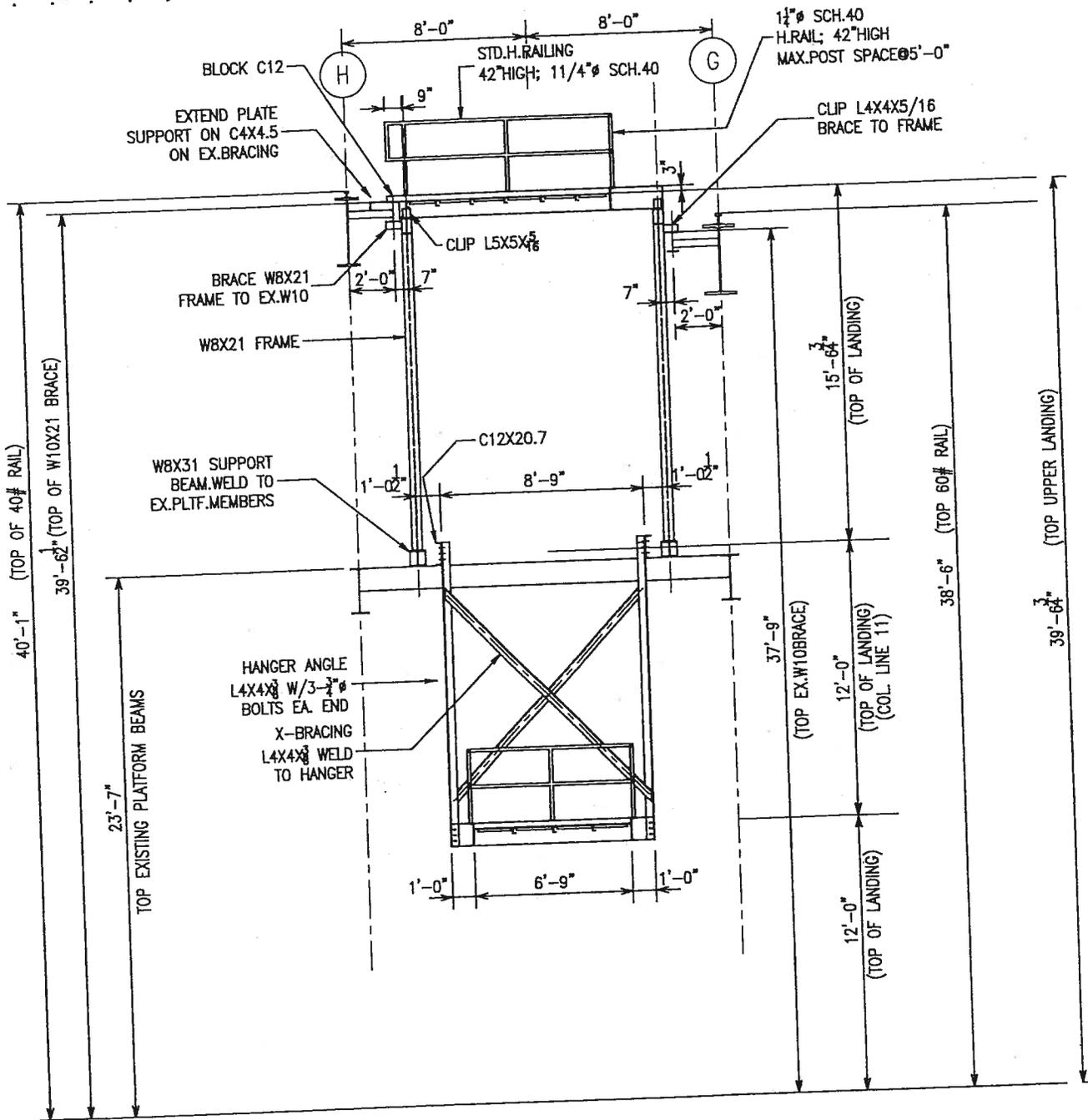
Project No. 2011-4

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By DAH

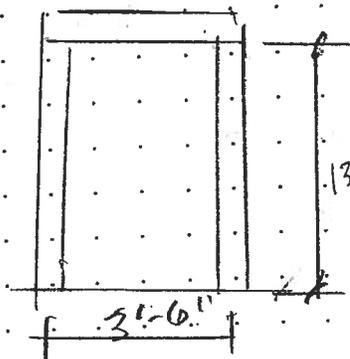
Date 3/21/11

Revised     



SECTION THRU STAIR LANDINGS

Check Upper Level Support FRAME



Check W8X21  $A = 6.16 \text{ in}^2$

$\frac{d_f}{r_y} = \frac{13.88(12)}{1.26}$

$r_y = 1.26$   
 $r_x = 3.44$

$\phi_c = 132.2$

$F_y = 8.55 \text{ ksi}$

$\therefore \text{Allowable Load} = (6.16)(8.55)$

$P_{all} = 52.7 \text{ K} \rightarrow \text{OKAY}$

W8X21 OKAY

Check HANGER "L" w/ 3-3/4"  $\phi$  A325 Bolts

L4X4X5/16  $A = 2.40 \text{ in}^2$  Deduct 1 3/16" Holes  
 $r_z = 0.791$

$A_{net} = 2.4 - 1.08 = 2.32$   $A_g = (6.8125)(0.3125)(L5/16)$   
 $\phi < 0.08 \text{ in}^2$

$P_{all} = 20,000(2.32)$

$\therefore P_{all} = 46,400 \# \leftarrow$

Bolts: 3-3/4"  $\phi$  A325-N  $V_{all} = 9.3 \text{ kip/Bolt}$

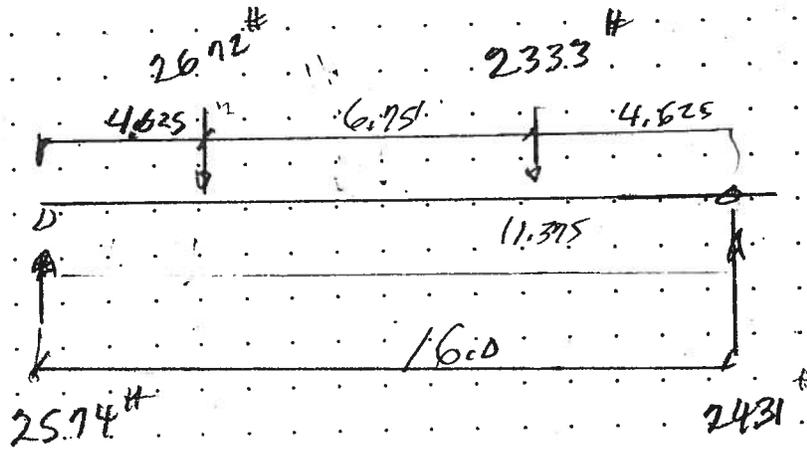
$\therefore P_{all} = 3(9.3) = 27.9 \text{ K} = 27,900 \#$

Note: Total wt of stair

L4X4X5/16 OKAY

$P_{TOT} = 18,990 \#$

MAIN SUPPORT BEAM - MH1



$$\begin{aligned}
 &16'-0'' \\
 &- 6'-9'' \\
 &9'-3'' \times \frac{1}{2} = 4.625 \\
 &\quad \cdot 6.75 \\
 &\hline
 &11.375
 \end{aligned}$$

Subject: KONECRANES  
FOR HONEYWELL - BLOWOUT

Project No. 2011-03  
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By DAH  
Date 3/21/11  
Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
MAIN SUPPORT BEAM - LOWER LANDING  
16' SPAN MEMBER

SHEAR DIAGRAM



Max. Shear = 2574 lbs

MOMENT DIAGRAM



Max. Moment = 1.19E+04 ft-lbs

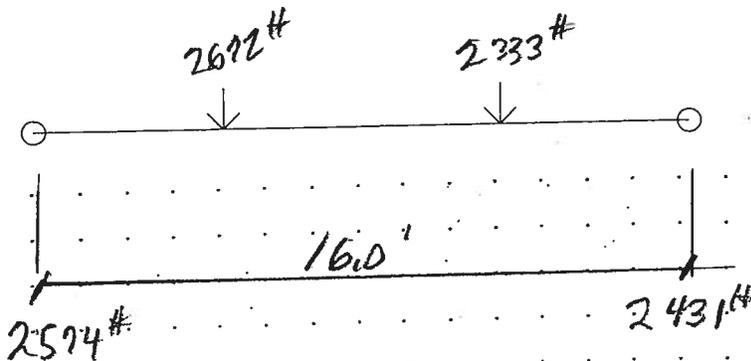
DEFLECTED SHAPE



Max. Def. = 0.152 in

$$\Delta/L = 1/9,263$$

BEAM SYSTEM



Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 2011-42  
Page C.23 of       
By GAH  
Date 3/21/11  
Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
MAIN SUPPORT BEAM - LOWER LANDING  
16' SPAN MEMBER

*Archon Beam Design Program*

INPUT DATA

Beam Type = C12X20.7  
Beam Classification = C

Total Length = 16.00(ft)  
Unbraced Length = 4.600(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 129.0(in<sup>4</sup>)  
Section Modulus = 21.50(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

(1) Point Load = 2672(lbs)  
Located 4.625(ft) from the left side.

(2) Point Load = 2333(lbs)  
Located 11.38(ft) from the left side.

OUTPUT

Max. Moment = 1.19E+04(ft-lbs)  
Max. Shear = 2574(lbs)  
Max Deflection = 0.152(in)  
Reaction R1 = 2574(lbs)  
Reaction R2 = 2431(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 6.644 ksi  
ALLOWABLE BENDING STRESS = 21.60 ksi, PER (.6Fy)

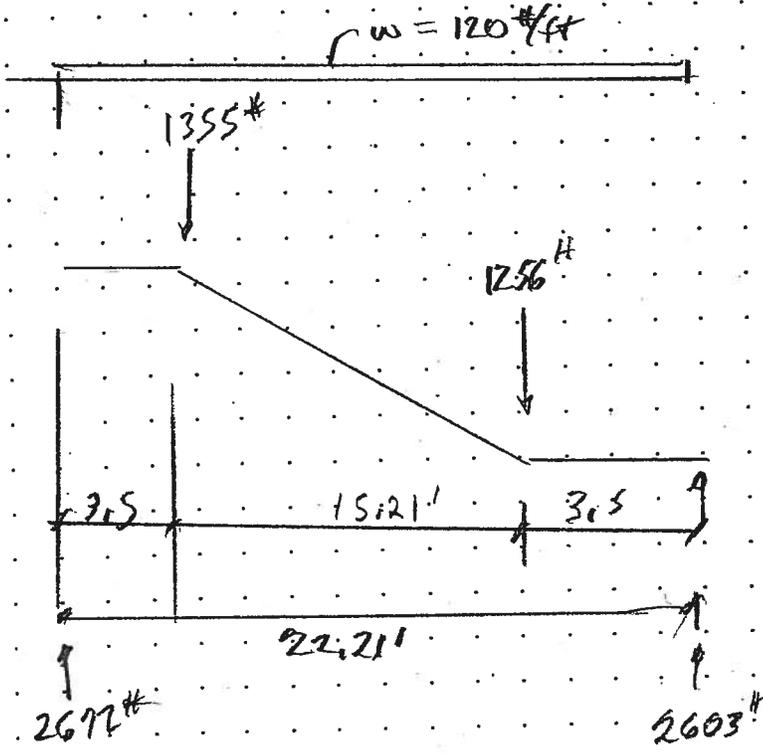
SHEAR STRESS = 0.762 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

Check STRINGER "S4" (Lower)(OUTSIDE)



$$L = 3.5' + 1.4' + 15' + 1.4' + 3.6'$$

$$\begin{array}{r} 3.5 \\ 15.21 \\ \hline 18.71 \end{array}$$

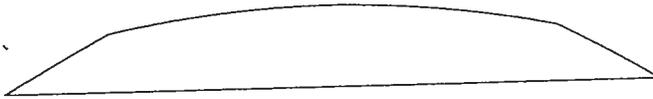
KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LOWER STRINGER "S4"  
OUTSIDE

SHEAR DIAGRAM



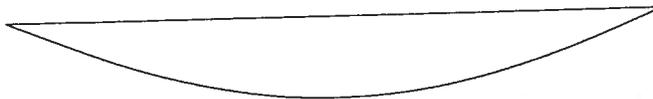
Max. Shear = 2672 lbs

MOMENT DIAGRAM



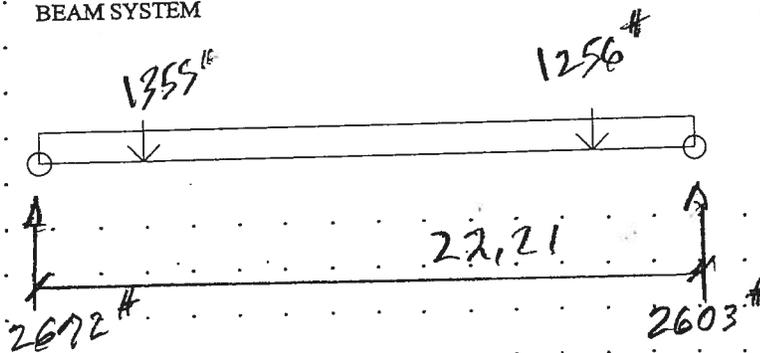
Max. Moment = 1.20E+04 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.301 in

BEAM SYSTEM



Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 2011-4  
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By JOH  
Date 3/21/11  
Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LOWER STRINGER "S4"  
OUTSIDE

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
LOWER STRINGER "S4"  
OUTSIDE

*Archon Beam Design Program*

INPUT DATA

Beam Type = C12X20.7  
Beam Classification = C

Total Length = 22.21(ft)  
Unbraced Length = 2.000(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 129.0(in<sup>4</sup>)  
Section Modulus = 21.50(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

( 1 ) Level Unif. Load = 120.0(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 22.20(ft).

( 2 ) Point Load = 1355(lbs)  
Located 3.500(ft) from the left side.

( 3 ) Point Load = 1256(lbs)  
Located 18.71(ft) from the left side.

OUTPUT

Max. Moment = 1.20E+04(ft-lbs)  
Max. Shear = 2672(lbs)  
Max Deflection = 0.301(in)  
Reaction R1 = 2672(lbs)  
Reaction R2 = 2603(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 6.681 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 0.791 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

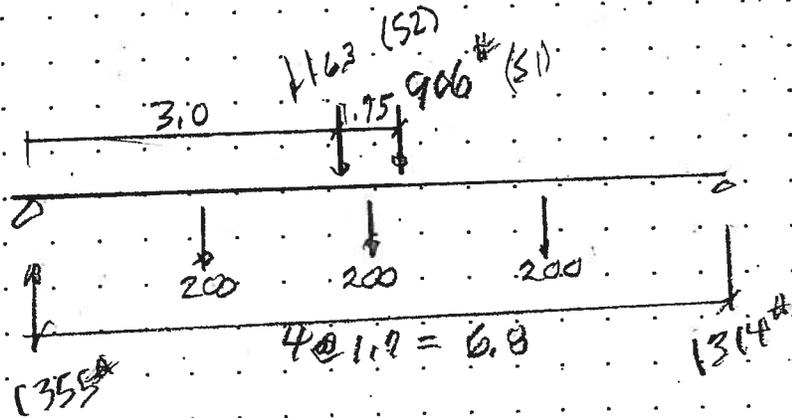
The member axial stress passes !  
The member bending stress passes !

The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

Subject KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 1111  
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By DAH  
Date 3/21/11  
Revised     

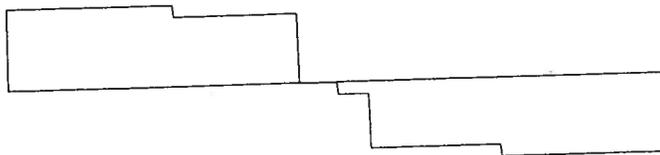
UPPER LANDING Header Bm HZ



Subject: KONECRANES  
FOR HONEYWELL - BLOWNT.

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
HEADER BEAM "H2" - UPPER LEVEL  
STRINGER LOADS + PLATFORM SUPPORT BEAMS

SHEAR DIAGRAM



Max. Shear = 1355 lbs

MOMENT DIAGRAM



Max. Moment = 3808 ft-lbs

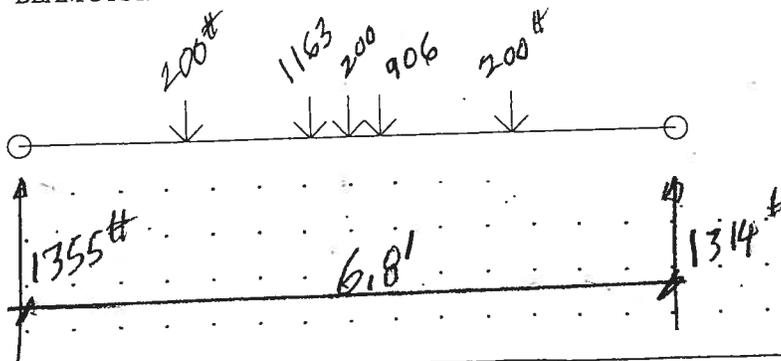
DEFLECTED SHAPE



Max. Def. = 0.0204 in

$$\Delta/L = 1/4000$$

BEAM SYSTEM



Subject: KONECRANES  
FOR HONEYWELL - BLOWOUT

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
HEADER BEAM "H2" - UPPER LEVEL  
STRINGER LOADS + PLATFORM SUPPORT BEAMS

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
HEADER BEAM "H2" - UPPER LEVEL  
STRINGER LOADS + PLATFORM SUPPORT BEAMS

Archon Beam Design Program

INPUT DATA

Beam Type = C9X13.4  
Beam Classification = C  
Total Length = 6.800(ft)  
Unbraced Length = 0.0100(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 47.90(in<sup>4</sup>)  
Section Modulus = 10.60(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

- ( 1 ) Point Load = 1163(lbs)  
Located 3.000(ft) from the left side.
- ( 2 ) Point Load = 906.0(lbs)  
Located 3.750(ft) from the left side.
- ( 3 ) Point Load = 200.0(lbs)  
Located 1.710(ft) from the left side.
- ( 4 ) Point Load = 200.0(lbs)  
Located 3.410(ft) from the left side.
- ( 5 ) Point Load = 200.0(lbs)  
Located 5.110(ft) from the left side.

OUTPUT

Max. Moment = 3808(ft-lbs)  
Max. Shear = 1355(lbs)  
Max Deflection = 0.0204(in)  
Reaction R1 = 1355(lbs)  
Reaction R2 = 1314(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER  
ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER  
BENDING STRESS = 4.311 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)  
SHEAR STRESS = 0.645 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject KONECRANES

FOR HONEYWELL - BLOWNT

Project No. 2011-03

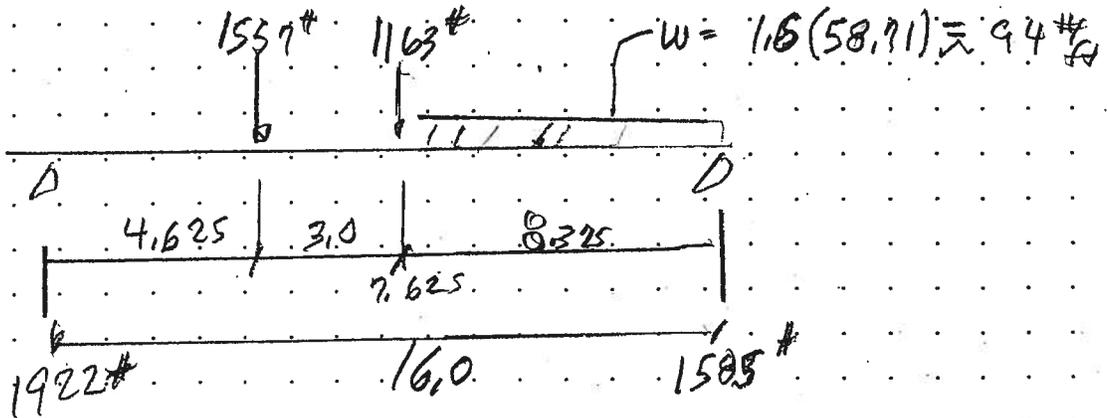
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By DAH

Date 3/21/11

Revised     

## MAIN SUPPORT BEAM - MHZ



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT.

Project No. 2011-03

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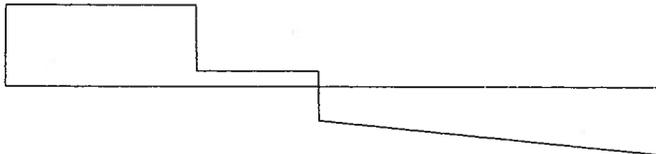
By JAH

Date 3/21/11

Revised     

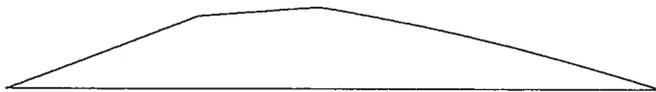
KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
MAIN SUPPORT BEAM - LOWER LANDING  
16' SPAN MEMBER

SHEAR DIAGRAM



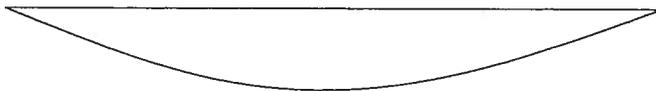
Max. Shear = 1922 lbs

MOMENT DIAGRAM



Max. Moment = 9978 ft-lbs

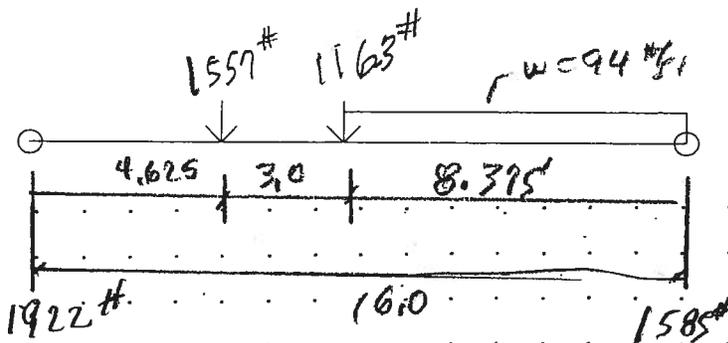
DEFLECTED SHAPE



Max. Def. = 0.113 in

$$O/L = \sqrt{1/1,699}$$

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 2011-03

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By DAH

Date 3/21/11

Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
MAIN SUPPORT BEAM - LOWER LANDING  
16' SPAN MEMBER

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
MAIN SUPPORT BEAM - LOWER LANDING  
16' SPAN MEMBER

### Archon Beam Design Program

#### INPUT DATA

Beam Type = C12X20.7  
Beam Classification = C  
  
Total Length = 16.00(ft)  
Unbraced Length = 8.375(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 129.0(in<sup>4</sup>)  
Section Modulus = 21.50(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

#### LOADS

- ( 1 ) Level Unif. Load = 94.00(lbs/ft)  
Starting 7.625(ft) from the left side.  
Over a length of 8.375(ft).
- ( 2 ) Point Load = 1557(lbs)  
Located 4.624(ft) from the left side.
- ( 3 ) Point Load = 1163(lbs)  
Located 7.625(ft) from the left side.

#### OUTPUT

Max. Moment = 9978(ft-lbs)  
Max. Shear = 1922(lbs)  
Max Deflection = 0.113(in)  
Reaction R1 = 1922(lbs)  
Reaction R2 = 1585(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER  
ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 5.569 ksi  
ALLOWABLE BENDING STRESS = 14.67 ksi, PER (F1-8)

SHEAR STRESS = 0.569 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

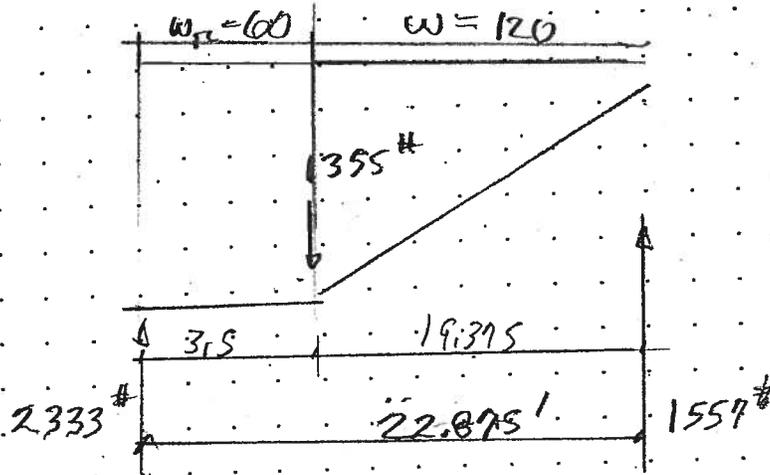
COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

#### CONCLUSION:

The member axial stress passes !  
The member bending stress passes !

The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

Check Stringer "53" (Upper)(Outside)



Subject: KONECRANES  
FOR HONEYWELL - BLOWOUT

Project No. 2011-05  
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By DAH  
Date 3/21/11  
Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
UPPER STRINGER "S3"

SHEAR DIAGRAM



Max. Shear = 2333 lbs

MOMENT DIAGRAM



Max. Moment = 1.03E+04 ft-lbs

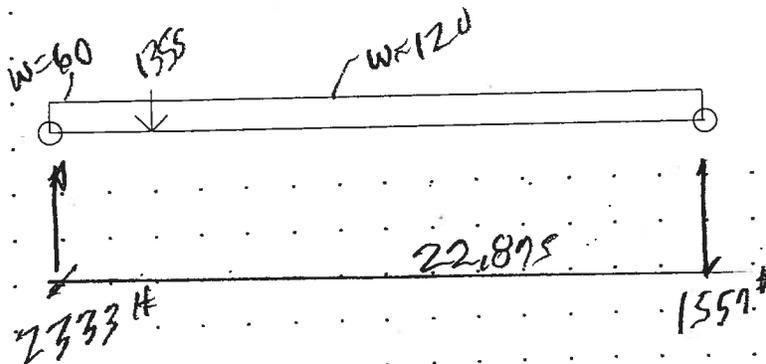
DEFLECTED SHAPE



Max. Def. = 0.266 in

$d/L = 1/1032$

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT.

Project No. 2011-φ  
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By GAH  
Date 3/21/11  
Revised     

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
UPPER STRINGER "S3"

KONECRANES - HONEYWELL - CRANE ACCESS STAIR  
UPPER STRINGER "S3"

### Archon Beam Design Program

#### INPUT DATA

Beam Type = C12X20.7  
Beam Classification = C

Total Length = 22.98(ft)  
Unbraced Length = 2.000(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 129.0(in<sup>4</sup>)  
Section Modulus = 21.50(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

#### LOADS

(1) Level Unif. Load = 60.00(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 3.500(ft).

(2) Level Unif. Load = 120.0(lbs/ft)  
Starting 3.500(ft) from the left side.  
Over a length of 19.38(ft).

(3) Point Load = 1355(lbs)  
Located 3.500(ft) from the left side.

#### OUTPUT

Max. Moment = 1.03E+04(ft-lbs)  
Max. Shear = 2333(lbs)  
Max Deflection = 0.266(in)  
Reaction R1 = 2333(lbs)  
Reaction R2 = 1557(lbs)

#### CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 5.724 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 0.690 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

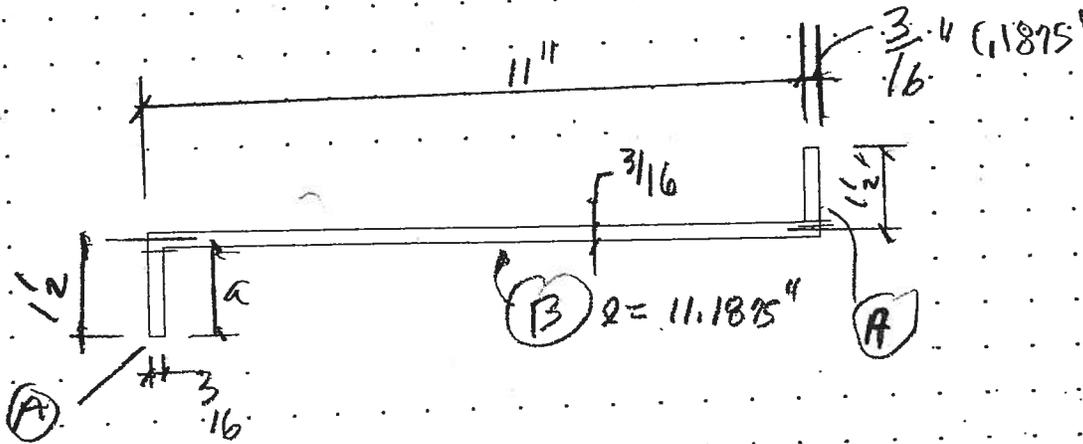
COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

#### CONCLUSION:

The member axial stress passes !

The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

STAIR TREAD CHECK



$$a = 1.5 - \frac{1.1875}{2} = 1.4063$$

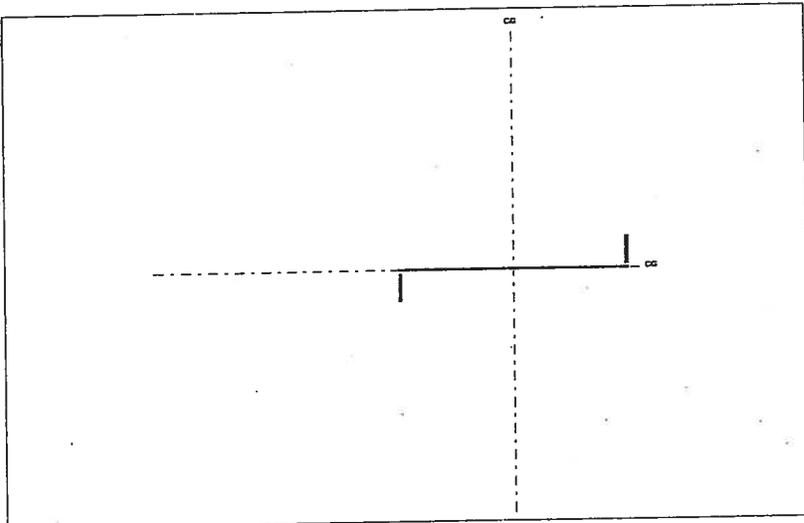
$$cg \text{ } y = 1.1875 + \frac{1.4063}{2} = 0.891''$$

**General Section Properties**

Lic. #: KW-06001371  
 Description: KONECRANES - HONEYWELL - STAIR TREAD

**Final Section Properties**

Total Area :	2.625 in <sup>2</sup>
Calculated final C.G. distance from Datum :	
X cg Dist. :	5.594 in
Y cg Dist. :	0.0 in
Edge Distances from CG. :	
+X :	5.594 in
-X :	-5.595 in
+Y :	1.594 in
-Y :	-1.594 in
Ixx =	0.5116 in <sup>4</sup>
Iyy =	37.835 in <sup>4</sup>
Sxx : -X :	0.3209 in <sup>3</sup>
Sxx : +X :	0.3209 in <sup>3</sup>
Syy : -Y :	6.763 in <sup>3</sup>
Syy : +Y :	6.763 in <sup>3</sup>
rxx :	0.4415 in
ryy :	3.797 in



**General Shapes**

Rect #	Area	Xcg	Ycg	Height	Width	Rotation	Rxx	Ryy
Rect : 1	0.264 in <sup>2</sup>	0.093 in	-0.891 in	1.406 in	0.188 in	0 dec CCW	0.062 in <sup>3</sup>	0.054 in
Rect : 2	2.098 in <sup>2</sup>	5.594 in	0.000 in	0.188 in	11.188 in	0 dec CCW	0.066 in <sup>3</sup>	3.230 in
Rect : 3	0.264 in <sup>2</sup>	11.094 in	0.891 in	1.406 in	0.188 in	0 dec CCW	0.062 in <sup>3</sup>	0.054 in

CHECK STAIR TREAD BASED ON  $f_b = 16 \text{ ksi}$

TREAD SPAN =  $3'-0"$

• UNIFORM LOAD

$$\text{DL: } w_t = \frac{2.62(490)}{144} = 8.92 \text{ \#/ft}$$

$$\text{LL: UNIFORM} = 50 \text{ psf}$$

$$\text{CONC.} = 300 \text{ \#}$$

• BENDING MOMENTS

$$\text{UNIFORM: } M = \frac{wL^2}{8} = \frac{58.92(3)^2}{8} = 66.285 \text{ ft-\#}$$

$$\text{CONC: } M = \frac{PL}{4} = \frac{300(3)}{4} = 225 \text{ ft-\#}$$

• BENDING STRESS

$$\text{UNIFORM: } f_s = \frac{M}{S} = \frac{66.285(12)}{1321} = 2,479 \text{ psi. OKAY}$$

$$\text{CONC: } f_b = \frac{M}{S} = \frac{225(12)}{1321} = 2,041 \text{ psi. OKAY}$$

Check Existing Platform BEAMS

EXISTING DESIGN LOADS

DL - 50 psf

LL - 100 psf

TL = 150 psf

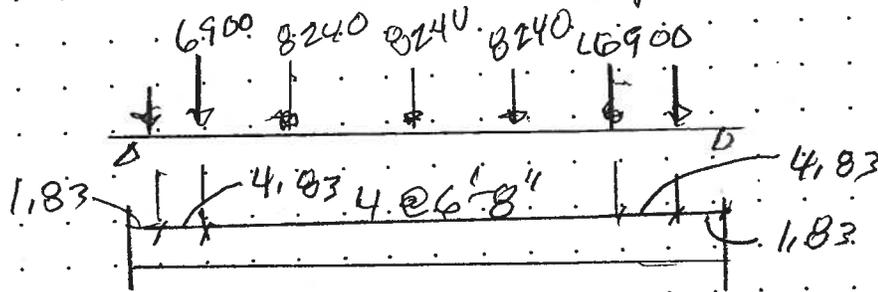
◦ Intermediate Beam @ 6'-8" : W12X31

◦ Span @ 16'

◦ Load to Beam :  $W_{TL} = 150 (6.67') = 1000.5 \#$

Total Load:  $W = 16 (1000.5)$   
 $= 16,008 \#$

MAIN BEAM - W24X76 - Span = 40'



$$\begin{aligned} &4' - 10'' \\ &+ 6' - 8'' \\ \hline &11' 6''/2 = 5.75 \end{aligned}$$

$$W = 5.75 (150)$$

$$W = 862.5$$

$$W = 862.5 (16)$$

$$W = 13,800$$

$$\frac{W}{2} = 6,900 \#$$

SUM SPACES

1.83	26.67
+ 4.83	+ 6.83
<hr/>	<hr/>
6.66	33.50
6.67	4.83
<hr/>	<hr/>
13.33	38.33
6.67	
<hr/>	
20.00	
+ 6.67	
<hr/>	
26.67	

# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT.

Project No. 2011-03

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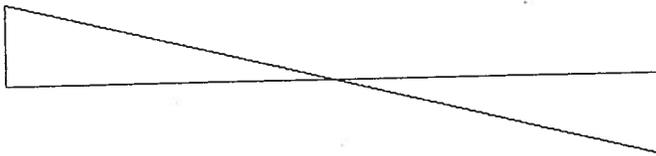
By DAH

Date 3/21/11

Revised     

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W12X31 (NOW W12X30)

SHEAR DIAGRAM



Max. Shear = 8240 lbs

MOMENT DIAGRAM



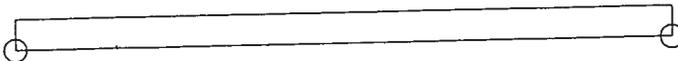
Max. Moment = 3.30E+04 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.220 in

BEAM SYSTEM



# HARTLEY & ASSOCIATES, INC.

Consulting Engineers

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

Project No. 2011-03

Page C40 of     

By DAH

Date 3/21/11

Revised     

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W12X31 (NOW W12X30)

## Archon Beam Design Program

### INPUT DATA

Beam Type = W12X30  
Beam Classification = W

Total Length = 16.00(ft)  
Unbraced Length = 0.0100(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 238.0(in<sup>4</sup>)  
Section Modulus = 38.60(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

### LOADS

(1) Level Unif. Load = 29.97(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 16.00(ft).

(2) Level Unif. Load = 1000(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 16.00(ft).

### OUTPUT

Max. Moment = 3.30E+04(ft-lbs)  
Max. Shear = 8240(lbs)  
Max Deflection = 0.220(in)  
Reaction R1 = 8240(lbs)  
Reaction R2 = 8240(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER  
ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 10.25 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 2.567 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

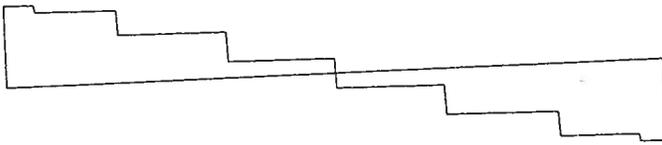
### CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W24X76 MAIN BEAM

SHEAR DIAGRAM



Max. Shear = -2.28E+04 lbs

MOMENT DIAGRAM



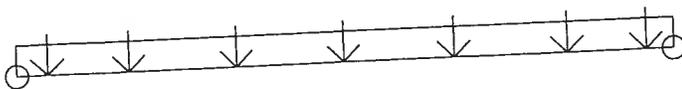
Max. Moment = 2.56E+05 ft-lbs

DEFLECTED SHAPE



Max. Def. = 1.183 in

BEAM SYSTEM



Subject: KONECRANES  
FOR HONEYWELL - BLOWT.

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W24X76 MAIN BEAM

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W24X76 MAIN BEAM

*Archon Beam Design Program*

INPUT DATA

Beam Type = W24X76  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 0.0100(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 2100(in<sup>4</sup>)  
Section Modulus = 176.0(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

- (1) Point Load = 2000(lbs)  
Located 1.830(ft) from the left side.
- (2) Point Load = 6900(lbs)  
Located 6.660(ft) from the left side.
- (3) Point Load = 8240(lbs)  
Located 13.33(ft) from the left side.
- (4) Point Load = 8240(lbs)  
Located 20.00(ft) from the left side.
- (5) Point Load = 8240(lbs)  
Located 26.67(ft) from the left side.
- (6) Point Load = 6900(lbs)  
Located 33.50(ft) from the left side.
- (7) Point Load = 2000(lbs)  
Located 38.33(ft) from the left side.
- (8) Level Unif. Load = 76.37(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

OUTPUT

Max. Moment = 2.56E+05(ft-lbs)  
Max. Shear = -2.28E+04(lbs)  
Max Deflection = 1.183(in)  
Reaction R1 = 2.28E+04(lbs)  
Reaction R2 = 2.28E+04(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER  
ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 17.48 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 2.169 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !  
Member is treated as compact.

APPROXIMATE WT. OF STAIR SYSTEM

Use  $w_{DL} \approx 15 \text{ psf}$

$w_{LL} = 50 \text{ psf}$

$w_{TL} = 65 \text{ psf}$

Landing 1:  $A = (3.5)(6.75) = 23.63 \text{ SF}$

$w_{DL} = (23.63)(15) = 354 \#$

$w_{LL} = (23.63)(50) = 1,182 \#$

$w_{TL} = 1,536 \#$

Landing 2 = Landing 1:

$w_{DL} = 354 \#$

$w_{LL} = 1,182 \#$

$w_{TL} = 1,536 \#$

Landing 3 (Upper)

$A = (3.5)(14) = 49 \text{ SF}$

$w_{DL} = 49(15) = 735 \#$

$w_{LL} = 49(50) = 2,450 \#$

$w_{TL} = 3,185 \#$

Stair (cont'd)

STAIR #1      $A = (3)(15) = 45 \text{ SF}$

$W_{DL} = (15)(45) = 675$

$W_{LL} = (50)(45) = 2250 \#$

$\Sigma W_{TL} = 2,925 \#$

Stair #2      $A = (3)(15) = 45 \text{ SF}$

$W_{DL} = (15)(45) = 675 \#$

$W_{LL} = (50)(45) = 2250 \#$

$\Sigma W_{TL} = 2925 \#$

Stair #3 :  $A = 3(19.16) = 57.48 \text{ SF}$

$W_{DL} = (57.48)(15) = 862 \#$

$W_{LL} = (57.48)(50) = 2874$

$\Sigma W_{TL} = 3,736 \#$

SUMMARY

	DL	LL	TL
LANDING 1	354	1182	1536
" 2	354	1182	1536
" 3	735	2450	3185
Stair 1	675	2250	2925
" 2	675	2250	2925
" 3	862	2874	3736
<u>Totals</u>	<u>3,655</u>	<u>15,135</u>	<u>18,790 #</u>

Check Approximate Weight of Platform  
DL & LIVE Load (LL) Used in the original design

$W_{12 \times 14.4} \text{ wt} = 14(16)(2) = 448$

$W_{12 \times 31.5} \text{ wt} = 31(16)(5) = 2,480$

$W_{24 \times 76} \text{ wt} = 76(40)(2) = 6,080$

$\Sigma \text{ wt} = 9,008 \#$

LIVE LOAD:  $\text{wt} = (16)(40)(100) = 64,000 \#$

Case 1: Total Design Load  $\approx 73,008 \#$

OR:  $\text{DL} = 50(16)(40) = 32,000 \#$

$\text{LL} = 100(16)(40) = 64,000 \#$

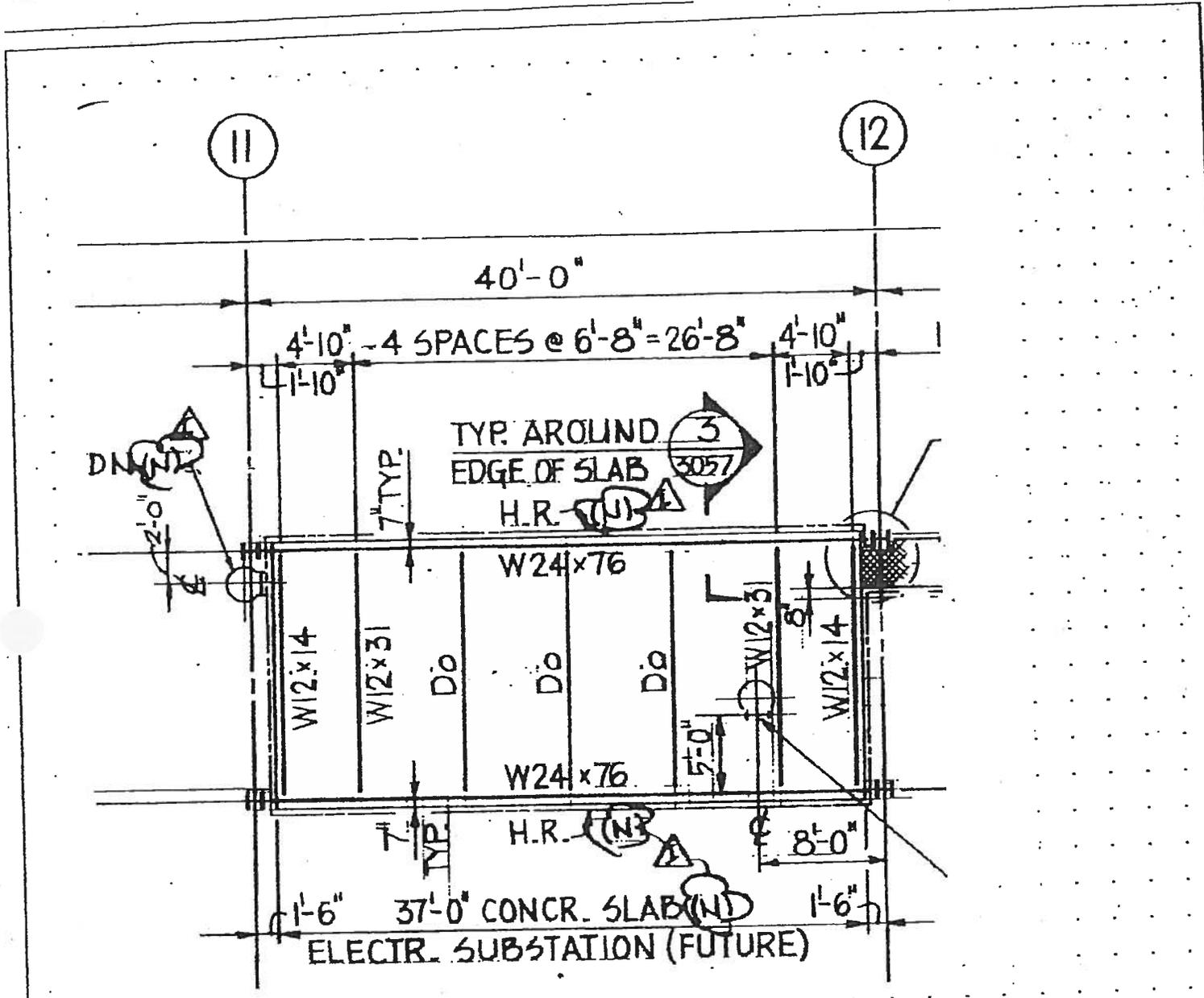
Case 2: Total Des. Load =  $96,000 \#$

Approximate Total Load of Steel System:

$W_{DL} = 3,655 \#$

$W_{LL} = 15,135 \#$

$\Sigma W_{TL} = 18,790 \# \lll (96,000 \#)$



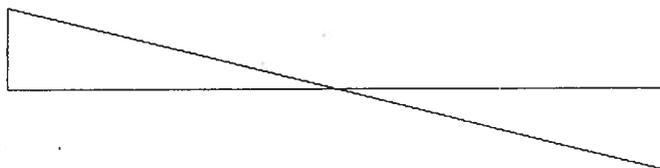
Check LOAD EFFECTS. For M.A.10. Bms

$W24 \times 76 - 545 \#/ft - f_b = 7.45 \text{ ksi} \quad \Delta = 0.519''$   
 (21,800#)  
 $W18 \times 50 - 505 \#/ft - f_b = 13.64 \text{ ksi} \quad \Delta = 1.254''$   
 (20,200#)  
 $W18 \times 35 - 505 \#/ft - f_b = 21.0 \text{ ksi} \quad \Delta = 1.967''$

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W24X76 MAIN BEAM

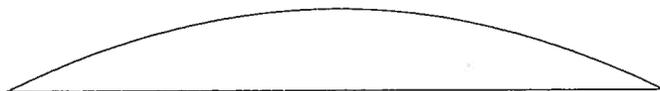
W24X76

SHEAR DIAGRAM



Max. Shear = 1.09E+04 lbs

MOMENT DIAGRAM



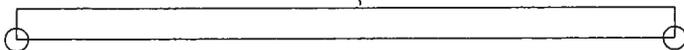
Max. Moment = 1.09E+05 ft-lbs

DEFLECTED SHAPE



Max. Def. = 0.517 in

BEAM SYSTEM



$w = 470 + 26.4$

$f_b = 7.45 \text{ ksi}$

Subject: KONECRANES  
FOR HONEYWELL - BLOWOUT

Project NO. \_\_\_\_\_  
Page C49 of \_\_\_\_\_  
By DAH  
Date 3/21/11  
Revised \_\_\_\_\_

KONECRANES - HONEWELL PROJECT  
PLATFORM BEAM CHECK  
W24X76 MAIN BEAM

*Archon Beam Design Program*

INPUT DATA

Beam Type = W24X76  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 6.670(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 2100(in<sup>4</sup>)  
Section Modulus = 176.0(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

( 1 ) Level Unif. Load = 76.37(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

( 2 ) Level Unif. Load = 470.0(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

OUTPUT

Max. Moment = 1.09E+05(ft-lbs)  
Max. Shear = 1.09E+04(lbs)  
Max Deflection = 0.517(in)  
Reaction R1 = 1.09E+04(lbs)  
Reaction R2 = 1.09E+04(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 7.450 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 1.039 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W18X50 MAIN BEAM

W18X50

SHEAR DIAGRAM



Max. Shear = 1.01E+04 lbs

MOMENT DIAGRAM



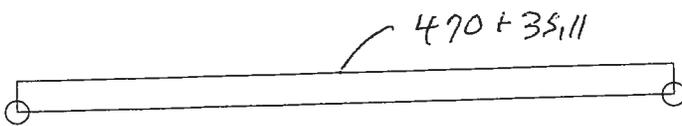
Max. Moment = 1.01E+05 ft-lbs

DEFLECTED SHAPE



Max. Def. = 1.254 in

BEAM SYSTEM



$$f_b = 13,64 \text{ ksi}$$

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W18X50 MAIN BEAM

*Archon Beam Design Program*

INPUT DATA

Beam Type = W18X50  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 0.0100(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 800.0(in<sup>4</sup>)  
Section Modulus = 88.90(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

(1) Level Unif. Load = 470.0(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

(2) Level Unif. Load = 35.11(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

OUTPUT

Max. Moment = 1.01E+05(ft-lbs)  
Max. Shear = 1.01E+04(lbs)  
Max Deflection = 1.254(in)  
Reaction R1 = 1.01E+04(lbs)  
Reaction R2 = 1.01E+04(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 13.64 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 1.581 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

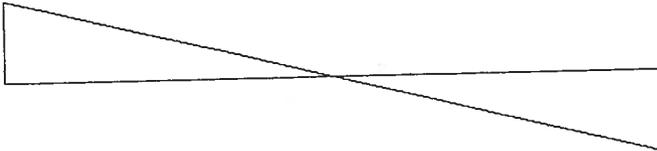
The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !

Project: KONECRANES  
FOR HONEYWELL - BLOWNT.

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W18X35 MAIN BEAM

W18X35 (ALTERNATE)

SHEAR DIAGRAM



Max. Shear = 1.01E+04 lbs

MOMENT DIAGRAM



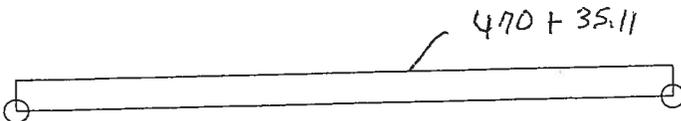
Max. Moment = 1.01E+05 ft-lbs

DEFLECTED SHAPE



Max. Def. = 1.967 in

BEAM SYSTEM



$$f_b = 21.05 \text{ ksi}$$

Subject: KONECRANES  
FOR HONEYWELL - BLOWNT

KONECRANES - HONEYWELL PROJECT  
PLATFORM BEAM CHECK  
W18X35 MAIN BEAM

*Archon Beam Design Program*

INPUT DATA

Beam Type = W18X35  
Beam Classification = W

Total Length = 40.00(ft)  
Unbraced Length = 0.0100(ft)  
Young's Modulus = 2.90E+07(psi)  
Moment of Inertia = 510.0(in<sup>4</sup>)  
Section Modulus = 57.60(in<sup>3</sup>)  
Strong Axis Bending!  
Both ends of the beam are pinned.

LOADS

(1) Level Unif. Load = 470.0(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

(2) Level Unif. Load = 35.11(lbs/ft)  
Starting 0(ft) from the left side.  
Over a length of 40.00(ft).

OUTPUT

Max. Moment = 1.01E+05(ft-lbs)  
Max. Shear = 1.01E+04(lbs)  
Max Deflection = 1.967(in)  
Reaction R1 = 1.01E+04(lbs)  
Reaction R2 = 1.01E+04(lbs)

CODE CHECK DATA, AISC (ASD) 9th Ed.

AXIAL STRESS = 0 ksi  
ALLOWABLE AXIAL STRESS(Weak axis buckling) = 0 ksi, PER

ALLOWABLE AXIAL STRESS(Strong axis buckling) = 0 ksi, PER

BENDING STRESS = 21.05 ksi  
ALLOWABLE BENDING STRESS = 23.76 ksi, PER (F1-1)

SHEAR STRESS = 1.903 ksi  
ALLOWABLE SHEAR STRESS = 14.40 ksi, PER (F4-1)

COMBINED AXIAL AND BENDING FACTOR(Weak axis buckling) IS 0 PER  
COMBINED AXIAL AND BENDING FACTOR(Strong axis buckling) IS 0 PER

CONCLUSION:

The member axial stress passes !  
The member bending stress passes !  
The member shear stress passes !  
The member combined stress passes !

# APPENDIX D

## DRAWINGS

### NOTES:

1. EXISTING BUILDING REFERENCE DRAWINGS AND NEW ACCESS STAIR DRAWINGS ARE LISTED ON DRAWING "DWG".
2. 11X17 SIZE DRAWINGS ARE SEPARATELY ATTACHED WITH THIS REPORT.
3. IN ADDITION, FULL SIZE 22X34 PRINTS ARE ATTACHED SEPARATELY BY REFERENCE.

STRUCTURAL ENGINEERING INVESTIGATION REPORT  
 OF AN EXISTING BUILDING FOR THE SUPPORT  
 OF A PROPOSED 25 TON CRANE

TABLE A

LIST OF BUILDING REFERENCE DRAWINGS SPECIFICALLY  
 APPLICABLE TO EVALUATION OF CRANE RUNWAY AND FOR THE  
 CONSTRUCTION OF AN CRANE ACCESS STAIRWAY

A. GROUP 1 - TAKEN FROM A SET OF 201 DRAWINGS BY  
 LOCKWOOD GREENE DATE 1973

DWG. NO.	TITLE
1. 3A-4-3001-F	ROOF FRAMING PLAN (Includes GENERAL NOTES & ROOF LOADS)
2. 3A-4-3021-E	CRANE RUNWAY FRAMING
3. 3A-4-3022-D	CRANE RUNWAY FRAMING
4. 3A-4-3023-F	CRANE RUNWAY FRAMING
5. 3A-4-3035-F	COLUMN SCHEDULE & DETAILS, SHEET 1
6. 3A-4-3036-F	COLUMN SCHEDULE & DETAILS, SHEET 2
7. 3A-4-3050-D	ELEVATION OF CRANE RUNWAY (LINE H)
8. 3A-4-3051-D	ELEVATION OF CRANE RUNWAY (LIKE J)
9. 3A-4-3052-F	CRANE RUNWAY SECTIONS & DETAILS
10. 3A-4-3055-F	CRANE DESIGN LOADS & CLEARANCES
11. 3A-4-3056-G	FRAMING PLANS & DETAILS (SHEET 1)
12. 3A-4-3057-I	FRAMING PLANS & DETAILS (SHEET 2)
13. 3A-4-3058-H	FRAMING PLANS & DETAILS (SHEET 3)
14. 3A-4-3063-B	SECTIONS & DETAILS
15. 3A-4-3064-C	STAIR PLANS, SECTIONS & DETAILS
16. 3A-4-3065-B	STAIR PLANS, SECTIONS & DETAILS

B. GROUP 2 - TAKEN FROM A SET OF 46 DRAWINGS BY FLORIDA STEEL CORP.  
 DATED 1981

1. 3A2  
 GENERAL LAYOUT  
 NOTE: THIS DRAWING IDENTIFIES BRIDGE CRANES  
 LOCATED IN EACH BUILDING BAY

STRUCTURAL ENGINEERING INVESTIGATION REPORT  
 OF AN EXISTING BUILDING FOR THE SUPPORT  
 OF A PROPOSED 25 TON CRANE

TABLE B

LIST OF NEW DRAWING BY HARTLEY & ASSOCIATES, INC.  
 SHOWING A PROPOSED ACCESS STAIR TO THE NEW CRANE

DWG. NO.	TITLE
1. ST-1	ACCESS STAIR TO CRANE (SHOWS PLANS OF STAIR SYSTEM)
2. ST-2	ACCESS STAIR TO CRANE (SHOWS SECTIONS THRU STAIR)
3. ST-3	ACCESS STAIR TO CRANE (SHOWS TRANSVERSE SECTION THRU LANDINGS)

DATE	3/23/11
JOB NO.	2011-03
SHEET NO.	
 HARTLEY & ASSOCIATES, INC. CONSULTING ENGINEERS JACKSONVILLE, FLORIDA	
KONECRANES INC. ORANGE PARK, FL FOR: USMC - BLOUNT ISLAND - JACKSONVILLE, FL BUILDING EVALUATION FOR 25 TON CRANE	